Proceedings of The 5th Annual International Seminar on Trends in Science and Science Education

18-19 October 2018, Medan, Indonesia

AISTSSE 2018

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Preface

This book contains the proceedings of the 5th Annual International Seminar on Trends in Science and Science Education (AISTSSE-2018), held in Medan, Indonesia 18-19 October, 2018. AISTSSE is organized by Faculty of Mathematics and Natural Sciences, Universitas Negeri Medan.

AISTSSE conference presents six plenary and invited speakers from Australia, Japan, Thailand, and from Indonesia. Besides speaker, around 171 researchers covering lecturers, teachers, participants and students have attended in this conference. The researchers come from Jakarta, Yogyakarta, Bandung, Palembang, Jambi, Batam, Pekanbaru, Padang, Aceh, Medan and several from Malaysia, and Thailand. The AISTSSE meeting is expected to yield fruitful result from discussion on various issues dealing with challenges we face in this Industrial Revolution (RI) 4.0. The purpose of AISTSSE is to bring together professionals, academics and students who are interested in the advancement of research and practical applications of innovation in education, science and culture.

The presentation of such conference covering multi disciplines will contribute a lot of inspiring inputs and new knowledge on current trending about: Mathematical Sciences, Mathematics Education, Physical Sciences, Physics Education, Biological Sciences, Biology Education, Chemical Sciences, Chemistry Education, and Computer Sciences. Thus, this will contribute to the next young generation researches to produce innovative research findings. Hopely that the scientific attitude and skills through research will promote Unimed to be a well-known university which persist to be developed and excelled.

The proceedings consist of 159 papers. The peer review process was employed by Committee to evaluate all of papers, whose the members are highly qualified independent researcher in the AISTSSE topic area.

Finally, we would like to express greatest thankful to all colleagues in the steering committee for cooperation in administering and arranging the conference. Hopefully this conference will be continued in the coming years with many more insight articles from inspiring research. We would also like to thank the invited speakers for their invaluable contribution and for sharing their vision in their talks. We hope to meet you again for the next conference of AISTSSE.

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Martina Restuati
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Contribution of Multiple Intelligence to Students’ Biology Learning Outcomes in whole MAN (Madrasah Aliyah Negeri) Medan

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Departemen Biology Universitas Negeri Medan¹,²,³

Abstract. This research is a descriptive research with regression analysis technique at significance level α = 0.05. This study aims to determine the contribution of multiple intelligences to student biology learning outcomes in whole MAN Medan. The population in this study covers all students of class XI MIA in whole MAN Medan. The sample in this study was taken with proportionate stratified random sampling (PSRS) and simple random sampling (SRS) technique, which totaled to 281 students. The instruments of this research are multiple intelligence test and biology study result. The results obtained that multiple intelligences (multiple intelligences) contribute to student biology learning outcomes by 57.7% with the significance value of \( X_{1,1} = 0.000, X_{1,2} = 0.029, X_{1,3} = 0.040, X_{1,4} = 0.000, X_{1,5} = 0.780, X_{1,6} = 0.913, X_{1,7} = 0.891 \) and \( X_{1,8} = 0.000 \), then individually \( X_{1,1}, X_{1,2}, X_{1,3}, X_{1,4} \) and \( X_{1,8} \) (verbal, logic, visual, kinesthetic and natural intelligence) influence students’ biology learning outcomes with significance values <0.05. The conclusion in this study is to see the contribution of each multiple intelligence, it can be known that what kind of multiple intelligences which has the greatest contribution or called the best predictor of students’ biology learning outcomes.

Keywords: Multiple intelligences, students’ biology learning outcomes

1 Introduction

Intelligence is the ability possessed by every human being that is closely related to human life and success (Maftuh, 2015). Intelligence is an important factor as a predictor of academic achievement in schools and has an important role in the future success of students (Kuncel et al, 2004). Zohar (2005) divides three types of intelligence, namely Intellectual intelligence (IQ), emotional intelligence (EQ) and spiritual intelligence (SQ).

There are still many educational patterns that prioritize understanding the language of intelligent students only limited to IQ. Gardner argues that linguistic abilities and logic/mathematical abilities possessed by a person do not always contribute more than other intelligences (Mahasneh, 2013). There is no certainty that students who have high intelligence will automatically succeed in learning in school (Fauzi & Farichah, 2016).

Education has so far still and only emphasized mathematical and language logic abilities. According Purwatiningsih (2015) that the national education system that measures the level of intelligence of students who only emphasize the ability of knowledge needs to be revised, the level of children’s intellectual intelligence does not only include two parameters, namely logic and language, but also must be seen from the kinesthetic, musical, visual, spatial,
interpersonal, intrapersonal and naturalistic aspects, so that scientific development can be carried out.

An individual is said to be intelligent when the IQ test results are high (Lukman et al, 2005). So that success is solely related to intellectual intelligence because it is considered as a person's thinking capacity (Pratama et al, 2015). According to Katsis et al (2014) that high intellectual intelligence cannot show high knowledge, but a lower IQ will hamper academic performance. Academic results and IQ tests are weak predictors of true intelligence because they only measure a person's linguistic-verbal and logical-mathematical abilities (Lwin et al, 2004).

Gardner in Armstrong (2009) provides a means of mapping various abilities possessed by humans by classifying their abilities into eight intelligences or multiple intelligences. According to Al-Mahbasi et al (2017) some intelligence can produce a more interesting learning environment and support more active learning. This multiple intelligence will help teachers to recognize the strengths, weaknesses and abilities that are different from each student, so that it will help the teacher in the activities of the teaching and learning process (Koura & Al-Hebaishi, 2014). Teachers can also help develop children's multiple intelligences by positioning children as learning centers (Komala & Asri, 2016). Multiple intelligence approaches and assessments of learning enable students to succeed in classroom learning (Gangadevi, 2014).

Based on the results of observations made in MAN (Madrasah Aliyah Negeri) whole Medan, it was found that the teacher had applied several cooperative learning methods, although it was not necessarily appropriate for students who had different types of intelligence and were less facilitated in developing each students’ intelligence. If the teacher understands multiple intelligence, they can overcome the variety of student learning styles (Richards, 2016). This is related with Murdiyanti (2012) which states that the subject matter, teaching materials, media and cognitive evaluation instruments used focus more on intellectual intelligence in the form of logic and language, whereas if the syllabus, teaching materials and media based on multiple intelligences can improve the effectiveness of biology learning outcomes. Based on the description above and in order to overcome these problems, it is important to conduct research on the contribution of multiple intelligences to the results of student biology learning outcomes in whole MAN (Madrasah Aliyah Negeri) Medan.

2 Research Methods

This research has been carried out in March-April 2018 at three schools of MAN (Madrasah Aliyah Negeri) Medan. The population in this study were all students of grade XI Science in MAN Medan academic year 2017/2018 as many as 942 students distributed into 21 classes (clusters) in three schools. The research sample was taken with the Proportional Stratified Random Sampling (PSRS) and Simple Random Sampling (SRS) techniques. Determination of the number of samples using the Slovin method with a total of 281 students.

The procedure of this research was carried out through 3 stages, namely: (1) the preparation phase, (2) the stage of data collection, and (3) the preparation stage of the report.

The instruments in this study include (1) direct observation when observing the teaching and learning process in class; (2) a questionnaire of multiple intelligences by Howard Gardner obtained from the previous researcher and modified consisting of 40 statements, with a Likert scale of point 4, where point 4 states always, point 3 states often, point 2 states
sometimes and point 1 states never. The aspects of multiple intelligence measured include eight intelligences, namely: verbal-linguistic intelligence, logic-mathematical intelligence, visual-spatial intelligence, kinetic physical intelligence, musical intelligence, interpersonal intelligence, intrapersonal intelligence, and natural intelligence; 3) biology learning outcomes test in the form of multiple choices consisting of 25 multiple choice questions and validated in terms of content (human digestive system material) and problem construction.

Data analysis techniques include: (1) descriptive analysis, (2) quantitative analysis consisting of normality test, homogeneity test and hypothesis test of stepwise multiple regression analysis.

3 Research Result

The relationship between multiple intelligences (X1) on student biology learning outcomes in the form of a simple linear regression equation can be written as follows: \( \hat{Y} = -30.210 + 1.210X1 \).

The correlation value is 0.760 or 76.0% which is classified as very strong. The calculated F value is 380.82 with a significance level of 0.000 indicating that the significance value is much smaller than 0.05, so the regression model above can be used to see the significance of the relationship between student learning outcomes.

Contribution of multiple intelligences (X1) to student biology learning outcomes (Y) is 0.577 or 57.7%, while the remaining 42.3% is determined by other variables.

Table 1. Summary of Multiple Intelligence Contribution Results on Students’ Biology Learning Outcomes

<table>
<thead>
<tr>
<th>No</th>
<th>Variable</th>
<th>Regression Equation</th>
<th>Correlation (r / R)</th>
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<th>F_count</th>
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<tr>
<td>1</td>
<td>Multiple Intelligence</td>
<td>( \hat{Y} = -30.210 + 1.210X1 )</td>
<td>0.760</td>
<td>0.577</td>
<td>380.8</td>
<td>2.63</td>
</tr>
<tr>
<td>2</td>
<td>Verbal Intelligence</td>
<td>( \hat{Y} = -0.113 + 0.745X_{1,1} )</td>
<td>0.850</td>
<td>0.722</td>
<td>725.5</td>
<td>2.63</td>
</tr>
<tr>
<td>3</td>
<td>Logical Intelligence</td>
<td>( \hat{Y} = 18.639 + 0.445X_{1,2} )</td>
<td>0.505</td>
<td>0.255</td>
<td>95.60</td>
<td>2.63</td>
</tr>
<tr>
<td>4</td>
<td>Visual Intelligence</td>
<td>( \hat{Y} = 45.804 - 0.028X_{1,3} )</td>
<td>0.025</td>
<td>0.001</td>
<td>0.173</td>
<td>2.63</td>
</tr>
<tr>
<td>5</td>
<td>Musical Intelligence</td>
<td>( \hat{Y} = 43.167 + 0.012X_{1,4} )</td>
<td>0.012</td>
<td>0.000</td>
<td>0.042</td>
<td>2.63</td>
</tr>
<tr>
<td>6</td>
<td>Interpersonal Intelligence</td>
<td>( \hat{Y} = 39.246 + 0.068X_{1,5} )</td>
<td>0.075</td>
<td>0.006</td>
<td>1.574</td>
<td>2.63</td>
</tr>
<tr>
<td>7</td>
<td>Intrapersonal Intelligence</td>
<td>( \hat{Y} = 39.024 + 0.079X_{1,6} )</td>
<td>0.079</td>
<td>0.006</td>
<td>1.766</td>
<td>2.63</td>
</tr>
<tr>
<td>8</td>
<td>Kinesthetic Intelligence</td>
<td>( \hat{Y} = 5.099 + 0.676X_{1,7} )</td>
<td>0.880</td>
<td>0.775</td>
<td>961.4</td>
<td>2.63</td>
</tr>
<tr>
<td>9</td>
<td>Natural Intelligence</td>
<td>( \hat{Y} = 9.755 + 0.611X_{1,8} )</td>
<td>0.775</td>
<td>0.601</td>
<td>420.5</td>
<td>2.63</td>
</tr>
</tbody>
</table>
Multiple intelligence (X1) consists of several components of intelligence, namely verbal, logical, visual, musical, interpersonal, intrapersonal, kinesthetic and natural intelligence. The contribution of each intelligence is; verbal intelligence (X1.1) contributes 0.722 or 72.2%, logical intelligence (X1.2) contributes 0.505 or 50.5%, visual intelligence (X1.3) contributes 0.001 or 0.1%, musical intelligence (X1.4) contribute 0.000 or 0%, interpersonal intelligence (X1.5) contribute 0.006 or 0.6%, intrapersonal intelligence (X1.6) 0.006 or 0.6%, kinesthetic intelligence (X1.7) contribute 0.775 or 77.5 % and natural intelligence (X1.8) contribute 0.601 or 60.1%. (Table 4.1).

Based on the significance value that is X1.1 = 0.000, X1.2 = 0.000, X1.3 = 0.678, X1.4 = 0.838, X1.5 = 0.211, X1.6 = 0.185, X1.7 = 0.000 and X1.8 = 0.000, then individually X1.1, X1.2, X1.7, and X1.8 (verbal intelligence, logic intelligence, kinesthetic intelligence and natural intelligence) contribute each component to students' biological learning outcomes with a significance value of <0.05. While other variables do not contribute to each component of emotional intelligence with a significance value of>0.05.

4 Discussion

Based on the results of the study, it is found that multiple intelligences can simultaneously predict the students’ biology learning outcomes. In this case multiple intelligences that have individual contributions from each component of intelligence to students’ biology learning outcomes are language, logic, kinesthetic and natural intelligence.

Verbal intelligence has a contribution of 0.722 or 72.2%, this intelligence has an important meaning in achieving optimal learning outcomes, where verbal intelligence is the ability of a person to think of a series of available words. This intelligence is an important intelligence in all academic and non-academic activities in secondary schools. Verbal intelligence reveals
how well a person can understand ideas expressed through words (verbal), and how clearly one can think and reason with words. With verbal intelligence students will more easily understand the biological science concepts provided by the teacher (Solihah, 2012).

Logical intelligence has a contribution of 0.255 or 25.5%, logical intelligence also has a contribution in achieving student biology learning outcomes, where logical intelligence is the intelligence to recognize thought patterns of a logical relationship and concepts. According to Gardner (1989) if someone has this logical intelligence then the skills that will be possessed are scientists and mathematicians, because biology is a science subject, so it is necessary to contribute logical intelligence to the biology learning outcomes.

Kinesthetic intelligence has a contribution of 0.775 or 77.5%, kinesthetic intelligence possessed by students is quite high because in biology learning experiment is often carried out which makes students more active in moving when practicing. This is in line with Bire (2014) that students who have kinesthetic intelligence in which students will immediately take action in learning so that the process and learning outcomes become more smooth and maximal. Kinesthetic intelligence also enhances creative learning so that students become aware of lessons that grow toward student achievement (Uzho & Salame, 2016).

Natural intelligence has a contribution of 0.601 or 60.1%, natural intelligence possessed by students also includes predictors of students' biology learning outcomes, this is because biology learning does not escape nature. Visits to nature or learning directly from nature can increase students' knowledge. This is related with Lesmana (2016) which states that natural intelligence / naturalist can improve science learning outcomes which have implications in everyday life. It is said that natural intelligence is because this intelligence is a person's ability to recognize and classify species such as flora, fauna and the environment and also includes sensitivity to other natural phenomena, so that this intelligence has links with science which includes biological subjects.

Each intelligence has its own advantages, so that none of the students is considered superior to others (Morgan, 2004). Intelligences that contributes to students' biology learning outcomes are language, logic, kinesthetic and natural intelligence, but that does not mean that other intelligences are considered not superior, this is why Gardner classifies their abilities into eight intelligences or multiple intelligences rather than looking at their IQ level (verbal and logic) only but by looking at the potential of verbal, logical, visual, musical, interpersonal, intrapersonal, kinesthetic and natural intelligence.

Gardner in Armstrong (2009) provides a means of mapping various abilities possessed by humans by classifying their abilities into eight intelligences or multiple intelligences. This level of intelligence can develop or can even be hampered along with increasing age and influencing factors, the strong weakness of each multiple intelligence is influenced by biological factors, life history, personal, cultural and historical backgrounds. Multiple intelligence can help teachers to recognize the strengths, weaknesses and abilities that are different from each student, so that it will help teachers in the activities of the teaching and learning process (Koura & Al-Hebaishi, 2014). The ability of teachers to recognize multiple intelligences possessed by students is very important, this factor will be very decisive in planning the learning process that must be taken by students (Murray, 2012).

The development of multiple intelligences theories and with their acceptance in the world of education, this theory can be applied in the class. Multiple intelligences learning is learning that values the intelligence possessed by students, and a variety of ways of learning students (Samsinar, 2014) and provides opportunities for students to use a type of intelligence that is prominent in encouraging learning (Spirovksa, 2013). According to Amalia (2015) that a dominant intelligence potential can develop optimally if the potential possessed by the child is
designed in the right and continuous way through a fun and varied way in learning. One way that can be done is with multiple intelligences-based learning, this is related with Andini's (2018) research that the application of learning based on multiple intelligences can stimulate the diversity of intelligence possessed by students and make the learning atmosphere more enjoyable.

5 Conclusion

Based on the results of research and discussion, it can be concluded that the contribution of multiple intelligences to the students’ biology learning outcomes in grade XI Science in whole MAN (Madrasah Aliyah Negeri) Medan is 0.577 or 57.7%, while the remaining 42.3% is determined by other variables. By looking at the contribution of each component of multiple intelligences, it can be known which components of multiple intelligences have the greatest contribution or are called the best predictors of student biology learning outcomes.

Acknowledgments. Thank you for my thesis supervisors, Mr. Prof. Dr. Herbert Sipahutar, M.S., M.Sc. and Mr. Dr. Syahmi Edi, M.Si., who helped me a lot in completing this article and the MAN (Madrasah Aliyah Negeri) schools in Medan that helped me a lot in collecting data for the completion of this article.

References


Antibacterial Activity of The Hexane Extract from Leaf of Plant Solanum Ferox L

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Abstract. Solanum ferox or Acid aubergine plants is one of the vegetables that are made in the food. Solanum ferox contains terpenoid compounds, steroids, flavonoids, alkaloids, and phenolics. Solanum ferox has antipyretic active compounds, antirheumatic, antiasthma, antiviral, and as a syphilis drug. The purpose of this research is the antibacterial activity of Solanum ferox plant leaf extract. Solanum ferox leaves are extracted using n-hexane. The extract was tested for antibacterial activity using a diffusion method to use E.coli, S.aureus and B.subtilis bacteria. Amoxicillin is used as a positive standard, whereas negative control is the solvent used to dissolve the sample. The antibacterial activity of n-hexane extract and amoxicillin showed inhibitory zone to E.coli of 7.80 - 12.93 mm and 19.97 mm, whereas in S.aureus and B.subtilis did not provide inhibition zone.

Keywords: Solanum ferox, E.coli, S.aureus, B.subtilis, Antibacterial.

1 Introduction

Humans are often infected with various microorganisms such as bacteria, fungi, yeast, and viruses that exist in our environment. This is due to an increase in the number of antibiotic-resistant microorganisms and the cost of health care costs, many scientists have examined methods for developing new effective antimicrobial agents that overcome microorganism resistance and are also cost-effective (Hwan et. al., 2011).

Infectious diseases are a major cause of global morbidity and mortality. In 1990, the infection caused 16 million deaths, and by 2010, the number of deaths has dropped to 15 million. The spread of infectious diseases resulted in many changes from human behavior, included lifestyle and land use patterns, increased trade and travel, and inappropriate use of antibiotic drugs such as mutations in pathogens. Staphylococcus aureus, Escherichia coli and Bacillus subtilis are the main causes of various human and animal infections that cause skin and soft tissue infections, surgical site infections, and bone and joint infections. Staphylococcus aureus is a common cause of hospital-acquired bacteremia and is associated with acquired respiratory infections in the hospital. E. coli is the most common cause of urinary tract infection (UTI) in humans and is a major cause of enteric and systemic infections. Systemic infections include bacteremia, nosocomial pneumonia, cholecystitis, cholangitis, peritonitis, cellulitis, osteomyelitis, and infectious arthritis. E.coli is also a major cause of neonatal meningitis. A variety of antimicrobial agents effectively inhibit E.coli growthBachir
and Abouni, 2015). Another bacterium that causes infectious disease is Bacillus subtilis. A large amount in the intestine would cause diarrhea that was transmitted through food contamination (Griffith & Grossman, 2008).

The acid aubergine (Solanum ferox L) is one type of vegetable which often used as a flavoring in cooking, the acidic eggplant is included in the Solanaceae family and includes three main food crops (Abdullah, et.al., 2012). Solanaceae is a family of flowering plants, which consists of about 100 genera and 2500 species (Olmstead, et.al., 2008). Solanaceae is one of the most valuable and varied families among vegetables, and this family has many uses. Several plant species of economically viable Solanaceae become an important system pilot in biological plant research to study crop development, fruit maturation and food security[6].

Previous research showed that Solanum ferox-consisted of terpenoid compounds, such as steroids, flavonoids, alkaloids, and phenolics. Literary studies show that Solanum ferox L can be used for syphilis, antipyretic, antirheumatic, antiaxia, antiviral, and anticancer drugs (Joy, et.al., 2001). In one study also showed that the Solanum ferox plant has a variety of bioactive compounds that are antibacterial (Rahman, et.al., 2008), antirematics, anti-inflammatory, antiviral, anticancer[7] and toxic (Andullah, et.al., 2012). Based on the interest of Solanum ferox then conducted a study to see the antibacterial activity of Solanum ferox plant leaves.

2 The Material And Method

2.1 The Materials

The instrument was kept in the sterile box, petri dish, ose needle, vial, aluminum voil, and glass tools commonly used in the laborato-ry. Materials used include methanol, n-hexane, nu-

2.2 Gel media preparation.

The media used for the antibacterial test are NA (nutrient agar). The process of preparing, the amount of 20 gr of mediawas provided and dissolved in 1000 mL of aquadest and fed into the reaction tube, each of which was 15 mL. The media was closed and sterilized at a temperature of 1210C and a pressure of 15 psi for 15 minutes.

A PDA of 39 grams was dissolved in 1000 mL of aquades and then the media was fed into the reaction tube, each of which was 15 mL. The media was closed and sterilized at a temperature of 1210C and a pressure of 15 psi for 15 minutes.

2.3 Microbial Rejuvenation

Microbial rejuvenation aims to rejuvenate bacteria (S.aureus, E.coli, and B.subtilis) from in order to tilt into the NB solution. NB media that have been made are put into a test tube and sterilized. The bacteria from oblique agar were taken using a sterile needle, then inoculated into the NB medium. The tube was covered with cotton and then incubated in an incubator at 370C for 24 hours.
2.4 Antibacterial Test

The medium was heated to be melted and cooled to a temperature of 50°C in a waterbath. Thus, added 1 mL of bacterial culture of E.coli, S.aureus and B.subtilis (OD600 nm = 0.1 into tube, then homogenized and poured into petri dishes.) After the media solidified, (0.9 mg/mL, 3.8 mg/mL and 5.7 mg/mL) were placed on positive agar medium, Amoxsan with concentration of 3.8 mg/mL and negative control of solvent used to dissolve the sample petri dishes were incubated in incubator at 37°C. The diameter of bacterial growth inhibition area was measured after incubation for 24 hours All treatment was done aseptically and repeated twice.

3 Result And Discussion

Antibacterial activity test was performed on n-hexane extract with concentrations of 1.9 μg/ml, 3.8 μg/ml and 5.7 μg/ml of Escherichia coli, Staphylococcus aureus and Bacillus subtilis bacteria. Anti-bacterial activity test from total extract of n-hexane showed the inhibitory zone diameter against E.coli bacteria while S.aureus and B.subtilis were not able to inhibit bacterial growth. This can be seen in Tables 1 and 2.

Table 1. Antibacterial test of n-hexane extract

<table>
<thead>
<tr>
<th>Concentrations (μg/mL)</th>
<th>E.coli</th>
<th>S.aureus</th>
<th>B.subtilis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extract of n-Hexane</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.9</td>
<td>7.80</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3.8</td>
<td>9.27</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5.7</td>
<td>12.93</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Amoxicillin (3.8 μg/disk)</td>
<td>19.97</td>
<td>11.80</td>
<td>17.73</td>
</tr>
<tr>
<td>Negative Comparison</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

An antibacterial activity test was performed to determine the presence and absence of antibacterial activity from n-hexane. The method used is gel dif-fusion method. The principle of this method is the direct diffusion test sample to media gel containing the test bacteria with an OD value of 0.1. The presence of antibacterial activity is characterized by the formation of a clear zone around the test sample. The concentrations of the samples tested were 1.9 μg/mL, 3.8 μg/mL, and 5.7 μg/mL. The tested sample was dissolved in a solvent which dissolved the sample, so the solvent was used as a negative control, while the positive control on bacteria was antibiotics, Amoxicillin.

In the disc paper, the sample tested was dropped by 10 μL using a micro pipette with concentration variations of 1.9 μg/mL, 3.8 μg/mL and 5.7 μg/mL, then wait until dry. The
A disc paper that has been dropped by the test sample is placed on a gel medium (Nutrient gel) which has been solidified for bacteria. The purpose of drying to evaporate the solvent used. This preliminary study was conducted to examine the ability of each test sample to kill or inhibit the test bacteria.

The bacteria tested were two groups of bacteria, one Gram positive (S. aureus and B. subtilis), one Gram negative (E. coli) bacteria. The three microbes were selected because they are commonly used in biological activity tests and there are stocks in the laboratory, and in general they are also the cause of some diseases and infect humans.

The antibacterial activity test of n-hexane extract showed the inhibitory zone diameter against E.coli. The drag zone diameters against S.aureus and B.subtilis were not able to inhibit bacterial growth (Table 1 and Figure 1). This is due to the fact that the n-hexane can dissolve essential oil compounds, saturated and unsaturated fats. So it can damage the outer membrane composed of proteins, lipoproteins, phospholipids, lipopolysaccharides, and porin (Pratiwi, 2008). Ability to interact and damage the peptidoglycan on Gram negative cell wall bacteria.

Fig. 1. Anti-bacterial activity test of n-hexane extract

Differences in antibiotic resistance Amoxicillin that occurs in all test bacteria is also due to differences in the components of the bacterial cell wall. Gram-negative bacteria have cell walls containing thin peptidoglycan (one or more layers only), whereas for Gram-positive bacteria having thick cell walls compared with gram-negative bacteria, it comprises 60-100% peptidoglycan (Pratiwi, 2008).

Gram negative bacteria has a hydrophilic outer and an inner membrane, however gram-positive bacteria has an inner membranes only. This is what causes differences in inhibition of antibiotic Amoxi-cillin for all test bacteria both Gram positive bacteria and Gram negative bacteria (Tiay & Rahardja, 2002).

Based on the results of the antibacterial activity test showed that n-hexane extracts generally have moderate activity against gram-negative bacteria (E. coli and B. subtilis). For the n-hexane extract, it can inhibit at all test concentrations ranging from 7.80 to 12.93 mm.

If the diameter of the clear zone or inhibit zone is greater than 20 mm means that the test sample has a strong activity The inhibitory diameter of 16-10 mm has a moderate activity, a 10 mm inhibitory diameter has a weak activity and a small inhibitory diameter of 10 has very weak activity (Saxena and Gomber, 2008). This is in contrast to the diameter of the clear zone produced by Amoxicillin in general ranging from 11.80 - 12.08 mm and 12.08 - 19.97 mm for Gram positive and negative bacteria at concentrations of 3.8 μg/mL indicating that Amoxicillin has activity is.

Tables 1 and 2 shows that the inhibitory power of all test samples increases with the increasing concentration of the test solution. This shows that the greater the concentration of test solution, the inhibitory power of all test samples will be greater. Amox-icillin is a broad-spectrum antibiotic derivative of semisynthetic penicillins belonging to the β-lactam-type.
antibiotic, a class of ampicillin. The β-lactam antibiotics such as penicillin inhibit bacterial growth by binding to transpeptidase enzymes that sequester the bacterial peptidoglycan wall, thereby weakening the bacterial cell wall (Tortora, 2001). The bacterial cell wall comprises a peptidoglycan network of pol-ymers of amino compounds and sugars that are interconnected with one another (crosslinked) and thus provide mechanical strength to the walls (Pratiwi, 2008).

4 Conclusion

It seems that the extract of n-hexane is able to inhibit the highest E.coli bacteria at 5.7 μg/mL c with 12.93 mm inhibition power.

References

The Effect of Bangunbangun (Plectranthus amboinicus L. Spreng) Supplemented in Feed on the Quality of Broiler Chicken Meat

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Abstract. This study aims to determine the effect of feed supplemented with Bangunbangun (Plectranthus amboinicus) leaf flour (PF) on the quality of broiler chicken meat. Meat quality is determined based on observations of parameters of body weight, percentage of carcass, liver weight, and meat cholesterol. This type of research is an experimental study with a completely randomized design (CRD), consisting of five treatments and five replications. The treatments were P0 as control, P1, P2, P3, and P4 respectively given commercial feed treatment + 0% PF, commercial feed + 10% PF, commercial feed + 15% PF and commercial feed + 20% PF, from two chickens so the total number of chickens used by 50 chickens. Feed and drinking water are given ad libitum. Treatment was given for 35 days. On the 36th day all chickens were cut, for observation of body weight, percentage of carcass, liver weight, and meat cholesterol. The data obtained were tabulated and analyzed using one-way ANOVA and continued with LSD test using SPSS 21.0. The results showed that the higher giving of wake-up leaf flour reduced the weight of the liver and cholesterol levels of meat. Supplementation of 20% PF flour in feed does not affect broiler chicken body weight.

Keywords: Plectranthus amboinicus, carcass, liver weight, meat cholesterol

1 Introduction

Broiler is one of the most popular sources of animal protein in the community, in addition to its affordable price; this chicken meat tastes good and easily obtained. The problem that often arises is the high level of cholesterol in chicken meat so that many people avoid it, especially parents or people who are already inclined to have high cholesterol levels in their blood.

To overcome the high cholesterol in chicken meat, it can be done through modification of the commercial feed which can reduce cholesterol levels. This modification can be done by supplementing vegetables in the feed. In this study Bangunbangun (Plectranthus amboinicus L. Spreng) was chosen. Bangunbangun (Plectranthus amboinicus L. Spreng) was chosen as an ingredient in chicken feed supplementation which contained several components, such as various vitamins and secondary metabolites which were very useful. This Statement also proven by Koti et al (2011) research about the activity of Bangunbangun (Plectranthus amboinicus L. Spreng) as antihyperglycemic and antihyperlipidemic on normal and alloxan-induced diabetic rats.
The composition of broiler meat explained by Kumar (2017). There are three different brands of broiler meat with different protein content. The highest protein was found in broiler meat from the second brand, with 18.06 ± 0.13 (P>0.05). 23% protein was given into broiler commercial feed also affect the body weight and protein percentage in the meat. Meanwhile the highest fat percentage found in broiler from the first brand with 22.30 ± 0.91 in broiler drumstick meat, and 0.02 ± 0.000 in broiler breast meat. This research also explained that protein profile, amino acid, and fat acid also affect the cholesterol balance in broiler meat.

Drumstick is the part that taken to be a sample to analyzed the meat cholesterol. This part is the most favorite part to consumed by people because its taste. But, this part has the highest cholesterol levels compared to another part of chicken body (Marangoni et al, 2015).

As a potential vegetable that can help to reduce the cholesterol level in broiler meat trough feed supplementation, Bangunbangun (Plectranthus amboinicus L. Spreng) contain several component such as various vitamin and secondary methabolites. Niacin is one of the compounds that found in bangunbangun which is a derivate of vitamin B3 which function in regulating blood glucose. According to Marangoni et al (2015), niacinis proven to increase levels of free fatty acid, so that the ability of pancreatic beta cells to produce insulin is important to prevent an increase in blood glucose. Niacin can reduce the cholesterol and quail blood serum fat at dose of 600 ppm (sig<0.05). According to Asimwee (2014) research about the chemical compounds and the toxicological evaluation of bangunbangun leaves showed that it was contained some bioactive compound,like saponin, tannin, flavonoides, and steroids glycosides.

2 Material And Method

2.1 Plant Material and Flour Preparation

Bangunbangun leaves were harvested from Animal House yard that have been planted since September 2017. The best leaves to use are the shoot leaves to the third leaves from the base of the stem. A month old bangunbangun leaves are picked and washed, then drained and aerated for a night. After aerated, the leaves are finely sliced and dried using an oven at 40°C to dry and brittle. Dried leaves are blended until smooth and sifted using calico fabric.

2.2 Chicken Food and Bangunbangun Flour Supplementation

The Starter and Finisher commercial feed that used in this research was obtained from PT. Charoen Pokphand Indonesia. Provision of feed with supplementation of bangunbangun leaf flour was as follows.

Commercial feed is mashed, then mixed homogeneously with bangunbangun flour. For starter chicken the feed is left smooth. While to feed finisher chicken after commercial feed is mashed and mixed with bangunbangun leaf flour, given a little water then formed according to the size of the pellet. Supplementation of leaf flour wake up in accordance with a ratio of 5, 10, 15 and 20 percent.
2.3 Broiler Chicken’s Cage

The chicken cages that used are 25 plots of cages with a multilevel battery system. The size of each cage is 60 cm length, 50 cm width, and 70 cm height and 2 broilers are put in one cage. Before the usage, it is better to sterilize the cage with disinfectant to prevent the broilers from bacteria and fungi. Thirty cm length of plastic are used to accommodate the broilers feces and cleaned every two days or three days a week.

2.4 Broiler Chicken’s

The chicken’s type that used in this research was DOC CP-707. 50 broilers that obtained from PT. Charoen Pockphand. After arriving, the broilers are given sugar water for stress relieve during the trip with ad libitum technique (Bell, 2002). Newcastle disease and Gumboro vaccine are given on days 4 and 21. Before the treatment was given, broilers will be acclimated for 14 days.

2.5 Experiment Design

After acclimatization for seven days, broiler chickens were treated as follows. 50 broiler chickens were divided into five treatment groups. Each treatment consisted of five replications and each replication was given two chickens. The five treatments, namely control (K) were given commercial feed without suplentation of bangunbangun flour. P1, P2, P3 and P4 are groups of chickens fed supplementation 5%, 10%, 15% and 20% flour. The five treatments were given for 35 days. On the 36th day all chickens were weighed and slaughtered. The liver and carcass are separated and weighed. Cholesterol analysis of meat is done with Liebermann-Burchard, Cholesterol levels were measured using a spectrophotometer.

2.6 Data Collection Technique

2.6.1 Body Weight Gain (BWG)

Weight gain is obtained from the difference in the final body weight (day 36) minus the weight of the first day of treatment.

2.6.2 Percentage of Carcass

Carcass is the meat product after the slaughter and separated from head, internal organs, fur, and legs (Tonga 2016). The percentage of carcass can be calculated by dividing the carcass weight with the life weight, the formula: Percentage of carcass is obtained by carcass weight (g) divided by life weight (g) multiplied by 100%

2.6.3 Liver Weight

To obtain the liver organ, we have to slaughter the broiler first then take the liver organ from the body; put it on the tissue paper and then weighing with analytical scale. Data about the liver weight is taken on the 36th day.
2.6.4 Meat Cholesterol Level

The meat cholesterol levels analyzed with Liebermann-Burchard technique (Gressner and Gressner., 2017). A gram meat smoothed and put in to test tube. Then, drop 10 ml of acetone and 10 ml of 96% alcohol. Heat the test tube on the water bath until the first bubble is out and chill. After that, centrifuge the test tube with 2750 ppm velocity for 15 minutes to get the supernatant sample and then evaporated using the oven with 40°C temperature. Drop 2 ml chloroform and homogenize with shaker. Take 0.4 ml from the fluid and transferred to another new test tube. Drop 1.6 ml chloroform, 2 ml H2SO4, and 2 ml anhydrate acid and homogenize it for 5 minutes then put in to dark room. Read the absorbance using the spectrophotometer at 480 nm in wave. The cholesterol levels can be calculated with formula:

\[
\text{Cholesterol} = \frac{\text{Sample Absorbance}}{\text{Standart Absorbance}} \times 200 \text{ mg/100 g}
\]

2.7 Data Analysis

Data are expressed as Mean ± S.E.M. and subjected to one way ANOVA followed by Post Hoc Test Using SPSS 21.0 Software.

3 Result

3.1 Body Weight Gain

The weight gain of chickens in all treatments was significantly lower than that of chicken feed for control. The lowest weight gain is in chicken treated with supplementation with 15% bangunbangun flour, while the 20% weight gain treatment is significantly higher compared to P1, P2 and P3. Chicken weight gain in all treatments can be seen in Figure.1
3.2 Liver Weight

The higher the percentage of supplementation of the bangunbangun flour in the feed, causing weight loss in the liver (Figure 2). Weight loss of liver organ in all treatments for meal supplementation of bangunbangun flour was significant (p <0.05) compared to control.

3.3 Carcass Weight

Carcass weight is important in broiler farming. In this study, the weight of chicken carcass fed with the supplementation of bangunbangun leaf flour decreased significantly (p <0.05) if compared to the control. Chickens that consumed feed supplemented with 20% of bangunbangun leaf flour did not have a significant decrease in carcass weight (Picture 3.)
3.4 Carcass Percentage

Although broiler chicken gain and carcass weight given feed supplementation of bangunbangun leaf flour decreased, the percentage of carcasses did not decrease. Even in P2 and P3 treatment, the percentage of carcass is higher if compared to control (Figure 4).

3.5 Meat Cholesterol

Feed supplementation of bangunbangun leaf flour that given to chickens can reduce meat cholesterol levels significantly. And the higher the level of leaf flour bangunbangun in the feed, the higher the decrease in cholesterol in broiler chicken meat. In this study the level of cholesterol in broiler chicken can we see in Picture 5.
Supplementation feed with bangunbangun (Plectranthus amboinicus Lour Spreng) leaves flour significantly (p<0.05) reduced of broilers’ weight gain. This happens because bangunbangun leaves contain linalool (50.3%) that play rule to increase the activity of microsomal hepatic enzymes which help to increase the metabolism activity (Asiimwe, 2014). According to Hullatti and Prasenjit (2011) Plectranthus amboinicus has been found to cause reduction in egg laying capacity, retard in adult emergence and weight loss in pulse beetle Callosobruches naculatus. Bangunbangun leaves did not influence the increasing of rats body weight Silitonga et al (2014). Moreover, bangunbangun also contain Niacin that affects the regulation of fat acid in the body. Niacin is proven increases the free fat acid that affect the activity of beta-pancreas cell to produce insulin. As we know that insulin is play an important rule to regulating blood glucose level and human metabolism.

Liver is an organ that plays an important rule on cholesterol formation and storage. In its formation, carbohydrates obtained from food and processed by body storage in 3 forms, there are cholesterol, glycogen, and fat. Not only synthesized, liver also catabolised fat acid. Liver also regulate the cholesterol synthesis, esterification, and excretion. The serum of cholesterol is one of cholesterol test standart needed. Based on explanation above, liver weight is use to be one of parameter to know the level of cholesterol in an organ that absolutely also affect a whole body.

In this study feed that supplemented with 20% of bangunbangun flour reduced of liver weight. Bangunbangun leaves, contain carvacrol and niacin that potential to prevent the hypercolesterol symptom in liver. This statement also supported by Santi et al (2015) research, that niacin have the potential affect to inhibit the tissue fat changes, decrease the taking of free fat acid by intestine from the food and also increase the cholesterol removal by the bile.

One-Way ANAVA test showed that, the higher dose given, then the liver weight also lower. This happened because, there is a decreasing of cholesterol synthesize in liver. This statement supported that supplemetation feed by bangunbangun leaves flour can inhibit the
cholesterol formation in liver. So that, the other tissue that also potential contain cholesterol such as meat also decreasing.

From the occurrence of liver weight while the higher doses given, give a conclusion that the supplementation of bangunbangun leaves flour decrease the cholesterol level in the body. This is because bangunbangun contains niacin or nicotinate acid that affect the cholesterol flushing in blood vessel (Koti et al., 2011 and Haryanto et al., 2017). Niasin is a vitamin B-kompleks derivate such as coenzim NAD (nicotin amide-adenin dinukleotida) and NADP (nicotin amide-adenin dinukleotida fosfat) which are have a very important role in oxidating-reduction process. The decreasing of plasma cholesterol level happen because the niacin inhibit the activity of hydoxy-metilflutaril KoA (HMG-KoA reduktase) in liver, so that the change process of mevalonat acid also inhibited and at last forming the squalent, and the level of cholesterol also decreasing (Peter and Bothamr, 2003).

Final carcass weight and carcass percentage are the most concern of. Because broilers as well known as chicken meat product. In big farm, this parameters also affect the production. The carcass percentage calculated with formula. In this study showed that the supplementation feed with bangunbangun leaves flour doesn’t significantly (p> 0.05) increased weight and percentage of carcass. As the explanation before, that bangunbangun contains niacin, linalool, and carvavrol that affect the broilers’ metabolism and decrease the body weight that also affect the weight and percentage of carcass (Asiimwwee, 2014).

The percentage of carcasses did not decrease even though the weight and weight of the carcass decreased with the feeding supplemented with bangunbangun flour. Decreased body weight in line with decreased cholesterol levels in the meat. Decreasing cholesterol levels in the meat is a desired thing in accordance with the background of the problems described earlier. The decreasing of meat cholesterol levels also in line with the decreasing of liver weight. Decrease in cholesterol levels in chicken meat is in line with the results of research by Sihite and Silitonga (2018). More lower of liver weight, the cholesterol level in body also getting lower. Recall that bangunbangun contain niacin and linalool that have an important role in cholesterol flushing in blood vesels. Linalool also can activated the metabolism enzyme in the body.

5 Conclusion

1. Feed supplementation of bangunbangun leaf flour reduces the weight of broiler chickens
2. Feed supplementation of bangunbangun leaf flour decreased of carcass weight but does not affect the percentage of carcass
3. Feed supplementation of bangunbangun leaf flour decreased liver weight, and cholesterol in broiler chicken meat
Acknowledgments. Our thanks go to the State University of Medan's biology and biochemistry laboratories for their permission in conducting data research and analysis

References


Antibacterial Activity of Extract Ethyl Acetate and Ethanol of Raru (Vatica pauciflora Blume)

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Abstract. This research purpose is to show the inhibition of the extract of ethanol and ethyl acetate stem bark and leaf of Raru according to the causes of bacterial E-coli (ATCC 25922) and St Aureus (ATCC 25923) with variation concentration 10%, 5%, 2.5% and 1.25%. Methods used were diffusion with disk blank paper and disk cloramphenicol as a control. The highest result observed on 10% concentration among the variation. This concentration then compared with control and the result as follow for stem bark of ethanol and ethyl acetate extract for bacterial E-coli and St Aureus : 14.7 and 14.5 ; 11.6 and 13.5. for leaf : 14.6 and 13.5; 14.0 and 13.30

Keywords: Raru (Vatica pauciflora Blume) ; Anti Bacteria E-coli and St Aureus

1 Introduction

The Raru plants belong to the family Dipterocarpaceae for a long time known as medicinal plant by the community Tapanuli. was used as an additional drink nira aren. The purpose of adding flavour is known as a traditional drink called Tuak (Gunawan, 2011). Once of them has been investigated In North Sumatera, Central Tapanuli, there are Raru plants types (vatica pauciflora Blume) which on phytochemical was founded flavonoid compound in activity as anti-diabetic in in vitro (Riris, 2014). Many of this plant was used as a herbal by people in the world (Al – Rubiay et al, 2008).

The bacteria have been known to cause infections. The utilization of plants are often used in traditional medicine as a preventive of infections (Vauren s. f. van, 2008). Activity antibacterial test can be done to find out if there are activities of the plant is antibacterial and the most widely method used performe by the method of diffusion discs (Natheer et al, 2012). Methods of diffusion affected many of the physical and chemical factors other than simple interactions between drugs and organism (e.g., the nature of the medium and the ability of molecular size, diffusion, and drug stability) (Jawetz et al., 2007). On researches to analyze the inhibition of plant extracts commonly used type of Gram positive bacteria and Gram negative (Palombo Enzo A, et al, 2001). On this research aim to see if extracts of leaves and bark gives the barriers against bacteria: Staphylococcus Aereus and Escherichia Coli, with measurement results drag zone (mm) ≤ 10 classified is not active; 11-15 (weak); 16-20 (medium); and ≥ 20 (strong) (Greenwood, 1995).
2 Material And Method

2.1 Plant Samples

The raru (Vatica Pauciflora Blume) were collected from the Central Tapanuli of North Sumatra. Chemicals used: extract of stem bark ethyl acetate and ethanol, MHA (Mueller Hinton Agar Oxoid CM0337), physiological NaCl 0.9%, Mc Farland, 0.5%, paper discs, chloramphenicol, DMSO, ethanol, cotton, tissue, heat-resistant plastic.

2.2 Preparation of The Sample

3 kg samples were washed, air-dried and then sift to be powder bark and leaf raru (vatica pauciflora Blume).

2.3 Extraction

Extraction was prepared with maceration in ethanol and ethyl acetate for 3 x 24 hours. On the process of maceration was performed 3 times then repetition was filtered by using a Buchner so obtained the filtrate and residue. The filtrate is obtained with a vacuum rotary evaporator according the boiling point of the solvent used i.e. ethanol solvents with boiling point of 78.4 °C, and ethyl acetate with a boiling point of 77, 1o so obtained extracts.

2.4 Antibacterial Screening

2.4.1 Sterilization Equipment

Glass tools sterilized using the oven at a temperature of 180 °C during 2 hours, as for metal tools and tools which no heat resistant and medium on heating with high temperature, sterilized in an autoclave and wrapped with aluminum foil at 121 °C and 2 atm for 15 minutes.

2.4.2 The Creation of Media so that (Satish, 2008)

Media in order for the MHA (Mueller Hinton Agar) is a common medium media was used to grow the bacteria Escherichia coli and stphylococcus aureus. Weighing as much as 38 g of MHA media (Oxoid CM0337) then add 1 L aquadest ,mixed and sterilized in autoclave at 121 °C for 15 minutes, then put the media into the BSC (Bio Safety Cabinet) then the media pour into petri dish and keep in an incubator for 24 hours at 37°C

2.4.3 Cultured of Bacterial Suspension (sukandar et al., 2010)

The bacteria will be used first bred prior to use for testing. By using a cotton bud taken bacteria and inserted into the impulse tube, after it suspended bacteria into the NaCl 0.9% as much as 2 mL afterwards in the vortex and levels compared with a 0.5 McFarland Standard (0.05 mL Barium Chloride in 9.95 mL of Acid Sufat, 10-8 x 1.5 mL) (Whitman and MacNair, 2010).
2.5 Methods of Paper Disc Diffusion

Weight 100 mg/mL extracted test with concentration of 10; 5; 2.5 dan 1.25 mg/mL is made by doing serial dilution with 1 mL of DMSO extract (Natheer et al., 2012). Paper discs were sterilized with 20 µL aqueous extract dried in sterile petri at room temperature. A suspension of bacteria taken with a cotton bud and smeared in the media of MHA (Oxoid CM0337) which prepared in advance. The positive control used is chloramphenicol antibiotic discs while the negative control used is solvent DMSO (Natheer et al., 2012).

3 Results And Discussion

Table 1. Diameter zone of inhibition (mm) of ethanol and ethyl acetate Extract of stem bark of to bacteria Escherichia coli

<table>
<thead>
<tr>
<th>Extract stem bark of raru</th>
<th>Concentration (%)</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>D</th>
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<tr>
<td>Ethyl acetate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>13.2</td>
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<tr>
<td>5</td>
<td>9.6</td>
<td>9.9</td>
<td>9.5</td>
<td>9.9</td>
<td>9</td>
</tr>
<tr>
<td>2.5</td>
<td>8.5</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>7.50</td>
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</tr>
<tr>
<td>0.02</td>
<td>18.8</td>
<td>18.6</td>
<td>18.5</td>
<td>18.8</td>
<td>18.8</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>13</td>
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<tr>
<td>5</td>
<td>11</td>
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<td>6</td>
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<tr>
<td>Chloramphenicol</td>
<td>0.02</td>
<td>18.8</td>
<td>18.6</td>
<td>18.4</td>
<td>18.8</td>
</tr>
</tbody>
</table>

25
Table 2. Diameter zone of inhibition (mm) of ethanol and ethyl acetate Extract of stem bark of to bacteria *Staphylococcus aureus*

<table>
<thead>
<tr>
<th>Extract stem bark of raru</th>
<th>Concentration (%)</th>
<th>Diameter zone of inhibition (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>St. aureus</strong></td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>Ethanol</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td></td>
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<td>9</td>
</tr>
<tr>
<td></td>
<td>1.25</td>
<td>6</td>
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<tr>
<td>Ethyl acetate</td>
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<td>0</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>10</td>
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</tr>
<tr>
<td></td>
<td>1.25</td>
<td>6</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>0.02</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0.02</td>
<td>17.8</td>
</tr>
<tr>
<td>Raru leaf extract</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Diameter zone of inhibition (mm) of raru leaf ethanol and ethyl acetate extract to bacteria *Escherichia coli*

<table>
<thead>
<tr>
<th>Raru leaf extract</th>
<th>Concentration (%)</th>
<th>Diameter zone of inhibition <em>Escherichia coli</em></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>D1</td>
</tr>
<tr>
<td>Ethanol</td>
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</tr>
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<td></td>
<td>5</td>
<td>11.2</td>
</tr>
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</tr>
<tr>
<td></td>
<td>1.25</td>
<td>6.1</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>20.5</td>
<td></td>
</tr>
</tbody>
</table>
Tabel 4. Diameter zone of inhibition (mm) of raru leaf ethanol and ethyl acetate extract to bacteria Staphylococcus aureus.

Following are the results of the image zone the resistance of each extract and test bacteria.

<table>
<thead>
<tr>
<th>Raru leaf of extract</th>
<th>Concentration (%)</th>
<th>Diameter zone of inhibition (mm) St. aureus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D1</td>
<td>D2</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>10</td>
<td>12.5</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>10</td>
</tr>
<tr>
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</tr>
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<td>7.5</td>
</tr>
<tr>
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<td>20.3</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>14</td>
</tr>
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<td>Ethanol</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td></td>
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<td>8</td>
</tr>
<tr>
<td></td>
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<td>8</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>23.2</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1. (A) Zone inhibition extract EA and (B) ET leaf to E.coli

Figure 2. (A) Zone inhibition extract ET and (B) EA to E.coli Staphylococcus aureus
Figure 3. (A) Zone inhibition extract EA and (B) ET leaf to E. coli

Figure 4. (A) Zone inhibition extract EA and (B) ET leaf to Staphylococcus aureus.

Figure 5. Zone inhibition antibacterial extract of raru stem bark against E. coli
It shown inhibition zone widest at concentrations of 10% ethanol extract of the leaves and bark. Antibacterial activity of ethyl acetate extract of raru stem bark on staphylococcus aureus bacteria has a larger diameter compared to Escherichia coli bacteria. While the ethanol extract of raru stem bark on Escherichia coli bacteria has a clear zone diameter greater than that of staphylococcus aureus. From the results obtained in the extract, it can be seen that the higher the concentration, the clearer zones produced are also wider, the bark and leaf extracts have strong antibacterial activity (Greenwood, 1995).

The activity test of ethanol and ethyl acetate extracts from the bark and leaves of Raru (Vatica pauciflora Blume) inhibited E. coli as gram negative bacteria and St Aureus gram positive bacteria, a greater variation in concentration gave a barrier to wider bacteria.
Acknowledgments. To the Medan State University research institute, and funding providers of the Directorate of Research and Community Service with the contract number: 027 / UN 33.8 / LL / 2018

References

Computer Based Test (CBT) System for Student Academic Examination

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Abstract. Computer based test (CBT) becomes more pervasive in the last few decades, there is growing need for educators to consider modes of assessment because there are many advantages. CBT is an effective solution for mass education evaluation, so that CBT is very necessary applied especially in evaluation and assessment for students. The purpose of this research is to design a system for student academic examination based on computer based test (CBT). The system is designed to facilitate the examination processes and manage challenges surrounding the conduct of examination, auto-submission, auto-marking and examination result report generation. This research was executed until the limited trial of design model because the lack of the time of this study. Define was analysed student’s need, the goal, and the CBT’s concept. Design was choosed the CBT’s software, software that used in this study was learning management system (LMS) Moodle. The goal of this study is create CBT system for student examination and showed the effectivity of the system.

Keywords: CBT, Student’s Examination, Moodle

1 Introduction

The world is now in the fourth generation of industry revolutionaries (the 4.0 industrial revolution). The development of this fourth generation of revolution has not come off the influence of education. The education in Indonesia is also capable to face 4.0 revolution challenges. One of the attempts to be done is to connect between education and the development of technology. The use of computers had become very popular in education department in the last few decade. Computers are used in education from presenting the lesson to student examination. Computer-based testing (CBT) has emerged as one of the recent “innovative” approaches to assessments most pursued by states. CBT is lauded as the answer to having cheaper and speedier test delivery for state and district-wide assessments (Thurlow, et al., 2010). Virtually errorless high speed data processing feature has made computers accepted assesment tools in education (Akdemir, et al., 2008). Testing based paper and pencil had become the old way and and left behind and start to use computers as a tools for saving, access, and process the test (Martin, 2008). This assessment known as computer based test (CBT). CBT is the efective solution for a evaluation change in education (Piech & Gregg, 2018)
CBT has many advantages, so made the CBT getting noticed and become interested to use in evaluation and education in all over the world. The interest in developing and using computer-based test (CBT) in assessment in schools and educational institutions has heightened in recent years. CBT considered as the effective and up to date way of giving an assessment (Shilova, et al., 2014). The benefit ranged from the automation of marking and subsequent reduction in marking workload to opportunity to provide students with immediate feedback on their performance. The use of CBT is an attempt to overcome these limitations and look for some way to make course and assessments more interesting and useful processes for both teachers and students (Hurley, 2017). The use of CBT can improve the efficiency and profitability of academic institutions. It reduces the cost of stationeries and labor involved in conducting examination manually. This work can be improved through the introduction of the forms of questions types such as theory based and diagrammatic questions to make the test questions more diverse (Kuyoro, 2016).

CBT is the effective transformation that can be used for the educator nowadays. CBT offers the higher potential and the value either than paper based test (PBT) (Haryanto, 2017). A teacher slowly should exploited computer as way to give an assessment to the students. The reason that should using CBT because CBT has many benefit that everyone could get either than using PBT. Some of the drawback includes malpractices, waiting for results, wastage of resource such as pen, paper, etc., collecting answer sheet, mistake occurs during evaluation etc., (Singh et al, 2016).

In this paper, software that use for the CBT is learning management system Moodle. Moodle is a free learning management system that allowed you to create powerful, flexible and engaging online learning experiences. The word moodle was originally an acronym for Modular-Object-Oriented Dynamic Learning Environment, which is mostly useful to programmers and education theorists (William, 2011). There have been a number focusing on the development of automated examination systems and electroning learning information systems. Al-Qdah, et al (2003) survey about their experiences with both exams, the students indicated to prefer certain aspects of online exam, such as automatic results and feedback. Singh, et al (2016) a secure online examination system without paper has been designed and proposed for examinations to be conducted at different places. By CBT, resources like time, energy to evaluate every single answer sheet and the need to use paper is reduced. Arachchi, et al (2014) computer based testing is much better and have proved it is more successfull than the paper based testing due to the following advantages. Al Saleem (2016) computer based testing offers a lot of options that have implications for test reliability and length, security, cost and maintenance, and other program needs for test administration that are not possible with traditional paper-and-pencil based test. The goal of this research is to create and to know how to make the CBT system for student examination and showed the effectivity of the system.

2 Method

This kind of research is part of research and development research. This research was conducted with some steps, that is define consist of front-end analysis, learner analysis, task analysis, concept analysis, specifying instructional analysis. Design consist of criterion test construction, media selection, format selection, initial design. Development consist of expert appraisal and development testing and disseminate. But this study was limited to the second stage of design. The instrument used to collect the data was (1) CBT that has been developed.
with moodle software, (2) instrument test, (3) CBT validation, (4) test validation, (5) questionnaire for students, (6) the list of interview for students. The techniques to collect the data was observation, questionnaire, and interview. The validation sheets was addressed to the judgement experts to know the effectiveness of CBT. The stages of design showed Figure 1:
2.1 Data Analysis

The validation sheets was addressed to the judgement experts to know the effectiveness of CBT. The validation sheets using Guttman scale with 2 alternative yes or no answers. Mark from the judgement experts answers could be seen on the Table 1.

<table>
<thead>
<tr>
<th>Answer</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
</tbody>
</table>

After the data was obtained, then analyzed the data. Data was analyzed by a statistical descriptive system. The next stage to analyze the data was:

1. The questionnaire that has been filled by the respondents, examined the complementary items that are subsequently assembled.
2. Quantified the answer to each question by giving the score.
3. Made the data tabulation.
4. Calculated the percentage of each variable.
5. Made the range from the score that had been gotten.

2.2 Conceptual Design

The conceptual design of the CBT system was carried out the activity diagram, the data flow diagram, the use diagram and entity-relationship diagram.

2.2.1 Activity Diagram

Activity diagrams can be used to describe the operational step by step workflows of components in a system. An activity diagram show the overall flow of control. However, figure 2 presents the activity diagram for the CBT system develop.

Figure 3: Activity Diagram for the CBT System
2.2.2 Data Flow Diagram

The data flow diagram presents the functions performed by the CBT system. Figure 3 below shows the relationships among the entities in CBT system. The entity ‘student’ can take examination after gaining access to the system. The entity ‘teacher’ can upload questions to be answered by student into the CBT database using any preferred question format, set the examination instructions and configure the correct options or set of options for the questions. The entity ‘administrator’ is saddled with the responsibility of inserting students, teacher and setting the default password for the users of the system. The entity ‘server’ is responsible for authenticating the users of the system and also provides the timing functionality for the examination. The system logs off a student upon expiration of duration for the examination.

2.2.3 Cbt Diagram For User

Use cases diagram for each entity present in the CBT system below. These include use cases diagram for the administrator, teacher, system and student. The use cases diagram for the administrator is presented in Figure 4. It shows the activities that are required of the administrator including the upload of teacher’s details and creation of default password for users.

The teacher use of diagram as shown in Figure 5 depicts

Figure 4: CBT Diagram for Administrator
of setting examination instruction, insertion of questions into database, insertion of options as well as the specification of correct answer(s) to question(s).

The server use of diagram represents the responsibility of authenticating users of the system and providing timer functions for the examination are carried out. This is presented in Figure 6.

The use of diagram for student shows that student can access the system and take their examination. Figure 7 presents the use of diagram for the student.
2.2.5 Programming Tools

To make the CBT system based on moodle had some stage process such as installation the web server xampp and moodle application initially. The component that needed to install xampp and moodle for the localhost need the spesification such as:

(a) Hardware inside 2 components with specification:
   1) Hardisk
   2) Memory

(b) Software within 4 components
   1) OS windows XP7
   2) Web server apache atau IIS
   3) PHP (minimum versi 5.3.2)
   4) Database include 5 program
      - MySQL, version 5.0.25
      - PostgreSQL, version 8.3
      - MSSQL, version 9.0
      - Oracle, version 10.2
      - SQLite, version 2.0

3 Results

The CBT system is composed of 6 different functional pages including the student login page, the admin login page, the question page, question upload and configuration page as well as the student result page.

3.1 The Student Log In Page

This is the default page of the system. It is also known as the homepage of the system that automatically loads after the URL has been requested for by a web browser on the client system. It contains the log in section for the student to provide their details which is used to authenticate the student to gain access to the system. This page is depicted in Figure 8. The student logs-in with the matriculation number and password. The page also contains a link to the teacher login section.

![Figure 8: Students Login Page](image-url)
3.2 The Admin Login Page

As shown in Figure 9, this page is used by the teacher to log in into the CBT in order to carry out operations like setting questions, viewing the result summary report to generate a complete list of student’s grade after their examinations among other things. The teacher always logs in when the students logs-in.

![Admin Login Page](image)

Figure 9: Admin Login Page

3.3 The Question Page

The page is used to serve the questions of the examination to the student. The page is depicted in Figure 10. The page upon load fetches questions from the database randomly and serves it to the student and the correct answer will be represented after the students submit all the answers and click the submit button. The correct answer in the student’s option or present the answer in the required format required. The page also initiates a count-down timer which is used to manage the duration of the examination.
3.4 Student Result Page
The student result page is presented in Figure 11. This module is used to display the result of the student in the concluded examination, the result is computed based on the number of option specified by the teacher or answered in a preferred format presented by the teacher. The grade of the student is also displayed.
3.5 Question Upload

The page provides a platform for the teachers to input their question into database, while inputting the question into database, the teacher also has to specify the answer to the question. This page is displayed in Figure 12.

![Question Upload and Configuration Page](image)

Figure 12: Question Upload and Configuration Page

3.6 User Quality Assurance/Performance Scoring of CBT System

The user quality assurance and performance scoring test was carried out using evaluation metrics including user friendliness (tool-tip text, soft guide notes, pop-up messages), user interface design, reliability, robustness, ease of use, flexibility (customizable features/control to suit the user's needs) and scalability to incorporate new and advanced features. Performance assessment was carried out by 36 users of the CBT system and the average performance scoring is summarized in Figure 13.
4 Conclusions

In this paper, a CBT is developed and proposed for students. The information system is an online examination system that delivers question by the teacher to the student and generates the report of the results of students who take the examination as well as overall examination result summary based on the user’s account. Challenges including examination malpracties, low capacity examination venues, inadequate invigilators, inadequate examination materials, omission of student’s results and human error(s) during the marking/grading process will be automatically eliminated following the adoption of this e-examination. However, future research work should accommodate theory-based questions as opposed to only that the CBT system currently accommodates. Also, provision for video-based e-assessment can be investigated.

References

Comparison of Self-Regulated and Students’ Learning Achievements by Using E-learning Based Schoology and Power Point on Biology Material

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Department of Biology Education, Faculty of Mathematics and Natural Science, Universitas Negeri Medan, Jl. Willem Iskandar Psr V Medan Estate-Indonesia (20221)¹,²,³

Abstract. This study aims to investigate the comparison of self-regulated and learning achievements of students who are taught by using e-learning based schoology and power point media on human reproduction system in grade XI IPA SMA Negeri 1 Silimakuta. The research method which is applied is quasi experiment with the participants of all students of grade XI IPA are 160 students. The sample of research is determined by cluster random sampling technique mainly grade XI-1 is taught by using e-learning based schoology media and grade XI-2 is taught by using power point media. The research design which is used is pretest-posttest control group design. Data analysis technique used Independent Samples t Test. The results of the research shows that the students’ self-regulated learning which is taught by using e-learning based schoology media is 88,33±0,482 with the gain of 14,93±1,005 while in the class power point is 83,33±0,682 with the gain of 9,57±0,827. Students' self-regulated learning which is taught by using e-learning based schoology media is significantly higher is 21,88% compared with by using power point media (tcount4,124; P=0.000). Students' learning achievements which is taught by using e-learning based schoology media is 85,44 ± 1,018 with the gain of 61,44±2,138 while in the class power point is 72,53±1,448 with the gain of 50,07±2,911. Students' learning achievements which is taught by using e-learning based schoology media is significantly higher is 10,19% compared with by using power point media (t count3,145; P=0.003). As a conclusion that the use of e-learning based schoology media more contributes to improve self-regulated and learning achievements, especially in the material of the human reproduction system. Thus, researchers suggest that the use of e-learning based schoology media in the process of biology learning as one of the learning innovation efforts.

Keywords: E-learning, Schoology, Power Point, Self-Regulated Learning, Learning Achievements

1 Introduction

The use of technology nowadays has been widely done in various aspects of life including in education aspect. Digital technology in education can be used as a learning tool to
help students to obtain the factual information and facilitate teachers in delivering the subject matter. One of the information technology in learning is e-learning. According to Horton (2003) E-learning is the use of internet and web technology to create learning experiences. While Hargis (2000) states the reason for using internet is because of wide information access, unlimited resources, students as active participants, the motivation influence from learning activities, students’ discovery and cooperative learning. E-learning helps teachers in teaching-learning activities. By E-learning teaching, materials can be visualized in more dynamic and interactive forms so that students can be motivated to engage further in the learning process (Wahono, 2003). The use of E-learning today is not too difficult when viewed based on the rapid internet users. Based on the data obtained, the total of internet users in Indonesia in 2016 reached 132.7 million people (51.8%), university student users 10.3 million (7.8%) and students 8.3 million (6.3%) (Isparmo, 2016).

Teachers as an educator must be able to improve the quality of learning, develop innovative learning and expand innovative learning resources by utilizing ICT to increase students’ interests and motivation that will influence students’ achievements especially on elusive materials.

The reproduction system is one of the most elusive biology material for elementary and tenth graders according to Ozcan et al (2014). In line with research conducted by Tekkaya et al (2001) stated that the material reproduction is one of the material that is difficult to learn by some students. Lazarowitz et al (1992) in Tekkaya et al (2001) and Cimer (2012) also found that Israeli high-school students had difficulties in learning of physiological process materials. The reason why students treat biology as a difficult lesson is the low interest and motivation to learn biology (Mavrikaki et al., 2012). To overcome student's learning difficulties, it is necessary to do learning innovation which can improve students’ self-regulated and learning achievements such as the use of online e-learning media. According to Wood (2009), effective learning innovation can improve students’ knowledge. It is in line with Eison (2010) who stated that the use of active learning can build students’ interest and increase students' knowledge.

One of the learning innovations which can be used is the e-learning based schoology. Schoology is one of the Learning Management Systems (LMS) which provides facilities for teachers and students to interact each other and also exchange information via online. Schoology also enables students to download lesson material, presentation slides, video tutorials, work on exams, discussions and submission of task which is assigned by the teacher. According to Dziuban et al (2004) in Cepik et al (2016) one of the characteristics of blended learning is increasing the interaction between students with teachers, students with students, students with materials and students with other new material. Through the interaction among students in learning, it is expected to improve students’ regulated learning to achieve learning objectives. Research Susanto et al (2011) stated that using blended learning method by schoology can increase students’ self regulated learning 75.17%. Similarly, Ansor (2015) found schoology media is more effective to improve students’ mathematic self-regulated learning. Sicat et al (2015) also stated that there is significant differences of students’ learning achievements among groups applying conventional method and those applying schoology. Likewise, Irawan et al (2017) stated that there is significant differences of students’ learning achievements among those using blended learning based schoology and problem based learning.

Another media that can be used in the learning process is the power point. Power point is one part of simple e-learning that provides facilities in arranging an effective and easy multimedia presentation. Power points can be used to help convey an idea to be more
interesting and clear its purpose by creating dynamic presentation slides. This media can display images with animation to facilitate the delivery of abstract material such as stages of the process of gametogenesis to students, so that students more easily understand the material being submitted by the teacher. Visualization of images is one way to be concrete something abstract that can be displayed through the use of power point media. This media is expected to increase student interest and motivate students to actively participate in learning so that students’ learning outcomes can be achieved. There are various studies on the use of power points as learning media, such as research Srimaya (2017) found the motivation, activity and student learning outcomes increased after learning process using power point. Kafit Research (2009) using computer learning media can facilitate and improve the quality of learning, improve student learning motivation, support individual learning according to the ability of students, the material can be repeated as needed and able to improve students’ achievements.

Based on the observations conducted in SMA Negeri 1 Silimakuta, the learning process has not applied e-learning optimally. Learning is done by lecturing method, it was done in biology lesson as well. This results in low self-regulated and learning achievements on students. Therefore, this study suggests to provide information for the teachers to be able to optimize the use of internet by utilizing e-learning based schoology and power point media as a learning innovation.

2 Research Methods

2.1 Research Location, Population and Sample

This research was conducted in grade XI IPA SMA Negeri 1 Silimakuta, Pendidikan Street, No.156 Saribu Dolok. This study was conducted since May to June 2017. The participants of this study were all students of grade XI IPA of SMA Negeri 1 Silimakuta totalling 160 students in which grade XI-1 and XI-2 were the samples determined by cluster random sampling technique (Sugiyono, 2015).

2.2 Research Design And Variables

This research is quasi experiment with pretest-posttest control group design. Grade XI-1 were taught by using e-learning based schoology and grade XI-2 were taught by using power point. The independent variables are E-learning based schoology and power point, while the dependent variables are students’ self-regulated and learning achievements.

2.3 Instruments and Data Analysis

This research instrument is a questionnaire instrument to determine students’ self regulated learning and test instruments to determine students’ learning achievements. Data analysis techniques consist of descriptive analysis and inferential analysis. Descriptive analysis techniques calculate the percentage of students’ questionnaire acquisition, calculate the gain of each research variable, maximum score, minimum score and error standard. While inferential analysis techniques test the research hypothesis using the Independent Samples t Test to gain students’ self regulated learning and learning achievements. Anava test toward the indicators of each variable and Tukey's test is the continuity of Anava. Normality test uses
Kolmogorov-Smirnov and homogeneity test using Levene's test for equality variance. All data were analyzed using SPSS version 22.

3 Results And Discussion

3.1 Results

Based on the research, it was obtained that students' self regulated learning in e-learning based schoology class before treatment (pretest) is 73.4 ± 0.965 and post-test is 88.33 ± 0.482 with a gain is 14.93 ± 1.005. While students’ self regulated learning taught by power point (PPT) before treatment (pretest) is 73.76 ± 0.855 and the score after treatment (posttest) is 83.33 ± 0.682 with gain is 9.57 ± 0.827.

Fig 1. Comparison of students’ self regulated learning taught by using e-learning based schoology (EBS) (14.93 ± 1.005) and power point media (PPT) (9.57 ± 0.827). Students’ self regulated learning taught by EBS media is significantly higher than PPT (P = 0.000). Based on the hypothesis test, it was obtained that students' self regulated learning is significantly higher at 21.88% compared to using power point (PPT) media (Figure 1).

The analysis result of students' self regulated learning indicator shows that indicators of students’ awareness toward learning goals, continuity of learning, and learning activities were significantly different. While indicators of awareness of learning responsibilities and learning efficiency do not show significant differences (Figure 2).

Based on the results of the variance data analysis on each indicator, it was obtained that students' self regulated learning are significantly different and the results of further tests with Tukey test shows that students’ self regulated learning on indicators of students’ awareness toward learning goals, learning responsibilities awareness, continuity of learning and e-learning based schoology (EBS) is significantly different. While power point (PPT) gains students’ self regulated learning on indicators toward learning goals awareness, continuity of learning and learning efficiency which are significantly different (Figure 2).
Fig 2. Comparison of the average gain of students’ self regulated learning for each indicator taught using e-learning based schoology (EBS) and using power point media (PPT). The asterisk indicates a very significant difference compared to the pair on the same indicator ($P = 0.026; P = 0.001; P = 0.031$ in sequence). Different letters above the bar show significant difference compared to other indicators for the same media.

Fig 3. Gain comparison of students’ learning achievements taught using e-learning based schoology media (EBS) ($61.44 \pm 2.138$) and power point media (PPT) ($50.07 \pm 2.911$). Students’ learning achievements taught using EBS are significantly higher than PPT ($P = 0.003$).
Based on the each indicator analysis toward students’ learning achievements, it was obtained that indicators identify the structure, functions and processes which occur in the female reproduction organs, identify the process of gametogenesis, describe the process of fertilization and pregnancy shows significant differences. While indicators identify structures, functions and processes that occur in male reproduction organs, describe the menstruation process in women, connecting contraceptives and the process of preventing pregnancy in family planning and identifying diseases which occur in the human reproduction system do not show significant differences (Figure 4).

Based on the results of the analysis of variance data on each indicator, it is obtained that students’ learning achievements differ significantly and the results of further tests with the Tukey test obtained that the learning achievements gain on indicators of male reproduction structure, fertilization and pregnancy, contraception and family planning, reproduction diseases humans in e learning based schoology (EBS) and power point (PPT) classes differ significantly (Figure 4).

![Fig 4. Comparison of the average gain of students’ learning achievements for each indicator taught using e-learning based schoology media (EBS) and using power point media (PPT). The asterisk indicates a very significant difference compared to the pair on the same indicator (P = 0.019; P = 0.020; P = 0.004 in sequence). Different letters above the bar show significantly different realities compared to other indicators for the same media](image)

3.2 Discussion

The analysis of students’ self regulated learning taught using e-learning based schoology is significantly higher than using power point media (Figure 1). One of the reasons of high students’ self regulated learning in this e-learning based schoology is because when the learning process takes place, students are directly involved in finding information on topic discussed other than those which were already provided by the teacher. Students’ interaction with this learning media was able to increase students' self regulated learning by seeing and
paying attention to the material provided in e-learning based schoology, as well as students’ interaction with students and teachers with students discussing each other. These results are supported by Hargis (2000) who states that online learning system can improve students’ activity in learning and provide very high opportunities for students to successfully learn through internet. Because the more frequent students use internet technology, the more skillful the students are. This statement is supported by Dziuban et al (2004) in Cepik et al (2016) states that one of the characteristics of blended learning is to increase interaction among students and teachers, students with students, students with material and students beyond material. With this interaction, it causes an increasing on students’ activity and students’ self regulated learning to find information about the material being studied. Unlike the students in the power point class, the level of students’ self regulated learning is lower because students are only involved in seeking additional information from the students’ handbook and asking teacher during the learning process. Therefore, the activity and self regulated learning conducted by students is less than the maximum in e-learning based schoology. Likewise when answering posttest questions, self regulated learning in the power point class is still less than optimal because it is still possible to ask friends and change answers on answer sheet. While in e-learning based on schoology, the possibility of asking and replacing answers can be minimized because in answering the posttest questions is done directly on the e-learning schoology website as well as computer-based test (CBT) and the results obtained can be directly checked by the teacher. This is what makes students’ learning activities and self regulated learning different.

The activities of students involved in e-learning based schoology turned out to contribute to increase students’ curiosity about what was being learned, both curiosity about the use of schoology and the material which is available in the media. This leads students’ enthusiasm and learning activities to be high, especially because they learn new things via online and in line with technological developments in their day. As Santyasa (2003) stated, the atmosphere of e-learning learning can accommodate students to be more active in learning, students make design and look for material on their own. Likewise Lowry (2000) in Hidayati et al (2010) said that students’ self regulated learning is a person's learning initiative with or without other people. In power point class, students’ curiosity also increased, but students were not involved in using online technology so that students' activities and enthusiasm were not as high as e-learning based schoology classes.

One of the criteria for students’ self regulated learning according to Djamarah (2002) is students’ learning activity. Based on the observations conducted by reserachers during the study, the learning activity of students using e-learning based schoology was higher than the class using power point media. This is due to e-learning based schoology class, students are involved in using technology such as computers, laptops and smartphones that are connected to the internet, which makes students directly involved in finding information on the material being studied. Whereas in the power point media class, students only see images displayed by the teacher through infocus. This difference in learning activity, apart from the results of the observations of the researcher, was also seen from the results of questionnaires which were filled by students on the indicator of learning activity in the e-learning schoology class compared to the power point class. This result is supported by Aminoto et al (2014) who found an increase in the average learning activity and students’ learning achievements after using e-learning based schoology. Likewise Susanto et al (2011) used the blended learning method with media schoology to improve students’ self regulated learning and Ansor (2015) also suggested that schoology was effective in increasing students’ self regulated learning.
Analysis of students’ learning achievements data who were taught using e-learning based schoology was significantly higher than using power point media (Figure 3). The cause of higher learning achievements in e-learning based schoology class is this class makes learning more flexible, interesting, wider material discussed through video playback of embryo growth, animation of the birthing process, images in the form of power points and all word material Material formats can be downloaded so that they can be opened offline. This result is supported by Eison (2010) stated that the use of active learning can create students’ pleasure and increase students’ knowledge. Students who enjoy learning lead to increasing of motivation and self regulated learning which has an impact on students’ learning achievements. This acquisition can be seen from the score of students’ learning achievements in the e-learning based schoology is higher than the class that uses power point who only see the picture through infocus. This result is in line with Dale's theory (1969) in the cone of his learning experience, stating that if students see images, videos and animations and discussion can improve students’ learning experience by up to 50%. While in the power point class, students only see pictures, listen to teacher explanations, find additional information from the handbook, discussion and question and answer which are all done face-to-face, based on the cone of Dale's experience (1969) this learning experience is only able to reach 30%. With the difference in the format and form of material in the learning process that causes students’ learning achievements that are taught by using e-learning based schoology is higher than the students’ learning achievements in power point class.

Based on the observations of researchers during the research process, students who were taught using e-learning based schoology were more interested and enthusiastic during learning process, especially when playing embryonic growth videos. In the class of power point media, students were also enthusiastic in participating in learning, because during this slot, teachers rarely use e-learning media in teaching activities including power points, but what makes e-learning based schoology class superior is because it can be done online, format material teaching is more varied, and it is more interactive so students experience a more dynamic learning process. This is considered to be something new for students to do in the learning process as a result students have a higher enthusiasm in participating in learning. While in power point class, it is only displayed the learning material in the form of images through infocus, so the learning process is not as dynamic as in e-learning based schoology. These results are supported by the findings of O'Day (2008) that animation is more effective than static sequential images in studying the concepts of biological material, and also Olson's findings (2011) suggested that the use of e-learning technology as a learning medium has shown high learning achievements. The enthusiasm of students is more visible when viewing videos, all students are very serious and no one is noisy. After the video is finished, many students ask questions about things they do not understand. From the questions raised by students, the teacher gives a more detailed explanation in order to provide a deeper understanding to students. Supported by the findings of Trisnawati (2014) high-level thinking skills of students who were taught to use camtasia media were better than students who were taught using power point media.

The use of instructional media both e-learning based schoology and power point media can extend and overcome material that is difficult for students to understand while learning in class, useful for developing and instilling student involvement in the learning process. It is supported by findings of Kafit (2009) using computer media can facilitate and improve the quality of learning, improve students' learning motivation, support individual learning in line with students' abilities, the material can be repeated as needed and able to improve students’ learning achievement. However, the use of web-based online media provides more complete
facilities that can be used by students to improve the quality of learning achievements compared to the use of offline media such as power points. Therefore the learning achievements obtained by students in e-learning based schoology are higher than the students’ learning achievements in power point class. There are several advantages of learning using e-learning media according to Dongsong et al (2004) in Monika (2013) which is student-centered, students’ self regulation, flexible time, can reach wider students, unlimited access. This result is supported by the research of Asandului et al (2008) students prefer learning with blended one. Likewise Bibi et al (2015) found that blended learning models effectively improve students' understanding, and Jethro et al (2012) said that students who get blended learning are better than students who do not use e-learning.

High motivation has a positive influence on self regulation, because motivation causes the emergence of competitive desire to advance for the good of him, initiative in learning and making decisions, having confidence in doing his tasks, responsible for what he does. The findings are supported by Sakinah's research (2013), there is a positive and significant relationship between self regulation and students’ learning motivation. As a result of increasing students’ self regulation because of high motivation causes students’ learning achievements to be better and these results are supported by Budi et al (2012) research there is a significant relationship between students’ self regulated learning and students’ learning achievements. Likewise Khairunnisa (2015) found that self regulation has an effect on student learning achievements.

Thus, in this study students’ learning achievements who are taught using e-learning based schoology are higher than students’ learning achievements that are taught using power point media. These results are supported by the research undertaken by Kusumantara et al (2017) the learning achievements of students who use schoology are better than the results of the control class and Irawan et al (2017) also stated that there are significant differences in students’ learning achievements between blended learning based schoology and problems based learning. Figure 4 Comparison of the average gain of students’ learning achievements for each indicator taught using e-learning based schoology media (EBS) and using power point media (PPT). The asterisk indicates a very significant difference compared to the pair on the same indicator (P = 0.019; P = 0.020; P = 0.004 in sequence). Different letters above the bar show significantly different realities compared to other indicators for the same media.

### 4 Conclusion

Based on the results and discussion presented, it can be concluded that students’ self regulated learning who are taught using e-learning based schoology is significantly higher than students who were taught using power point media and students’ achievements taught using e-learning based schoology are significantly high compared to students taught using power point media on the material of the human reproduction system in class XI Science at SMA Negeri 1 Silimakuta. In other words, the use of e-learning based schoology contributes more to increase students’ self regulated learning and students’ achievements compared to power point media, especially in the material of human reproduction system. Therefore, the researcher suggests the use of e-learning based schoology in biology learning process as a learning innovation.
References

Analyzing Students’ Higher Order Thinking Skills
Using TIMSS-Like Questions

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Abstract. This study aims to assess students’ ability in solving Higher Order Thinking Skill (HOTS) problems. Test from national examination, formative and summative test, and also the test written in high school Mathematics textbook commonly used were analyzed, and it found that most of the test are to measure the lower order thinking skills. In 2018, Higher Order Thinking Skill (HOTS) problems emerged in National Examination and bring the nation in polemic about how mathematics classroom should be conducted. This study assess students’ abilities in analyzing, generalizing, integrating, justifying, and non-routine problem solving using TIMSS questions. Qualitative method was used as the research approach in this study. The finding showed TIMSS Questions still challenging to students. The findings showed none of the students perceived their thinking skills’ levels at “high”. 59 students (78.67%) perceived their Higher Order Thinking skills’ level at “moderate”, while 16 students (21.33%) perceived their Higher Order Thinking skills’ level at “low”. 78.67% students at “moderate” level has the ability to apply their understanding and knowledge in situation relatively complex.

Keywords: HOTS, Thinking, TIMSS, Higher Order, Bloom Taxonomy

1 Introduction

The Ujian Nasional Berbasis Komputer (UNBK), computer-based national examination in Indonesia, for the Senior High School has been held on April 2-5 and April 9-12, 2018. Unlike previous years, the UNBK introduced Higher Order Thinking Ability Thinking Skills (HOTS) problems. The number of problems reaches 10% for Junior High School and 15% for Senior High School. The Ministry of Education and Culture of Indonesia ensures that HOTS problems will be re-used in 2019 with 20% number of problems (Zunita, 2018).

The implementation of HOTS on UNBK, especially on mathematics was felt to be too difficult for students. It received a lot of responses from test participants and became viral on social media that makes the Komisi Perlindungan Anak Indonesia (KPAI) criticized the Ministry of Education and Culture’s policies (Noor, 2018). In fact, the policy of applying the HOTS model is intended to train children to think critically, creatively, and analytically. This policy in line with the goals of The Kurikulum 2013 that stated to improve students’ reasoning, including critical and analytical thinking.

Bambang Suryadi, Chairperson of the National Education Standards Agency (BSNP) in his presentation said that it had the policy of the Ministry of Education and Culture to apply mathematical problems that encourage students to do reasoning, not just understanding and applying. Furthermore, the Indonesian National Assessment is directed to an assessment model that requires thinking skills that not only recall, restate, or refer without processing (recite). However, there are HOTS principles that have not been fully implemented in preparing exam questions. In addition, teachers and students are not used to working on HOTS problems even though the problem have long appeared in Mathematics textbooks in schools. Therefore, the application of the HOTS problems in the UN needs to be balanced with an increase in the ability of teachers and students in the teaching and learning process. There have been some training in the preparation of HOTS problems but not regularly and involving many mathematics teachers, especially mathematics teachers in Madrasahs.

In order to encourage the development of the HOTS model, scoring of the questions is done by considering the complexity of the problem. More complex questions are given a higher weight. Thus, there will be distinguishing factors between students who are able to answer the HOTS problems and students who are only
able to answer easy or moderate problems. So that it is necessary to align the learning process and assessment with reference to national education standards.

There are a number of international tests that are used to evaluating education globally and are also used to find out whether Indonesia is able to compete with countries in the world, and where Indonesia’s position is among countries in the world. Two of them are the Program for International Student Assessment (PISA) and Trends in the International Mathematics and Science Study (TIMSS). In this paper, we used TIMSS-like question to analyze the level of students Higher Order Thinking Skill (HOTS). This study aims to assess students’ ability in solving Higher Order Thinking Skill (HOTS) problems. Students’ abilities in analyzing, generalizing, integrating, justifying, and non-routine problem solving assessed using the TIMSS-like questions.

2 Literature Review

2.1 Higher Order Thinking Skills

Higher Order Thinking Skills (HOTS) are one of the components that are emphasized in the Kurikulum 2013 beside STEM (Science, Technology, Engineering, Mathematics) and 4C (Communication; Collaboration; Critical Thinking and Problem Solving; Creativity and Innovation). However, the implementation is limited to fulfilling the demands of the 2013 Curriculum. Both teachers and students feel that applying HOTS in learning mathematics in schools are challenging. According to Heong (2011), HOTS combines the ability of creative thinking and critical thinking.

Mathematics is a science related to abstract concepts, therefore the presentation of mathematical material in learning is often associated with everyday life with the aim that students are able to find concepts and develop their mathematical abilities based on the experience or knowledge that students have. Students are said to be able to solve a problem if the student is able to examine a problem and be able to use his knowledge into a new situation. This ability is usually known as Higher Order Thinking Skills.

Higher Order Thinking Skills (HOTS) are students' thinking processes at a higher cognitive level which are developed from various cognitive concepts and methods and taxonomy of learning such as; problem-solving methods, taxonomy, and taxonomy of learning, teaching, and assessment. Krulik and Rudnick (1999) explained that HOTS includes the ability to solve problems, the ability to think creatively, think critically, the ability to argue, and the ability to make decisions. While Krathwohl (2002) gives the definition of HOTS as the ability to connect, manipulate, and change the knowledge and experience that has been possessed critically and creatively in determining decisions to solve problems in new situations. Table 1 showed basic concepts of Higher Order Thinking Skill (HOTS) and table 2 showed various meaning on these past year.

Brookhart (also reinforces the above statement stating that HOTS includes logic and reasoning, analysis, evaluation, problem solving, and decision making (judgment). Krathwohl(2002) classifies that judgment is included in the level of evaluation.

In conclusion HOTS is the ability to analyze, evaluate and create in solving problems. Analytical ability can be interpreted as an individual's ability to determine parts of a problem and show the relationship between parts, see the causes of an event or give arguments that support a statement. Evaluation ability is an activity to make judgments regarding the value of an idea, creation, method or method. Creative ability is the ability to combine elements to form a new and unique structure, design ways, and find multiple solutions. Reasoning is a thought process in determining a conclusion from a new knowledge that is received by linking it with the knowledge that has been previously owned. Reasoning is needed in the process of thinking and drawing conclusions in the form of knowledge.

HOTS in mathematics leads formulate, employ, and interpret. These three words describe the process that students must do to connect the context with mathematics and solve it. The capabilities that underlie this mathematical process include communication, mathematics, representation, reasoning and argumentation, formulating strategies to solve problems, using symbolic language, formal, and techniques and operations, using mathematical tools.
### Tabel 1. Basic Concept of Higher Order Thinking Skills

<table>
<thead>
<tr>
<th>Problem Solving (Krulik &amp; Rudnick)</th>
<th>Taksonomi Kognitif Bloom Original</th>
<th>Taksonomi Revisi (Anderson &amp; Krathwohl)</th>
<th>Bloom Higher Order Thinking Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recall Basic</td>
<td>Knowledge</td>
<td>Remember</td>
<td>Critical Thinking</td>
</tr>
<tr>
<td></td>
<td>Comprehense</td>
<td>Understand</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Application</td>
<td>Apply</td>
<td></td>
</tr>
<tr>
<td>Critical</td>
<td>Analysis</td>
<td>Analyze</td>
<td></td>
</tr>
<tr>
<td>Creative</td>
<td>Synthesis</td>
<td>Evaluate</td>
<td>Creative thinking</td>
</tr>
<tr>
<td></td>
<td>Evaluation</td>
<td>Create</td>
<td>Problem Solving</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Decision Making</td>
</tr>
</tbody>
</table>

### Table 2. Various Meaning of HOTS

<table>
<thead>
<tr>
<th>Sumber</th>
<th>Tahun</th>
<th>Definisi</th>
</tr>
</thead>
<tbody>
<tr>
<td>King et al.</td>
<td>1998</td>
<td>“includes critical, logical, reflective, metacognitive, and creative thinking. Activated when individuals face unknown problems, uncertainties, questions, or dilemmas.”</td>
</tr>
<tr>
<td>NCTM</td>
<td>2000</td>
<td>“Solving Routine Problems”</td>
</tr>
<tr>
<td>Anderson and Krathwohl</td>
<td>2001</td>
<td>Processing – Analyze, Evaluation,</td>
</tr>
<tr>
<td>Lopez and Whittington</td>
<td>2001</td>
<td>“(it) happens when someone picks up new information and information stored in memory and relates to and / or rearranges and expands this information to reach a goal or find answers that might be in a confusing situation.”</td>
</tr>
<tr>
<td>Weiss, E.</td>
<td>2003</td>
<td>Collaborative, authentic, unstructured, challenging problems</td>
</tr>
<tr>
<td>Rajendran, N.</td>
<td>2008</td>
<td>The use of an expanded mind to face new challenges.</td>
</tr>
<tr>
<td>Thomas, A. and Thorne, G.</td>
<td>2008</td>
<td>“Non-Algorithmic Thinking”</td>
</tr>
<tr>
<td>Kruger, K.</td>
<td>2013</td>
<td>“... (It) requires thinking to a higher level than just restating the facts. (It) requires that we do something with facts. We must understand them, connect them with each other, categorize them, manipulate them, integrate them in new or new ways, and apply them when we seek new solutions to new problems.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;involves&quot; concept formation, critical thinking, creativity/ brainstorming, problem solving, mental representation, use of rules, reasoning, and logical thinking</td>
</tr>
</tbody>
</table>

2.2 Trends In Mathematics And Science Study

The assessment of mathematics and science achievements in TIMSS is categorized into two domains; the content and cognitive domain by considering the curriculum that concerned in the country. The distribution of specifications and assessments is as follows:

2.2.1 Contents Domain.

Content consists of four domains: numbers, algebra, geometry, data and opportunities. Each domain of content is detailed in several topics. For example, the domain of number content includes the topic of fractions and decimals, integers, ratios, proportions and percentages. Table 3 shows the proportion of abilities tested in each domain that is assessed on the content dimension.

<table>
<thead>
<tr>
<th>Domain</th>
<th>Proportion</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>30%</td>
<td>Positive Integers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fraction, Decimal, and Integer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ratio, Proportion, Percentage</td>
</tr>
<tr>
<td>Algebra</td>
<td>30%</td>
<td>Algebraic Expression and operation</td>
</tr>
<tr>
<td>Geometry</td>
<td>20%</td>
<td>Geometric Shape</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Equation and Inequation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Relation and Function</td>
</tr>
<tr>
<td>Data</td>
<td>20%</td>
<td>Characteristic of Data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interpretation Data</td>
</tr>
</tbody>
</table>

2.2.2 Cognitive Domain

Cognitive dimension consists of three domains; knowing, applying, and reasoning. Cognitive dimensions are defined as the expected behavior of students when they are dealing with a mathematical domain that is included in the dimension of content. Table 4 shows the proportion of abilities tested on the cognitive dimensions in the 2015 TIMSS study.

According to taxonomy bloom, the level of high-level thinking ability lies at the level of analyzing (C4), evaluating (C5), and creating (C6). Bloom states that there are two levels of students' mathematical thinking; Lower Order Thinking Skills (LOTS) and Higher Order Thinking Skills (HOTS). Then it can be classified as ability level according to TIMSS and Bloom Taxonomy.
Table 4. Proportion of abilities tested in cognitive domain

<table>
<thead>
<tr>
<th>Domain</th>
<th>Proportion</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowing</td>
<td>35%</td>
<td>Recall</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recognize</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Classify/Order</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compute</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Retrieve</td>
</tr>
<tr>
<td>Applying</td>
<td>40%</td>
<td>Determine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Represent/Model</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Implement</td>
</tr>
<tr>
<td>Reasoning</td>
<td>25%</td>
<td>Analyze</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Integrate/Synthesize</td>
</tr>
<tr>
<td>Data</td>
<td>20%</td>
<td>Evaluate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Draw</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Generalize</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Justify</td>
</tr>
</tbody>
</table>

Table 5. Relationship between Bloom Taxonomy, TIMSS, and HOTS

<table>
<thead>
<tr>
<th>Bloom Taxonomy</th>
<th>Level TIMSS</th>
<th>Level of Thinking Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C6</strong></td>
<td>Level Advance</td>
<td>The ability to combine elements into something new, complete and broad, or make something original</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The ability to give reasons, draw conclusions, make generalizations, and solve linear equations. Students can complete various fractions, proportions and percent problems and justify their conclusions. Students can express algebraic generalizations and model situations. The ability to solve various problems involving equations, formulas and functions. The ability to give reasons with geometry figures to solve problems. The</td>
</tr>
<tr>
<td><strong>C5</strong></td>
<td></td>
<td>The ability to determine a degree based on certain norms, criteria or benchmarks</td>
</tr>
<tr>
<td>Bloom Taxonomy</td>
<td>Level TIMSS</td>
<td>Level of Thinking Skill</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------</td>
<td>------------------------</td>
</tr>
<tr>
<td><strong>C4</strong> Level High</td>
<td>The ability to separate concepts into several components and connect with each other to gain an understanding of the concept as a whole.</td>
<td>The ability to apply their understanding and knowledge in situation relatively complex. Students can use information from several sources for solving problems involving various typenumsbers and operations. The ability to change the form of ordinary fractions into decimal and percent forms or vice versa. The ability to show basic procedural knowledge related to expression algebra. The ability to use line, angle, shape and space to solve problems and analyze data.</td>
</tr>
<tr>
<td><strong>C3</strong> Level Intermediate</td>
<td>Ability to do something and apply concepts in certain situations.</td>
<td>The ability to apply basic mathematical knowledge in a variety situation. Students can solve problems involving decimals, fractions, proportion and percentage, and simple algebraic relationships. The ability to make two-dimensional image connections to three-dimensional objects. The ability to read, interpret, and create charts and tables.</td>
</tr>
<tr>
<td><strong>C2</strong> Level Low</td>
<td>The ability to recall information stored in memory.</td>
<td></td>
</tr>
<tr>
<td><strong>C1</strong></td>
<td>The ability to understand instructions and affirm ideas or concepts that have been taught.</td>
<td>Students have knowledge of integers and decimals, basic calculations and graphs.</td>
</tr>
<tr>
<td><strong>Lower Order Thinking Skills (LOTS)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 3 Research Method

This study is a survey research where data collected directly from respondents. The data was collected at MAN 1 Takengon, MAN 2 Takengon, and MAN 3 Takengon. The population was the 10th-grade students in Aceh Tengah, Aceh. The students had to be representation of (1) Gender, (2) Level of Achievement, (3) Age ≤ 15 years old.

20 TIMSS-like questions were given to 75 students. These questions are designed so that both dimensions of assessment; content and cognitive can be observed. The form of questions in TIMSS is multiple choice with 4 answer choices, short entries and descriptions. Short entries and descriptions are often called "constructed responses". If students answered the
question correctly, they given a score of 2, and if answered incorrectly given a score of 1, and 0 if no answer.

The TIMSS score then assessed based on students ability in analysis, evaluation, and creation (Anderson, 2001). Categorizing and analyzing the level of Higher Order Thinking Skills is the main target of this study. Then, students’ answers were analyzed based on Level of HOTS by Anderson and Kratwohl (2011). The HOTS level then categorized as follow:

<table>
<thead>
<tr>
<th>Mean Score</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00 – 1.00</td>
<td>Low</td>
</tr>
<tr>
<td>1.01 – 1.50</td>
<td>Moderate</td>
</tr>
<tr>
<td>1.51 – 2.00</td>
<td>High</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4 Research Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>The level of students’ Higher Order Thinking Skills (HOTS) were carried out by giving HOTS test questions taken from the questions tested on TIMSS in 2015. The test assessed cognitive domain of each content; number, algebra, geometry, and data and chance. There are 29.37% students who answer the test correctly, 63.93% students have wrong answer, and 6.33% did not answer the test. Percentage of students that answer TIMSS-like questions were given on table 7.</td>
</tr>
<tr>
<td>Table 7. Percentage of students that answer TIMSS-like questions</td>
</tr>
<tr>
<td>Correct Answer</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>MAN 1 Takengon</td>
</tr>
<tr>
<td>MAN 2 Takengon</td>
</tr>
<tr>
<td>MAN 3 Takengon</td>
</tr>
<tr>
<td>Average</td>
</tr>
</tbody>
</table>

The findings showed none of the student perceived their thinking skills’ levels at “high”. 59 students (78.67%) perceived their Higher Order Thinking skills’ level at “moderate”, while 16 students (21.33%) perceived their Higher Order Thinking skills’ level at “low”. 78.67% students at “moderate” level has the ability to apply their understanding and knowledge in situation relatively complex. They able to use information from several sources for solving problems involving various type numbers and operations. They also have the ability to change the form of ordinary fractions into decimal and percentage forms or vice versa. Meanwhile, 16 students at “low” level able to apply basic mathematical knowledge in a variety situation. Students can solve problems involving decimals, fractions, proportion and percentage, and simple algebraic relationships. The students have the ability to make two-dimensional image connections to three-dimensional objects and the ability to read, interpret, and create and
Table 8 showed that students feel that Algebra, geometry and Data and Change is still challenging. 65.33% students at “Low” level at Algebra, 56% students at “Low” level at Geometry, and 65.33% students. Number seems to be the least challenging content for students by having 30.67% “Low” level students. Surprisingly, on Geometry content, there are 20% students at “high” level. It means they are able to give reasons with geometry figures to solve problems and to use line, angle, shape, and space to solve problems and analyze data.

References


Comparison of The Implementation of Direct Instruction, Problem-Based Instruction, and Cooperative Learning using Cabri 3D on Geometry

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Takengon, Indonesia1,2,3,4

Abstract. This study aims to compare the implementation of 3 teaching strategies; Direct Instruction, Cooperative Learning, and Problem Based Instruction in the geometry classroom. Cabri 3D was used as media to teach geometry in a classroom where 38 students participated as the subject in this study. The instructions were implemented for 8 meetings to evaluate the practicality of Cabri 3D in Direct Instruction, Cooperative Learning, and Problem Based Instruction. The result indicates that each instruction has their own advantages but generally, Problem Based Instruction is the best teaching strategies to conduct geometry class. The practicality based on the average score of implementation in Direct Instruction is 2.47 (good), Cooperative Learning is 2.54 (very good), and Problem Based Instruction is 2.49 (good). Teacher activities in all of the three learning instructions are in a good category, Direct Instruction is 3.67 (good), Cooperative Learning is 3.82 (good), and Problem-Based is 3.99 (good). This finding supports the theories in using Cabri 3D as teaching media in mathematics classroom.

Keywords: Cabri 3D, Teaching Media, Direct Instruction, Problem Based Instruction, Cooperative Learning

1 Introduction

Geometry is an important way to understand the real world (Gunhan, 2009). Geometry is the most perceivable concepts in daily life. Geometry appears naturally in the structure of the solar system, a geological formation, rocks and crystals, plants and flowers, and even in animals. It is also a major part of the synthetic world such as art, architecture, cars, machines, and virtually everything humans create. In the same vein, studies revealed that geometry is applicable and relevant to employment in everyday life, other subjects in the curriculum such as science, arts, and technology. Also, geometry is used to develop students’ spatial awareness, intuition, visualizations and to solve practical problems and so on (Fabiyi, 2017).

According to the National Council of Teacher of Mathematics (NCTM), in geometry classroom; visualization, spatial reasoning, and geometry modelling are used to solve problems given (NCTM, 2012). It is preferably easy for a teacher to use the examples in daily life in order to make students understand the concept. However, many previous studies have shown that understanding geometrical objects or images is still challenging for students. 5 of 7 mathematics-talented students in Korea had difficulty in imagining a 3-dimensional object in a space depicted on a flat plane (Ryu, Yeong, and Seong, 2007). Researchers in Nigeria and...
Malaysia revealed the factors that are responsible for students’ difficulty in learning geometry to include: lack of proof by students, lack of background knowledge, poor reasoning skill in geometry, geometric language comprehension, lack of visualizing abilities, teachers’ method of teaching, non-availability of instructional materials, lack of proof by students, gender differences among others (Mason, 2002; Noraini, 2006; Uduosoro, 2011; Telima, 2011, and Aysen, 2012). Adegun and Adegun (2013) stated that students generally encountered difficulties in geometry and performed poorly in senior secondary school mathematics lesson. Also, Telima (2011) found out that many students fail to grasp key concepts in geometry and leave mathematics classes without learning the basic terminology. Findings have shown that some factors are identified to make the learning of geometry concepts in mathematics difficult which include: teachers’ methods of instruction, geometric language, visualizing abilities (Noraini, 2006 and Aysen, 2012). Other factors include: non-availability and obsolescence of instructional materials, gender differences, poor reasoning skill, inadequate time, inadequate school curriculum and lack of proof by students (Mason, 2002; Uduosoro, 2011and NERDC, 2012). All these are believed to have a negative effect on the learning of geometry.

Teacher need to implement different teaching strategies to enhance students’ understanding in conducting geometry classroom. Direct Instruction, Problem Based Instruction, and Cooperative Learning believed effective to be implemented as the appropriate technique.

Spatial ability is intended as a skill in representing, transforming, generating, and recalling symbolic, non-linguistic information (Yilmaz, 2009). It divided into three categories, namely: (1) mental rotation; (2) spatial perception; and (3) spatial visualization. Spatial ability is an intelligence factor that is not only important for mathematics and science, but also for success in many professions. Like activities in the engineering world, aviation, shipping, geography, astronomy, industrial technology and so on. Because of the importance of this spatial ability, teachers must pay more attention to developing it. In Geometry teaching activities, teachers have implemented various types of learning models such as Direct Instruction, Cooperative Learning, and Problem Based Instruction. The three learning models have their advantages in teaching spatial abilities to students.

This study aims to compare the implementation of 3 teaching strategies; Direct Instruction, Cooperative Learning, and Problem Based Instruction in the geometry classroom. Teaching skills, students’ activities, and the effectiveness of each teaching strategy in every strategy was determined and compared. The instructions were conducted using Cabri3D as educational tools. This software helps to explore the geometry of space so that users easily construct geometric structures in the three-dimensional space, and explore the structures constructed. Thus Cabri 3D can open up opportunities for students to improve their spatial abilities and build their geometric knowledge after observing, exploring, experimenting and hypothesizing further on that formal proof can eventually be applied in solving geometry problems.
2 Literature Review

2.1 Direct Instruction

The Direct Instruction model is a learning model that requires teachers to provide background information, demonstrate the skills being taught and then provide time for students to practice these skills and receive feedback about what they are doing (Nur, 2004). Joyce and Weil stated that the Direct Instruction is a learning model consisting of teachers explaining concepts or skills to students then they are tested for understanding through direct training by the teacher and instructing them to continue training under the guidance of the teacher or guided training (Joyce and Weil, 2000). It can be concluded that the direct Instruction is a learning model that starts from giving information from the teacher to students, demonstrating the teacher's skills and then giving the skills training as well as providing time for students to exercise independently under the guidance of the teacher.

There are 5 steps in Direct Instruction in which the model is still teacher-centred, which are: (1) Preparatory phase (Conveying the learning objectives and motivating students), (2) Demonstrations (Explain and demonstrate a specific learning strategy), (3) Guided training; Provide opportunities for guided training, (4) Feedback (Understanding checking and feedback providing. Stop the exercise and check to find out what kinds of problems students face regarding the strategy), (5) Advanced Training: Provide independent training and apply different situations (Nur, 2004).

2.2 Problem-Based Instruction

According to Pierce and Jones, when implementing problem-based Instruction, the teacher needs to: (1) preparing students to act as problem solvers by working together, (2) inquiry and investigation, namely exploring and distributing information, (3) performance that presents findings, (4) the question and answer purposes is to examine the accuracy of the solution, (5) reflection on problem-solving (Rusman, 2012). Problem-based instruction has a learning scheme; presenting the problem, problem analyzing, discovery and reporting, solution presentation and reflection, overview, integration and evaluation (concluding, integrating and evaluating) (Tan, 2004).

The advantages of Problem-based Instruction are: (1) problem-solving phase is effective incontents understanding; (2) problem-solving able to challenge students' abilities and providing satisfaction to students; (3) Problem-based Instruction can improve learning activities; (4) helping the student transfer knowledge to understand problems in daily life; (5) helping students develop their knowledge and to be responsible for their own learning; (6) helping students to understand the nature of learning as a way of thinking not only to understand the concepts based on textbooks; (7) Creates a fun learning environment, and (8) Stimulating students to study continuously (Wina, 2008).

2.3 Cooperative Learning

According to Johnson, the cooperative learning model is one of contextual learning. Cooperative learning can be defined as a structured work or a group learning system. It is
emphasizes shared attitudes or behaviours in a regular working group, consisting of two or more people (Amri and Ahmadi, 2010). Cooperative Learning conducted in 6 phases; (1) Conveying goals and preparation, (2) presenting information, (3) organizing students into groups, (4) coaching group, (5) evaluating, (6) giving recognition or appreciation (Suprijono, 2009).

2.4 Cabri 3D

Cabri technology was born in 1985 at a research laboratory of France's Center National de la Recherche Scientifique and Joseph Fourier University in Grenoble. Cabri 3D is one of the most interactive geometry software. Firstly introduced at the CABRILOG conference in Rome in September 2004 (Rososzczuk, 2015).

Cabri 3D is a software specifically developed by educators, mathematicians to help the geometry learning process (Cabri, 2012). Cabri can open opportunities for students to construct their geometry knowledge after observing, exploring, experimenting and hypothesizing further on that formal verification can eventually be applied in solving geometry problems (Sabandar, 2002).

3 Research Method

The geometry instruction was conducted by applying geometry learning using Cabri 3D on 3 different teaching strategies. The three teaching strategies are Direct Instruction, Cooperative Learning, and Problem Based Instruction. This was a trial phase of Developmental Research to develop Cabri 3D-based teaching media on geometry.

The trial was implemented in 10th Grade students. Direct Instruction was implemented for 3 meetings (1st, 3rd, 6th meeting), Cooperative Learning was implemented for 3 meetings (2nd, 4th, 7th meeting), and Problem Based Instruction was implemented for 2 meetings (5th, 8th meeting).

The practicality of teaching media refers to the implementation of teaching in the classroom. The score of teaching implementation is obtained from observations during instruction. It consists of learning components and supporting elements.

Learning components include syntax, social systems and reaction principles. This component is part of the learning instruction component according to Joyce and Weil (2003). Those components are (1) syntax, (2) social system, (3) principles of reaction, (4) the support system, and (5) instructional effect and nurturant effect component. The Supporting elements include learning tools and information technology devices.

In addition to implementation of learning, observers also make observation on the teacher’s activities on learning. The Teacher’s activities in learning include all phases in each teaching strategies.

According to Arends (2012), the phase of direct instruction includes clarify goals and establish set, demonstrate knowledge or skill, provide guided practice, check for understanding and provide feedback, provide extended practice and transfer. The phase of cooperative learning includes clarify goals and establish set, present information, organize students into learning teams, assist teamwork and study, test on the materials, provide recognition. The phase of Problem-Based Instruction includes orient students to the problem,
organize students for study, assist independent and group investigation, develop and present artefacts and exhibits, analyze and evaluate the problem-solving process.

The data analysis using average on descriptive statistic. The average obtained on each aspect of the observation as shown on table 1

Table 1: Learning implementation category

<table>
<thead>
<tr>
<th>Interval</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2.5 \leq I \leq 3.0$</td>
<td>Very Good</td>
</tr>
<tr>
<td>$1.5 \leq I &lt; 2.5$</td>
<td>Good</td>
</tr>
<tr>
<td>$0.5 \leq I &lt; 1.5$</td>
<td>Fair</td>
</tr>
<tr>
<td>$0 \leq I &lt; 0.5$</td>
<td>Poor</td>
</tr>
</tbody>
</table>

The average which is obtained in each aspect of observation of the teacher’s activities on learning is categorized as shown on table 2

Table 2: Teacher’s activities on learning category

<table>
<thead>
<tr>
<th>Interval</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>$TA \geq 4.5$</td>
<td>Very Good</td>
</tr>
<tr>
<td>$3.5 \leq TA &lt; 4.5$</td>
<td>Good</td>
</tr>
<tr>
<td>$2.5 \leq TA &lt; 3.5$</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>$1.5 \leq TA &lt; 2.5$</td>
<td>Fair</td>
</tr>
<tr>
<td>$TA &lt; 1.5$</td>
<td>Poor</td>
</tr>
</tbody>
</table>

The observation results of the implementation of learning were compared descriptively to the three learning instruction. Furthermore, it was confirmed by the results of observations of the teacher activities in each learning model.

4 Results

4.1 Implementation Of Learning

The result from the implementation of learning geometry using media based on cabri 3D can be seen in Figures below

Figure 1: Graph of Implementation of the Learning Component
All learning components observed were in the “good” and “very good” category for each teaching strategies. In the syntax component, the lowest score is on cooperative learning, which is 2.31 (good). The score of observation on “provide recognition” phase is 1.83. In the social system component, the lowest score is on problem-based learning, which is 2.42 (good). The result of the aspect “interaction between students and teachers” is 2.00. In the principles of reaction component, the lowest score on direct learning is 2.30 (good). The result of the aspect “teacher give strength to students” is 2.00.

![Figure 2: Graph of Implementation of Learning Support Elements](image)

All component of learning supporting elements observed are in the “good” and “very good” category. In the aspect of “learning tools”, the lowest score on problem-based Instruction is 2.58 (very good) and the highest in cooperative learning is 2.67 (very good). In the aspect of “information technology device”, the lowest observation score on direct learning is 2.42 (good) and the highest in cooperative learning is 2.63 (very good).

![Figure 3: Graph of Implementation of Learning](image)

Overall, the implementation of learning using cabri3D-based media in cooperative learning is best. The average results of observations on cooperative learning is 2.54 (very good), problem-based Instruction is 2.49 (good), and direct learning is 2.47 (good).

### 4.2 Teacher’s Activities

The result from the teacher’s activity on learning geometry using media based on cabri3D can be seen in Figures 4.
The average score of observing teacher activity in direct learning is 3.67 (good). The highest activity in the phase of "provide guided practice" is 3.84 and the lowest is in the phase of "provide extended practice and transfer" is 3.42.

The average observation of teacher activity in cooperative learning is 3.82 (good). The highest activity in the phase of "present information" is 4.22 and the lowest in the phase of "provide recognition" is 3.58.

The average score of observing teacher activity on Problem Based Instruction is 3.99 (good). The highest activity in the phase of "assist independent group investigation" and "organize students for study" is 4.25 and the lowest in the phase of "analyze and evaluate the problem-solving process" is 3.58.

This is consistent with observations of implementation of learning (Figure 3) on the aspect
"implementation of the learning component", where Problem-Based Instruction shows the best result.

5 Conclusions

The Geometry instruction using Cabri 3D-based teaching media fulfil the practicality criteria of teaching media. This can be seen from the implementation of learning in the three teaching strategies in the “good” and “very good” category.

Each strategies has their own advantage in its implementation, but based on observation, generally the implementation of Cooperative Learning is the best. The average score of learning implementation in Cooperative Learning is 2.54 (very good), Problem-Based Instruction is 2.49 (good), and Direct Instruction is 2.47 (good).

The result of observation of teacher activities in all three teaching strategies are in the good category. But the result of observation of teacher activities on Problem-Based Instruction (3.99) is higher than Cooperative Learning (3.82) and Direct Instruction (3.67). These results are consistent with the implementation of learning on aspect "implementation of the learning component" where Problem-Based Instruction is better than others.

References


Remote Sensing Role in Applied Science and Technology

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Abstract. This study was conducted: -To prove whether remote sensing can be accepted in science and technology, -see the changes in the environment and critical land. To get the information of an object, the principle of reflection in physics was used. Sunlight comes to the earth surface and an object or wave is brought to the object, then the object reflects back the wave spectrum corresponding to the object characteristics into space and captured by the sensor as a data source that will be processed using a computer. Thus, the reflected object characteristics will be known. The results of the study: -prove that remote sensing can be used to observe the desired earth surface, -and there is environmental changes by looking at the greenness index (NDVI) and surface temperature (LST) and, -there is land curvature. This study also recommends that: Remote sensing can be used to monitor the earth surface widely.

Keywords: Remote Sensing, environmental change, critical land

1 Introduction

The surface of our earth has an area about 510,072,000 km2, and Indonesia has 6981369 km2. To observe environmental changes condition on the earth surface and our so vast country, it requires expensive energy, thought, time, and cost. This is a separate challenge / problem for science and technology. Nowadays, the development of science and technology that can answer those problems is namely remote sensing technology. Remote Sensing is the science and art of obtaining information about an object, area or phenomenon through analysis of data obtained with a device without direct contact with objects, regions or phenomena that are studied. [1] Remote Sensing is a variety of techniques developed for obtaining and analyzing information about the earth. Is Remote Sensing able to monitor and identify of the earth surface.

Monitoring (PL) can be done by utilizing remote sensing technology. Remote Sensing Technology has the ability to monitor a wide area, a relatively long period of time, with a fast and low cost period. Some studies that previously used remote sensing: Vegetation and surface temperature relations [2], effectively monitor the environment and analyze patterns in urban areas [3], critical land [4] [5], critical land monitoring [6], and vegetation relations critical land [7]. Monitoring of environmental damage with Remote Sensing Technology in Indonesia, especially in North Sumatra has not been carried out until 2016. Monitoring environmental damage by analyzing comprehensively variables such as: Green surface level of the Earth (NDVI), Earth surface temperature (LST), Land Use & Land Cover, Forest Mangroves, soil surface inertia, soil pH, and Critical Land are carried out.

Science is something that is known to man through his life experience and will become knowledge if it has Been Proven True While Technology Is An Invention Through A Scientific Process To Achieve Its Goals In A More Simple Way. Does Remote Sensing Technology Play A Role In Applied Science? This Study Conducted Experiments And Field Surveys Using Cropsan Spectrometers, Thermometers, GPS, Satellite Data And Others To Test Whether The Intensity Of Light Coming To The Earth Surface Would Be The Same With That Reflected And Captured By Sensors On Landsat Satellites, Whether The Results Of Temperature Measurements In The Field Manually Same As The Calculation Results From Satellite Data. Furthermore, The Results Of The NDVI And LST Research Will Be Presented And Discussed As Well As The Relationship Between The Two In The Form Of Indexes And Maps To See Environmental Changes And Land Damage Which Ends With The Presentation Of The Critical Land Research Results.
2 Research Methodology

2.1 Data Analysis

1. Collecting references and literature material about the remote sensing benefits
2. Using crops an spectrometer
3. Calculating NDVI with the equation:
   \[ \text{NDVI} = \frac{NIR - RED}{NIR + RED} \]
4. Calculating the NDVI value by using the Transform function tools, NDVI with the formula:
   \[ \text{NDVI} = \frac{NIR - RED}{NIR + RED} \]
5. Performing LST calculations with equation:
   \[
   T1 = \left( \frac{K_2}{\ln \left( \frac{K_1}{L_3} + 1 \right)} \right)
   \]
   Where:
   \[K_1 = \text{Constanta 1 (774.89)}\]
   \[K_2 = \text{Constanta 2 (1321.08)}\]
6. Performing index calculations
   a. Humidity \[ TVDI = \frac{T-Ts_{min}}{s+NDVI-Ts_{min}} \times 10000 \] (3.2)
   b. Mangrove \[ IM = \left( \frac{NIR - SWIR}{NIR} \right) \times 10000 \] (3.3)
   c. Critical Land
7. For getting the value of critical land, 4 quantities below must be known. They are:
   a. Vegetation Density \[ FCD = \frac{(VD + ASI + 1) \times 0.5 - 1}{(x * \sin \theta)} \] (3.4)
   b. Slope \[ LS = \frac{X \times \frac{CZ}{2 \times 13}}{0.8980} \] (3.5)

Critical Land Index Calculation: \[ ILK = \{(axC) + (bxS) + (cxE) + (dxM)\} \]

3 Result And Discussion

3.1 Spectroradiometer Survey Result

Reflectance of electromagnetic waves can be detected by spectrometer and satellite remote sensing. Spectrometer Cropscan MSR 16R can be detected electromagnetic wave 520 nm until 2700 nm, and Landsat satellite image can be detected electromagnetic wave 450 nm until 2350 nm. Sample field measurement results for each of land cover type could be seen in table 3.1.

Table 1. Relationship of spectral reflectance value measurement using spectrometer Cropscan MSR 16R and Landsat 5 TM for each land cover type

<table>
<thead>
<tr>
<th>Land type</th>
<th>cover</th>
<th>Correlation value (Spearman Model)</th>
<th>Linear equation</th>
<th>Determination value R² (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A11</td>
<td>0.98</td>
<td>y=0.81x+3.57</td>
<td>97%</td>
<td></td>
</tr>
<tr>
<td>A12</td>
<td>0.98</td>
<td>y=0.67x+4.42</td>
<td>96%</td>
<td></td>
</tr>
<tr>
<td>A21</td>
<td>0.97</td>
<td>y=0.77x+2.68</td>
<td>94%</td>
<td></td>
</tr>
<tr>
<td>B11</td>
<td>0.98</td>
<td>y=0.93x+5.55</td>
<td>97%</td>
<td></td>
</tr>
<tr>
<td>B12</td>
<td>0.92</td>
<td>y=0.81x+6.88</td>
<td>96%</td>
<td></td>
</tr>
<tr>
<td>B21</td>
<td>0.61</td>
<td>y=1.40x+5.53</td>
<td>37%</td>
<td></td>
</tr>
<tr>
<td>B22</td>
<td>0.95</td>
<td>y=0.43x+4.66</td>
<td>91%</td>
<td></td>
</tr>
</tbody>
</table>
Where the result was a high correlation indicated that the classification results together with the results of field surveys Landsat, meant to further results from the Landsat satellite trustworthy used for classification, for the next satellite data can be used. [8]

3.2 Temperature Measurement Results

![Comparison between fields survey with satellite data](image)

Figure 1. Comparison between the temperatures obtained from field surveys and temperature obtained from satellite data and their correlation. [9]

3.1 Ndvi

Map of NDVI calculation results in Sinabung Mountain area from 2011 to 2017 can be seen in Figure 2.a, 2.b, and 2.c below

![Figure 2.a NDVI Landsat 8 Oli in 2011](image)

![Figure 2.b NDVI Landsat 8 Oli in 2015](image)
From the figure above, it can be seen that NDVI calculation results in 2011, 2015, 2017 in the Sinabung mountain area that each year the vegetation density had a significant decrease which we can see in table 1 below:

<table>
<thead>
<tr>
<th>No</th>
<th>Year</th>
<th>NDVI Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2011</td>
<td>0.6 - 0.8 emu</td>
</tr>
<tr>
<td>2</td>
<td>2015</td>
<td>0.4 - 0.5 emu</td>
</tr>
<tr>
<td>3</td>
<td>2017</td>
<td>0.3 - 0.4 emu</td>
</tr>
</tbody>
</table>

3.4 LST
For temperature index contour maps in Sinabung Mountain area from 2011-2017, it can be seen in Figure 2.a, 2.b and 2.c below. The picture above shows that the LST value has decreased so dramatically and it is very clear that the increase is quite drastic, from the temperature data from 2011, 2015 and 2017 that have been obtained; the average temperature change that occurs in Sinabung Mountain area can be concluded. The highest temperature value is quite dramatic as in Table 2 below
3.5 Land Damage

Before Sinabung Mountain had eruption, the surrounding top area of Sinabung was still relatively green so there was no land damage because according to information obtained that Sinabung Mountain was a favorite tourist attraction for tourists who like climbing. However, since the activities of Mount Sinabung were reactivated in 2010, there are now a lot of eruption impacts of the mountain. One of them is land damage caused by lava flows and volcanic ash bursts. From the calculation of NDVI and LST on Landsat 8 imagery OLI in 2015 and 2017, it provides an overview of the area and area spread which suffered damage in the 5 km buffering due to the activities of.

From the land damage map above, it was concluded that there had been land damage resulting from the Sinabung Mountain eruption. It was seen in 2015, it was very significant because the effect after the Sinabung Mountain eruption in 2013 was affecting, the effect was very large regarding the land damage around the mountain.

To see land damage change in every year, it can be seen in table 3 below. From the table it can be stated that a decrease in NDVI values proves that land damage can be calculated.

From the table above it can be stated that the area with the most damage in 2015 was due to the high temperature on the surface that was damaged.

### Table 3. The highest temperature value Table

<table>
<thead>
<tr>
<th>No</th>
<th>Year</th>
<th>LST Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2011</td>
<td>30 – 45 °C</td>
</tr>
<tr>
<td>2</td>
<td>2015</td>
<td>73 – 95 °C</td>
</tr>
<tr>
<td>3</td>
<td>2017</td>
<td>30 – 34 °C</td>
</tr>
</tbody>
</table>

Figure 3.c LST Landsat 8 Oli in 2017

Figure 3.c Land Damage Landsat 8 Oli in 2015

Figure 3.c Land Damage Landsat 8 Oli in 2017
Table 4. Damaged Area Changes at Sinabung Mountain Area

<table>
<thead>
<tr>
<th>No</th>
<th>Year</th>
<th>Width (Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2015</td>
<td>3282.12</td>
</tr>
<tr>
<td>2</td>
<td>2017</td>
<td>1205.51</td>
</tr>
</tbody>
</table>

3.6 Critical Land

Critical land obtained from the overlay (overlapping) for forest canopy density maps, slope maps of erosion hazard level maps so that we get a description of critical land in Pakpak Bharat District in Figure 4.

Critical Land Map of Pakpak Bharat Regency for 2014 year, such as:

![Critical Land Map](image)

Table 4. Percentage of Critical Land Level with Critical Land Parameter

<table>
<thead>
<tr>
<th>Kinds of Critical Land</th>
<th>Percentage of Critical Land Level (%)</th>
<th>Percentage of Forest Canopy Density (FCD)(%)</th>
<th>Percentage of Slope (%)</th>
<th>Percentage of Erosion Hazard Level (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No critical</td>
<td>38.38</td>
<td>13.25</td>
<td>12.71</td>
<td>23.66</td>
</tr>
<tr>
<td>Potential</td>
<td>42.38</td>
<td>35.77</td>
<td>19.94</td>
<td>20.69</td>
</tr>
<tr>
<td>Rather critical</td>
<td>16.73</td>
<td>23.07</td>
<td>25.55</td>
<td>34.00</td>
</tr>
<tr>
<td>Critical</td>
<td>2.45</td>
<td>23.11</td>
<td>26.48</td>
<td>16.27</td>
</tr>
<tr>
<td>Very Critical</td>
<td>0.05</td>
<td>4.79</td>
<td>15.31</td>
<td>5.37</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
The results of the percentage of critical level of land with critical land parameters, forest canopy density, slope and erosion hazard level can be classified as Table 4.

3.7 Discussion

From the results of Table 3.1, it states that the high correlation between the intensity observed with spectroscopic MSR cropsan and satellite generated, then from the results of Figure 2 the relationship of temperature measurements in the field and satellite states the same. This shows that both of these studies can prove that remote sensing technology can be accepted scientifically. From result 3 states that NDVI has decreased while result 4 states that there is an increase in temperature, this gives results that there has been a significant environmental change, this is also strengthened by the occurrence of environmental damage to yield 5 in the mountain area Sinabung with 5 km buffering. From the results 6, it is clear that there has been critical land in Pakpak Barat.

4 Conclusions

From the discussion above, it can be concluded that: Remote sensing technology can be accepted scientifically, Remote sensing technology can be used to see environmental changes, land damage, land consistency, and others.

References

The Effect of Implementation of Guided Inquiry-Based Model Towards Students’ Science Process Skill and Achievements on The Topic of Salt Hydrolysis in Natural Science Eleventh Grade SMA Negeri 1 Binjai

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Abstract. This research purposed to find out the increasement of students’ achievement which taught by using guided inquiry-based model higher than conventional model, the increasement of students’ science process skill which taught by using guided inquiry-based model higher than conventional model, and the significant correlation between students’ achievement with science process skill by implementing guided inquiry-based model. The population of this research is all students of natural science eleventh grade SMA Negeri 1 Binjai in the year academic of 2017/2018. Analysis technique was done by using gain test, normality test, homogeneity test, right-sided t-test, and correlation test. As result: 1) the increasement of students’ achievement which taught by using inquiry-based model is higher than the conventional model with t-table (1.666) > t-statistics (3.700) for cognitive domain, t-statistics (4.208) for affective domain, and t-statistics (4.798) for psychomotor domain, 2) the increasement of students’ science process skill which taught by using guided inquiry-based model is higher than conventional model with t-statistics (4.376) > t-table (1.6663), 3) there is significant correlation between students’ achievement with science process skill by implementing guided inquiry-based model with very high criterion respectively 0.900, 0.860, and 0.819 for cognitive, affective and psychomotor domain.

Keywords: Guided inquiry, science process skill, students’ achievement, salt hydrolysis.

1 Introduction

The process of natural science’s learning, especially chemistry, one of the elements that need to be handled properly to improve the quality of students. The subject of chemistry becomes very important in its position in society since chemistry is around us in everyday life. Essentially, chemistry is the way of finding out and understanding about nature systematically. Chemistry is not taught simply by providing an understanding of definitions, facts, concepts, principles, but also an invention through an experiment process with real action. Based on the characteristics of chemistry, the learning of chemistry today is not only emphasized on the product but also in the process. Since mastery of a good process will produce good products (Utami, et al., 2013).

The role of the teacher in learning which emphasizes the process is only as a mentor and director, meanwhile the activator of process is the student himself. Mastery of the process requires scientific skills which included in science process skill. Science Process Skills is the
development of physical and mental skill which originate from a person's basic abilities (Semiawan, 1992). Science process skills are techniques or strategies used by scientists to obtain the information.

The abilities which are developed in science process skills consisted of observation, classification, interpretation, prediction, asking the questions, hypothesis, experiments planner, using tools and materials, concept’s application, also communication (Rustaman, 2005). The result of Gabel's research in 2006 states that majority of students can work on questions and are trained in mathematical calculations, but lack understanding in the chemical concepts which based the problem [4]. Therefore, the teaching and learning process of salt hydrolysis should emphasize the concept of acquisition process, such that students may not only calculate the pH but also understand the concepts underlying the problem.

The result of interview with Mrs. Dra. Lorista Pane, as the teacher of chemistry subject at SMA Negeri 1 Binjai shown that the chemistry learning process still tends to be teacher centered. Teacher taught more often using the discourse method, where students were given direct concepts by the teacher then students worked on questions based on the concept. In addition, students were not understood the concept of salt hydrolysis material. This happened because the teacher only cramming the material without involving students to find their own concepts, such that the students were only encouraged to memorize without to know the underlying concepts. The brains of children who are forced to hoard and remember various information without being required to understand it formed graduates who are only theoretically smart but poor in application (Wardani & Priyani, 2009).

The using of chemical laboratories at SMA Negeri 1 Binjai was not optimal, since the practicum activities are still rarely carried out. When the practicum was carried out, students only followed the instructions or workflow demonstrated by the teacher. Practical instructions were used in direct instruction and did not activate students such that students' science process skills are underdeveloped (Arifin, et al., 2015).

The tendency of that learning causes students' science process skill is not developed. This is caused by the learning process students which not giving the opportunity to practice their science process skill. Consequently, students' knowledge is not meaningful, even students only memorize knowledge such that it does not last long. Meaningful learning will not be realized only by listening to lectures or reading other people's experiences. Experiencing by theirself is the key of meaningfulness (Trianto, 2010). Therefore, it needs an effort to improve science process skill. One of them is applying the Guided Inquiry learning model.

Guided Inquiry is a teaching model which allows students to move step by step from identifying problems, defining hypotheses, formulating problems, collecting data, verifying results, and drawing conclusions under the direction of the teacher (Matthew & Kenneth, 2013). Guided Inquiry learning is applied to students such that they are independent to develop the concepts which they learned not only limited to the material which recorded and memorized. In addition, the Guided Inquiry model can improve understanding of concepts and motivation to learn because students are actively involved in conducting investigations. This investigation has learning stages that usable to train science process skill (Wulanningsih, et al., 2012).

2 Research Methodology

This research has been done at SMA Negeri 1 Binjai on Salt Hydrolysis material. This research was carried out from January to May in the 2017/2018 academic year. In this time interval, survey activities, research proposal preparation, research process, and research report preparation are included.
The population in this study were all students of SMA Negeri 1 Binjai class XI MIA of even semester 2017/2018 academic year with 2013 curriculum. SMA Negeri 1 Binjai consisted of 7 classes, namely class XI MIA 1 to XI MIA 7 with an average class of 40 students. The sample in the study was taken by using purposive sampling technique, where the researcher determines the sample to be examined directly. This is done because the teacher is the same, then we wish that the teaching time is not too far apart, the teaching materials are same, and the students' initial abilities are also the same, such that it will facilitate the research process.

The class samples took 2 classes, namely XI MIA-1 class as the experimental class which given instruction through the Guided Inquiry learning model and the XI MIA-3 class as the control class which was taught with Conventional learning models. The students' samples for each class were 38 students.

The independent variable of the study is the using of Guided Inquiry model. The dependent variable is an increase in the achievement of cognitive domains and students' science process skill, achievement of the affective and psychomotor domains of students about Salt Hydrolysis. Research control variables are the same teachers who teach, the same student handbook, the same time allocation, the same taught material, and the same pretest-posttest questions.

The design of this study is the Quasi -Experimental with type of Non-equivalent Group pretest-posttest design by using two classes, namely experimental class, and control class. The data collection method of this study used a test of science process skill in the form of 10 essay questions and cognitive domain achievement (20 multiple choice questions), affective and psychomotor observation sheets, also questionnaires of student responses to the model.

The results of this study were analyzed in stages, namely: the increasement test (gain) of students' achievement and science process skill, normality test, homogeneity test, correlation test, and hypothesis testing. The hypothesis test which was used in this study is the right-sided t-test.

2 Results And Discussion

Analysis of pretest data on achievement of cognitive domain and science process skill of students was obtained by average value of students' pretest in the sample class of SMA Negeri 1 Binjai which was not much different between the experimental class and the control class. This shows that sample departs at the same initial state. Analysis of the final posttest data on cognitive achievement and science process skill in each class showed a significant difference. Normalized mean and gain of students in experimental class are higher than average and normalized gain in achievement of cognitive domain also science process skill of control class. Data on average pretest and posttest including the gain of cognitive achievement and science process skill is given in Table 1 below.
Table 1: Summary of average value in both class.

<table>
<thead>
<tr>
<th>Class</th>
<th>Variable</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>Cognitive Achievement</td>
<td>33.03</td>
<td>85.39</td>
<td>0.78</td>
</tr>
<tr>
<td></td>
<td>Science Process Skill</td>
<td>35.15</td>
<td>84.91</td>
<td>0.77</td>
</tr>
<tr>
<td>Control</td>
<td>Cognitive Achievement</td>
<td>30.00</td>
<td>80.26</td>
<td>0.72</td>
</tr>
<tr>
<td></td>
<td>Science Process Skill</td>
<td>34.70</td>
<td>79.29</td>
<td>0.68</td>
</tr>
</tbody>
</table>

Based on Table 1, the increasement of students' achievement and science process skill in the experimental class (Guided Inquiry) is higher than the control class (Conventional). Interesting thing from table above is the percentage of gain of cognitive achievement in both class is not quite different significantly meanwhile in science process skill has significant difference. This means Guided Inquiry model impacted so much to the students’ process skill. Now, take a look to the graph for the achievement improvement and science process skill for both of experimental class and control class which is given in Fig. 1. Although both classes has same level of low initial cognitive achievement and science process skill, Guided Inquiry in experimental class gives better result to the students. Furthermore, from the posttest data of students’ achievement, an analysis of the learning indicators accomplishment was done.

Figure 1: Increasement of students’ achievement in cognitive domain and science process skill.

The results of the analysis of the indicators accomplishment of salt hydrolysis material is given in Fig. 2 as below.
Figure 2: Increasement of students’ achievement in cognitive domain and science process skill.

In this study, observation on six aspects of science process skills were done consisted of observing, hypothesizing, grouping, designing experiments, implementing concepts, and interpreting. The gain of each aspect was calculated to find out which aspects of the science process skill experienced the highest increase. The increasement percentage in each aspect of the science process skill from both classes is presented in Table 2.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Experiment</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observing</td>
<td>79.29</td>
<td>76</td>
</tr>
<tr>
<td>Hypothesizing</td>
<td>78.31</td>
<td>61.12</td>
</tr>
<tr>
<td>Classifying</td>
<td>75</td>
<td>74</td>
</tr>
<tr>
<td>Planning Exp.</td>
<td>77.55</td>
<td>60.55</td>
</tr>
<tr>
<td>Applying concept</td>
<td>75</td>
<td>73.14</td>
</tr>
<tr>
<td>Interpreting</td>
<td>76</td>
<td>74.24</td>
</tr>
</tbody>
</table>

Based on Table 2, we may describe the difference of gain percentage of science process skill from the average value in experimental and control class which given by the graph in Fig. 3.
The data analysis result of cognitive achievement's gain obtained $t$-statistics $= 3.700$ meanwhile $t$-table $= 1.666$. Furthermore, the data analysis result of science process skill's gain obtained $t$-statistics $= 4.376$ meanwhile $t$-table $= 1.666$. So that, it may be concluded that $t$-statistics $> t$-table which means that the improvement of cognitive achievement and the improvement of students' science process skills which were taught by Guided Inquiry learning model is higher than students who were taught with the conventional model. The high increase in science process skills was also caused by using of guided inquiry methods at each meeting which were supplemented by the Student Worksheet (LKPD). Student Worksheet (LKPD) as an instrument for teaching and learning activities provides syntax of guided inquiry learning on it (Fajarida, 2016).

In addition of cognitive achievement and science process skills, this study also observed students' affective and psychomotor achievement. Data of affective and psychomotor achievement of students are given in Table 3 below.

Table 3: Summary of increase ment percentage in other domains of achievement.

<table>
<thead>
<tr>
<th>Class</th>
<th>Variable</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>Affective</td>
<td>89.14</td>
</tr>
<tr>
<td></td>
<td>Psychomotor</td>
<td>85.64</td>
</tr>
<tr>
<td>Control</td>
<td>Affective</td>
<td>88.57</td>
</tr>
<tr>
<td></td>
<td>Psychomotor</td>
<td>84.54</td>
</tr>
</tbody>
</table>

Based on the affective observation, it obtained an average for the experimental class with very a good category meanwhile control class with good category. Moreover, the psychomotor observation of students during the learning process obtained average for the experimental class with very good category and control class with a good category. Here is given the figure of the mean difference between affective and psychomotor values in both classes.
The data analysis result of affective and psychomotor achievements obtained t-statistics = 4.200 (affective) and 4.798 (psychomotor) meanwhile t-table = 1.666. So, we may conclude that affective and psychomotor achievements of students who were taught by the guided inquiry learning model are higher than students who were taught with conventional learning. Furthermore, a correlation test was conducted between the achievements and science process skill in the class which was taught by the Guided Inquiry learning model. This test was done to find out the hypothesis in this study is accepted or rejected. For cognitive achievement, the variable X is the increase (gain) of achievement and variable Y is an increase in science process skill. Testing criteria is: if \( r \)-statistics > \( r \)-table then the alternative hypothesis is accepted and the null hypothesis is rejected. Data of the correlation test between students' achievement and science process skill is given in Table 4.

Table 4: Summary of correlation between students’ achievement and science process skill.

<table>
<thead>
<tr>
<th>Correlation</th>
<th>( r )-stat.</th>
<th>( r )-table</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain of Cognitive-Science Process (1)</td>
<td>0.900</td>
<td>0.320</td>
<td>Ha accepted</td>
</tr>
<tr>
<td>Gain of Affective-Science Process (2)</td>
<td>0.8601</td>
<td></td>
<td>Ha accepted</td>
</tr>
<tr>
<td>Gain of Psychomotor-Science Process (3)</td>
<td>0.8193</td>
<td></td>
<td>Ha accepted</td>
</tr>
</tbody>
</table>

Table 4 above shows that there is a positive and significant correlation between students' achievement of cognitive, affective, and psychomotor domains with science process skill which were taught by the Guided Inquiry learning model. The contribution of students' achievements toward ups and downs of science process skill is 81% (cognitive); 73.97% (affective), and 67.12% (psychomotor). The graph of correlation test between students' achievements in experiment class is presented in Fig. 5 below.
Figure 5: Correlation test between students’ achievements and science process skill, respectively (1) cognitive, (2) affective, and (3) psychomotor domains.

At the end of the discussion meeting, students are given questionnaire to determine students’ responses to the guided inquiry learning model. This questionnaire contains 10 items. The following is a graph of students' responses toward guided inquiry learning model in Fig. 6.

Figure 6: Average of students’ responses toward guided inquiry learning model.

Explanation:
1. I am happy and motivated to study chemistry using the Guided Inquiry learning model.
2. The guided inquiry learning implementation makes me easy to understand salt hydrolysis material.
3. Implementation of Guided Inquiry learning can increase my curiosity.
4. Learning chemistry with Guided Inquiry learning model gives me the opportunity to argue and exchange ideas with friends in discussions.
5. Problems which given by researchers encourage me to gather information from various sources.
6. I feel happy to design my own experiments in practicum activities.
7. With the learning model provided by researcher, I became aware of several chemical concepts related to everyday life.
8. The implementation of learning with Guided Inquiry model can improve my ability to remember a concept of salt hydrolysis for longer.
9. The implementation of learning with the Guided Inquiry model is suitable for salt hydrolysis material.
10. The implementation of learning with the Guided Inquiry model needs to be applied to other topics in chemistry.

Generally, students give positive responses to the study of salt hydrolysis by using guided inquiry learning model. This is proven when the learning process takes place, students feel like learning chemistry with guided inquiry learning model because in this learning students are actively involved starting from formulating problems, submitting hypothesis, designing an experiment, collecting data, analyzing data, and making conclusions. Learning activities became more meaningful and easier for them to understand also remember the subject matter because they can find the concept of the subject matter independently. This is consistent with previous research that Science Process Skill is based on scientific inquiry and teaching science with inquiry makes students learn to think the critical and very effective approach to teaching that helps students to understand concepts well (Yager & Akcay, 2010).

Guided Inquiry learning is applied such that students are independent to develop the concepts they learn not only limited to the material recorded and memorized. In addition, the Guided Inquiry model able to improve understanding of concepts and motivation to learn because students are actively involved in conducting investigations. This investigation has learning stages which are usable to train science process skill (Wulanningsih, et al., 2012).

Almuntasheri, et al in 2016 linked the effectiveness of Guided Inquiry with its learning environment where students are encouraged to control their own learning with the guidance given by the teacher (Almuntasberi, et al., 2016). In such learning approaches, students become more aware of the contradictions between their pre-knowledge and the new concepts learned through their own scientific explanations, which come from their own data analysis. Even though questions are given by teachers in Guided Inquiry activities, students are leaders of the investigation process and involve themselves in motivational thinking, this then allows them to reach their own conclusions.

4 Conclusion

After conducting research, calculating data and testing hypotheses, the researchers obtained the following conclusions: The increase in the students' achievement which was taught by using Guided Inquiry model is higher than the increase in the students’ achievement which were taught by using conventional model. In the Salt Hydrolysis material, we obtained t-statistics for cognitive domain = 3.700, affective domain = 4.208, and psychomotor domain = 4.798 which are greater than t-table = 1.666. The increase in students' science process skill which was taught by using the Guided Inquiry model is higher
than the increasement of students' science process skill which were taught using the conventional model. In the Salt Hydrolysis material, we obtained $t$-statistics $= 4.376 > t$-table $= 1.666$. There is a significant correlation between students' achievement with science process skill through the application of the Guided Inquiry model. In the Salt Hydrolysis material, we obtained the correlation between science process skill with respectively cognitive domain $= 0.9000$, affective domain $= 0.8601$ and psychomotor domain $= 0.8193$ which greater than $r$-table $= 0.3200$. The contribution of students' achievement toward ups and downs of students' science process skill is 81% (cognitive), 73.97% (affective), and 67.12% (psychomotor).

References


Abstract. This study was aimed at investigating whether the developed material could improve students’ generic skill. It was a developmental research (Research and Development) conducted at chemistry department FMIPA Unimed year of 2017/2018 on students who took chemistry reaction organic subjects. The materials consisted of stereochemistry, basic concepts of organic chemistry reactions, electrophilic addition reaction, nucleophilic addition reaction, nucleophilic substitution reactions, electrophilic substitution reactions, elimination reaction and free radical reaction. The students consisted of 4 classes which were taken by using “one group pre-test post-test design” with quasi-experimental method for 2 classes, 1 class as experimental group while other as control group. The data was collected by using scoring instruments of Badan Standar Nasional Pendidikan (BSNP) which had been modified. It consisted of content feasibility, language feasibility and presentation feasibility components as well as test of 25 questions of multiple choices to measure the improvement of students’ generic skills. As the implementation test, the material used was validated by the experts. The data were pre-test and post-test score of experimental and control class which were analysed by using N-gain formula by using SPSS version 20. The result of the study showed the developed material met BSNP criteria with quite valid criteria and no revision required. Thus, it is able to improve students’ generic skills.

Keywords: Research and Development, Generic Skill, Organic Chemistry Reactions

1 Introduction

Organic chemistry is one of the compulsory subjects in Chemistry Education Study Program, Faculty of Mathematics and Science of Fakultas Matematika dan Ilmu Pengetahuan Alam (FMIPA) Unimed. Based on the evaluation result of lecturing process, in the last there years, the average score of students’ final test of organic chemistry 1 and organic chemistry 2 subjects showed that only 15% of the students got A. It indicates that many of the students were still lack of understanding the concept of organic chemistry. Thus, chemistry lecturing activity always put their efforts to improve and strengthen students’ understanding concept as teacher candidates although in reality it is faced with many problems.

After the observation was conducted, some factors which interfere students in understanding organic chemistry concepts were found, namely multi-dimension of chemistry, curriculum, language, mathematical understanding, misconception and cognitive stages. In the report also stated that organic chemistry concepts are considered as difficult to understand particularly on the types of reactions, reaction mechanism, and synthesis organic (Ruchiyat, 2013). Therefore, ways to improve students understanding on organic chemistry concepts and to upgrade their level of cognitive understanding are highly needed.

One of the ways to improve chemistry organic concepts mastery is by using problem based learning (PBL) model. PBL is an educational method where students develop their thinking and problem solving skills besides developing their understanding about key concepts through problem analysis in the real world (Sezgin Selcuk, Caliskan, Sahin, 2013). One of the approaches where students experience and discover the knowledge themselves is called PBL. In PBL, small group consists of 6 or 8 students with a tutor is made. The authentic and complex problem are given to help students to relate between theory and its application in reality, as well as developing their skills to overcome the complexity of reality (Tasoglu, A.K, Bakac, M, 2014).
Another effort to improve students’ learning outcomes in organic chemistry subject is by innovating learning materials. Innovation on learning materials can be developed by integrating the learning models. One of the models that can be used as an alternative is PBL. Chemistry materials which are integrated to PBL model have positive impact in teaching learning process (Sunaringtyas, 2015). Developing materials should fulfil the requirements of legal institution, namely Badan Standar Nasional Pendidikan (BSNP) dan curriculum.

Organic chemistry reactions material fits the PBL because the concepts of organic reactions can be the ‘problem’ in the learning stages of PBL which will develop students’ generic science skills and improve their mastery on organic reactions concept.

Chemistry lecture, besides of providing students with chemistry material, it is also intended to provide them with generic science skill. Thus, university is asked to provide students with generic science skills (Anwar, Liliasari, Setiabudi, & Martoprawiro, 2012). According to Khamsah in (Zakiyah, H., Adlim, & Halim, A., 2014) generic science skills can be categorized into 9 indicators, they are: (1) direct observation; (2) indirect observation; (3) magnitude scale awareness; (4) symbolic language; (5) logic of obeying the principal framework; (6) logical interference; (7) law of cause and effect; (8) mathematical modeling; (9) concept construction. Dibyantini (2017) developing problem based module on alkenes and alkynes subject which could improve students’ chemistry learning outcomes for 72%. Faizah (2013), concluded that developed problems based learning materials on salt hydrolysis could improve students’ soft skill and learning achievement. Silaban (2015) stated that problems based innovative material on chemistry formula and equation could improve the effectiveness of students learning in chemistry subject. This study was aimed at obtaining problem based materials which can improve students’ generic science skills in organic chemistry reactions subject.

2 Research Methodology

This study was conducted by using “one group pre-test post-test design” with quasi-experimental method. The subject was teacher candidate students of semester 4 in chemistry education program who took organic chemistry reactions subject at the year of 2017-2018, Universitas Negeri Medan. The students were consisted of 2 classes, that of experimental class with 21 students were taught by using PBL while the control class with 27 students taught by using direct instruction model.

The data was collected by using a multiple choices test which consisted of 25 questions to measure students’ generic skills which had been validated before by the expert validator. The data were pre-test and post-test score of experimental and control class which were analysed by using N-gain formula by using SPSS version 20. As the requirement in doing data analysis, normality and homogeneity test were done previously.

The procedures of this study were conducted following a research procedures that had been done by previous researcher, Sunaringtyas (2015) which consists of some stages, including: (1) designing problems based material in organic chemistry reactions subject, The materials consisted of stereoechemistry, basic concepts of organic chemistry reactions, electrophilic addition reaction, nucleophilic addition reaction, nucleophilic substitution reactions, electrophilic substitution reactions, elimination reaction and free radical reaction (2) developing problems based material in organic chemistry reactions subject, (3) standardizing the developed material (4) give a trial test to the developed material.

Figure 1. The procedures of designing problems based material
The data was collected by using scoring instruments from Badan Standar Nasional Pendidikan (BSNP) which consists of content feasibility, language feasibility and presentation feasibility components. The procedures are summarised in figure 1.

3 Result And Discussions

3.1 Chemistry Material

Based on the topics and sub-topics materials in organic chemistry reactions subject, the problems based chemistry materials particularly organic chemistry reactions were created. The next step was standardizing the problem based chemistry materials. The standardization was done by expert validator by using BSNP instrument which was modified to find out the results and suggestions. When the results were obtained, the developed material was revised. The data obtained were in the form of check lists (✓) table. The standardization was done by three experts. The overall assessment related to the validators’ comments about problems based materials are shown in the following table:

Based on the content feasibility assessment on problems based material particularly organic chemistry reactions, the highest score of organization components was obtained with average score is 4.00, it was occurred since the topic and its appropriateness to the sub-topic was organized well. Meanwhile, component with the lowest score was the content of material with 3.33. It happened because the materials as well as its contents have not yet fully been loaded. The average score from the content feasibility is 3.69 with valid criteria and no revision required.

<table>
<thead>
<tr>
<th>Elements of Assessment</th>
<th>The Assessed Components</th>
<th>Average Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content Feasibility</td>
<td>Organization of the Materials</td>
<td>4,00</td>
</tr>
<tr>
<td></td>
<td>Scope of Material</td>
<td>3,67</td>
</tr>
<tr>
<td></td>
<td>Validity of Concept</td>
<td>3,75</td>
</tr>
<tr>
<td></td>
<td>Capacity of Material</td>
<td>3,33</td>
</tr>
<tr>
<td>Total Average Score of Content Feasibility</td>
<td>3,69</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Validators’ Assessment on Content Feasibility of the Materials

Based on the language feasibility assessment on problems based materials particularly organic chemistry reactions, the highest score was obtained by appropriateness for students’ development with average score is 3.83. It was occurred since the developed material was able to create students understanding toward organic compound reactions subject. Meanwhile, the lowest score was obtained by writing aspect component with the average score 3.50. It happened because students’ higher comprehension skills toward presented material were needed. The average score from the language feasibility components is 3.72 with valid criteria and no revision required.

<table>
<thead>
<tr>
<th>Elements of Assessment</th>
<th>The Assessed Components</th>
<th>Average Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language Feasibility</td>
<td>Appropriateness for Students’ Development</td>
<td>3,83</td>
</tr>
<tr>
<td></td>
<td>Sentence clarity and readability aspect</td>
<td>3,80</td>
</tr>
<tr>
<td></td>
<td>Writing aspect</td>
<td>3,50</td>
</tr>
<tr>
<td></td>
<td>Language use aspect (terms)</td>
<td>3,75</td>
</tr>
</tbody>
</table>

Table 2. Validators’ Assessment on Language Feasibility of the Materials
Based on the presentation feasibility assessment on problems based materials particularly organic chemistry reactions, the highest score was obtained by material attractiveness component with average score was 3.83. It was occurred since the developed material provided clear writing, attractive cover page, attractive illustrations, etc. Meanwhile, the lowest score was obtained by the material presentation aspect with average score was 3.71. It happened because index, SPU table, glossary, references and summary have not yet fully been loaded to the materials. The average score from the presentation feasibility components is 3.75 with valid criteria and no revision required.

Table 3. Validators’ Assessment on Presentation Feasibility of the Materials

<table>
<thead>
<tr>
<th>Elements of Assessment</th>
<th>The Assessed Components</th>
<th>Average Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation Feasibility</td>
<td>Materials component</td>
<td>3.72</td>
</tr>
<tr>
<td></td>
<td>Material attractiveness</td>
<td>3.83</td>
</tr>
<tr>
<td></td>
<td>Material presentation aspect</td>
<td>3.71</td>
</tr>
<tr>
<td>Total Average Score of Presentation Feasibility</td>
<td></td>
<td>3.75</td>
</tr>
</tbody>
</table>

The result of problems based materials on organic chemistry reactions standardizing assessment were developed based on its strengths and weaknesses analyzed to the appropriateness of some lecturers’ lecturing materials. It was presented based on the feedback description related to the appropriateness of material standard. Each of the scoring description from three validators was calculated to find its average score. Then, the average score of whole scoring was also calculated to find the validators’ final scores for problems based materials on organic chemistry reactions subject, those are:

Table 4. The Result of Materials Standardization

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Average Score</th>
<th>Validation Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content Feasibility</td>
<td>3.69</td>
<td>Valid dan no revision required</td>
</tr>
<tr>
<td>Language Feasibility</td>
<td>3.72</td>
<td>Valid dan no revision required</td>
</tr>
<tr>
<td>Presentation Feasibility</td>
<td>3.75</td>
<td>Valid dan no revision required</td>
</tr>
<tr>
<td>Average Score</td>
<td>3.72</td>
<td>Valid dan no revision required</td>
</tr>
</tbody>
</table>

Table 4. indicates that content feasibility obtained 3.69 means valid and no revision required, for language feasibility was 3.72 means valid and no revision required, and for presentation feasibility was 3.75 means valid and no revision required. Thus, the average score obtained was 3.72 means valid and no revision required. It means that problems based materials on organic chemistry reactions was valid and no revision required. It can be concluded that the developed problems based materials on organic chemistry reactions can be used as lecturing materials. The average scores of standardization results are seen in the following figure:
3.2 Generic Skills

After conducting prequisites data analysis testing, namely normality and homogeneity test, the distributed normally and homogen data was obtained. Then, hypothesis testing by using SPSS program version 20 for windows can be done. The improvement of students’ generic science skills is shown in Table 5 which consists of the analysis of pre-test and post-test average score. N-gain and two sided test of significance with 95% of reliability can improve generic science skills in which the teacher candidate in experimental class was taught by using problems based materials and in control class by using no materials.

Table 5. Pre-test and post-test score of all generic science skill of science teacher candidates

<table>
<thead>
<tr>
<th>Class</th>
<th>Number of Students</th>
<th>Average score of Post-test</th>
<th>Average Score of Pre-test</th>
<th>N-gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>21</td>
<td>87.80</td>
<td>23.62</td>
<td>0.83</td>
</tr>
<tr>
<td>Control</td>
<td>27</td>
<td>54.67</td>
<td>20.74</td>
<td>0.42</td>
</tr>
</tbody>
</table>

Table 5 indicates that the highest average score of post-test is 87.80 for experimental class and the lowest average score of post-test is 54.67 for control class. Meanwhile, the highest average pre-test score is 23.62 for experimental class and the lowest average score of pre-test for control class is 20.74. From the table, it is seen N-gain class is 0.84 which categorized as high achievement level while control class is 0.42 as medium achievement level. Therefore, it is found that problem based materials can improve generic science skill of chemistry teacher candidates.
4 Conclusion

Based on the research, the development of problems based materials on organic chemistry reaction subject meets BSNP criteria, with average score of content feasibility, language feasibility and presentation feasibility was 3.72 which was categorized as valid ad no revision required. Based on the implementation of developed material, N-gain score was 83.84 % with high achievement stage. Thus, the development of problems based materials on organic chemistry reaction subject can improve students’ science generic skills.

References


The Development of Learning-Tools Oriented Learning Problem Based to Improve Ability Solving Problem and Self Studying of Students SMA Negeri 1 Kualuh Selatan

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Abstract. The objective of this study is to expose: 1) validity of learning-tools oriented learning of problem-based to develop; 2) be practical learning-tools oriented learning problem base to develop; 3) the effectiveness of learning-tools of learning oriented problem based to develop; 4) improvement capability problem solving in those students adopting a learning-tools oriented learning problem based to develop. In the study was taken that (1) the learning-tools in developed was valid to the total average of validity RPP = 4.60, students book = 4.45, teachers’ book = 4.47. LKS = 4.52, test ability to solve problem was in valid enough and valid in reliability of 0.910, and questionnaire in self-study was in valid category and valid sufficient with reliability of 0.97; (2) the learning-tools in development meets a practical criterion viewed from a) teachers’ assessment in category easily to execute; b) students’ valuation was in highly easy to conduct; and c) how to execute the learning is in the best category; 3) the learning-tools meets the an effective criterion; 4) average rise ability in solving problem on student from the test I through test II was 0.29 point with improvement for full-program to study classically was 15.12%.

Keywords: learning-tools, model learning problem based, ability to solve problem. Self-studying.

1 Introduction

Mathematics is acknowledged the queen science is at once science serving high required in dealing with global era. Mathematics constituted as an essential science as base to life forever. So, scholar with certain rate on mathematics highly required to all students for future one may get gain properly career and maintain in global era, surely not career without mathematics.

In reference with it, mathematics is one of lessons have highly important role in education, by mathematics is allowable to develop one’s way of thinking critically, creative, systematic, and logical. In addition, mathematics may contribute in daily life every things in simple such as basic calculation through matters in very complex and abstract such as to apply numerical analysis in engineering and so forth.
One of competences highly need to develop in mathematics as contained in curriculum such as aspect of solving problem. Solving problem is an important thing for one is led in endeavor to find the solution since it may present a concrete experience so by that experience may use in solving the problems alike.

It is relevant to NCTM (2010:1) program insist that the term of solving problem shall rely on the function of mathematics having highly potency to present an intellectual challenge in order to improve the development and know mathematics by students. Solving the problem is constituted a part of curriculum for the mathematics itself is highly important in process of learning and how to solve it, for the students is allowable to get many experiences in uses knowledge and basic skill to apply it for daily life dealing with problems.

Solving the problem should be an essential course in learning mathematics on school due to the student become more competent to select relevant information, then analyze it, research ever; (2) intellectual satisfactory may arise inside that seen as intrinsic problem; (3) potency intellectual of student improved; (4) student may know how to find by process and find invention (Hudojo, 2005:133).

With premises as above, it sees surely one’s ability to solve problem must get special approach, since it has truly highly strategic role in develop potency to the student, particularly on mathematics.

Unfortunately, the student can not solve the problem yet properly, then it may cause the result of learning mathematics never existed as hope. According to the result research of Trends International Mathematics and Science Study (TIMSS) in 2003 that Indonesia was in 34 ranks out 45 countries. In such performance is seen more poor relative to the program for International Student Assessment (PISA) for 2003 put Indonesia on the lowest rank of 40 countries sample, meant just one level higher than Tunisia. For Indonesia attended TIMSS for 1999, 2003, 2007, and PISA in 2000, 2003, 2006, 2009 the outcome showed not any change to each joint as participant (Wardani and Rumiati, 2011:1).

Seen low ability to solve the problem as on the result of observation in early and by interview with teachers of mathematics on SMA Negeri 1 Kualuh Selatan that mostly student got difficulty in solving the problem. The result of observation also indicated mostly student is massively in learning mathematics and showed poorly response upon the learning and courses is taking place.

The research was done on 5th September 2016, provided test of competence how to solve problem in material trigonometric upon 25 students Grade XI SMA Negeri 1 Kualuh Selatan, indicated to a maximum score 100, 36% students got score 0 for nothing the student can answer, and they acknowledged having not know how to answer, and another 48% got score arranged 10 – 40, 12% got score ranged 50-60 and only 4% students got score 90. This result indicated how poorly ability to solve the problem, whereas this material they had learned in course of class-room.

That poor condition must be treated, lead the student be custom to solve the problem in class-room. The activities with taking solving the problem according to Ruseffendi (1991:341) consisted of 1) formulate the problem clearly; 2) re-telling the problem in a form that may can be solved; 3) to make hypothesis and strategy to solve, 4) set own procedure how to solve them; 5) make evaluation upon the solving. In relating with Ruseffendi, Polya (1973:5), the solution upon solving the problem contained 4 phases for solving, they are: (a) to understand the problem, (b) make own plan to solve, (c) take solution refers to own plan, (d) make review. The steps with ability to take solution upon the problems as above, for each should know them for hope by this ability, in future the student may get self-ability to solve the problem in mathematics and any problem that he may find in daily life.
Beside ability to solve the problem, the request in Curriculum 2013 at present it not only rely on *hard skill*, but also *soft-skill*, noted one of them is willingness to self-study. The learning as designed is hope to allow each student not only to receive information and knowledge alike by explanation of teachers but they must be able to create own concept and principle. This approach is one of reality things in self-study as student.

Sumarno pointed out that self-study is a process of design and self-monitoring properly upon a cognitive and affective process in solving own academic (by Purnamasari, 2014: 4). Under self-study shall encourage student start studying by own-self, not depending on teachers, parent or other people. This self-study process permit students a worthy opportunity to deepen their awareness on the environment. In self-study approaching grant student to make own positive choices how a student may deal with worries and confusions in daily life. This motive allow the student may act according to own initiative to set up environment. How principle to have self-study in mathematics is due to demand in curriculum for the student can face the problem in class-room or out where they life more complex and also let them reduce dependent on other people in daily life (Fauzi, 2011:11).

Based on particulars as mentioned above, it can be concluded that self-study approach is highly required for each individual can take initiative, with or without other helping, mainly in arranging whatever activities to be done such as to formulate the purpose of studying, sources of knowledge (either as people or material), how to diagnose the requirement in study and control one-self the process of learning.

How essential self-study approach on student is not conformed with the reality yet as seen in field. Upon the questionnaire that has been presented to 20 students of Grade X SMA Negeri 1 Kualuh Selatan, then take conclusion that average self-study with 2.61 from maximum score 4. This rate is categorized poor in 2.6 rate is perhaps below 3. By an analysis done then obtained that: (1) 40% of students not capable to evaluate the process and the performance; (2) 50% students having no initiative to study; (3) still 65% of students can not diagnose yet the need for study; (4) 80% of students can not control self yet; and (5) for another 55% student can not explore and employ the resources available to explore.

By the cases and findings in field, poorly ability to solve the problem on students are because of several factors they are: First, the plan of learning provided by teachers is not conformed with the criterion to develop the learning-tools properly. This case correlated with: (1) the learning activity under RPP is not specifically to indicate the student and teachers in activity; (2) RPP in use by teachers is still the copy of other teacher made already previously and provided in generally; (3) the steps in the learning not contained allocation of time on each process of learning; and (4) there is no any rubric of score on the assessment on the student.

Secondly, Books of learning used on SMA Negeri 1 Kualuh Selatan found with some weakness, they are: (1) the questions available not indicated the steps that may measure one’s ability to solve the problem in mathematics; (2) mostly present formula immediately and then use it to solve the problem later, the book of learning contained not the steps how to find formula so mostly students only memorize that occasion forget later how to use; 3) the hand-book that students use is not attributed to their character as student.

Thirdly, the students have no any pieces paper to make activity, so the process how to develop ability to solve the problem and how to communicate mathematics not run well. Fourthly, test ability of student contained shortage of point development of capability and self-study in student. By several factors as above, the learning-tools is the dominant factor how lower ability how to solve the problem and self-study.
In order to enrich their ability how to solve the problem and to have self-study, it is highly required a learning-tools to support. It means, now there is a challenge to those teachers how to develop a learning-tools own refers to the Regulations No. 14 of 2005 regarding Teachers and Lecturers, pointed out that teachers competence covering a competence in pedagogic, competence in personality, competence in social and competence in professional and to attain it by profession.

Under required professional competency, so each teacher is obliged to arrange own learning-tools completely and systematically for the learning-approach can take place interactively, inspired, favorable, challenge to and motivate student to take part actively, and allow space sufficient to say initiative and creative and make own self-study according to talent, interested, and physical development as well as psychological. The learning-tools is acknowledge a tools to use in the process of learning (Trianto, 2011:201). Some learning-tools as required such as RPP, syllabus, LKS, books and evaluation devices. In addition, the learning-tools is also used as reference to those students with their portion to take part effectively. Nur (in Sulistyaningsih, 2012:2) stated that the learning-tools may provide easiness and assist the teachers in preparation and also to execute the learning-studying in class-room.

How to develop all the learning-tools above mentioned, it must be relied on a model of learning for the tools available to develop become unity to equip each other and focused on the purpose to gain. There are many models of learning can be used in order to enrich their ability for solving the problem and how to get student self-study, one of the models supporting to the character of mathematics is known as learning problem based. (PBM).

PBM model is acknowledged a learning model based upon several problems requiring researching authentic namely how to know solve truly upon a reality problem (Trianto, 2011:90). The problems was adopted to link one’s willingness to know, ability in analysis and initiative of students over the material of learning. This model may coach the students how to solve the problem according to their knowledge. The process itself mayframe up new knowledge be more profitable to all students.

The statement as above shall be correlated with the opinion Donalds Woods (in Amir, 2010:13) pointed out that PBM is more than large environmental effective to study and know his/her life in solving the problem, team cooperation and how to communicate. Under a self-study may offer freedom to the student to find how their live refers academic values. The student may take own conclusion and responsible for the points as consequences of that decision. The student also own arrange and adjust their actions to achieve the targets as want to.

Model PBM encourage students not only just thinking in concretely, but also to think ideas abstract and completed. Apply PBM model can assist student become scholar. Under supervision by teachers, the learning with PBM model can encourage students to ask many questions, to complete self assignments in learning, and solve the problems that student find in daily life.

By expose to background and see weakness ability to solve the problems and self-study of the student SMA Negeri 1 Kualuh Selatan indicated that quality of learning-tools used not good as well. So, it is required development of any learning-tools highly quality and refers to the criterion fulfilling with valid value, practical and effective. One of criterions to be taken is how to achieve indicators of rising ability of solving the problem.

The result of development in learning-tools oriented PBM model is highly expected as alternative to set up a better learning-tools and it may improve their ability to solve the problems. In correlating with it, the learning-tools in tri-gonometry using the PBM model is
not used widely yet. Therefore, this study is interested with developing it more under a learning-tools with a problem based learning-model (PBM).

2 Method

This study is a development research, with Model 4-D Thiagarajan.

2.1 The Subject And Object Of Research

The subject of this research are all students Grade X-2 and X-3 SMA Negeri 1 Kualuh Selatan. The object involved the learning-tools oriented learning problem based to develop.

2.2 How to Develop the Learning-tools

The learning-tools in to develop as in this study covering: RPP (the Draft of Learning, Books of Teacher (BG), Books of Student (BS), Paper of activity (LKS), instrument test of ability to solve the problem and questionnaire of self-study. Thiagarajan, Semmel, and Semmel with 4-D comprising of four stages of development either define, design, and disseminate. The summary of modified 4-D model is presented on figure 1 as follow.

![Diagram of 4-D Model](image-url)
2.3 Instrument and Data Analysis Technique

The instrument in collecting the data in this study comprising of Firstly, validity of learning-tools using validity sheet of tools. Secondly, the learning-tools itself is practical with (1) sheet available on teacher against practical product, used to assess the practical point of RPP, book of teacher, book of student, LKS, test of ability, and questionnaire; (2) sheet of assessment to the ability of solving problem, and questionnaire of self-study; (3) sheet of observation conducting the learning used as guidance to observer in monitoring the course of mathematics with PBM model.

Thirdly, instrument of assessment to effectiveness of product consist of (1) test ability of solving problem, used to measure ability in solving problem by student; (2) sheet of observation of activity on student, used to gain data of activities; (3) sheet of their respond use to get data of students’ respond.

In analyzing the data, used a descriptive statistic analysis based on average score of each learning-tools that has been validated, done it based on any correction, with suggestions given.

Further, in order to assure practically existed learning-tools, viewed from:

a. Teacher’s assessment against practical learning-tools as developed can be done in classroom fulfilling minimal “easy to execute” criterion.

b. Students’ view adjust that the learning-tools as developed should be easy adopted in course there fulfilling minimal “easy to execute” criterion.

c. In administering the learning-tools as developed should be run minimal in “good” category. Thus, in order to see effectiveness of the learning-tools, viewed from:

a. Full-study done by student classically is analyzed under considering for all students categorized completed if the student individually get achieved score ≥ 2.67, whereas for any learning shall be noted completed classically if it achieved 85% students joint to the test achieving the score. To have note completed the equal is as follow

\[
PKK = \frac{Students Completed}{TotalStudent involved} \times 100
\]

b. The students activity is analyzed there even describe out the result of activities during doing studying. To find average frequency and average percentage of time to use, the students should follow the stages below:

1. Make frequency of each category of activity in one meeting.
2. To take average percentage of frequency in each category of activity by dividing average frequency for each category of activity with amount frequency of monitoring on each meeting.

c. The response of student should be analyzed by assessment percentage amount of students show positive response on each category as required, under a Borich formula (Herman, 2012:5). 

\[
PRS = \frac{\sum A}{\sum B} \times 100 \%
\]

Remarks:
PRS : Percentage numbers of students respond positively.

\[ \sum A \] : Proportion of student take it

\[ \sum B \] : Total students (respond)

The respond is noted effective if the numbers of student respond it higher or similar to 80% of amount subject to research on each test. Still, the process given by student is seen by conformity of students’ respond with the indicator of capability to solve the problem and its mathematics communication.

3 Results

3.1 Description Of Stages In Development Of Learning-Tools Problem Based

In developing the learning-tools is done using a 4-D model comprising of four stages, they are to define, design, develop, and disseminate. In details how to develop them, is mentioned as following:

a. To define Stage

1) Early Analysis of end

In field indicated that for longer the teachers have not the learning-tools properly, covering the Learning execution plan (RPP) as used perhaps not the description of learning process as executed, it shall be copy format from other teacher, since the teacher in this case never plan own self about RPP, not use LKS as supportive, and hand books used not contain any questions helping the student in improving ability to solve problem and to self-study.

2) Analysis of Student

By cognitive, student grade X-2 and Grade X-3 SMA Negeri1 Kualuh Selatan have capable to think on a formal operational. Piaget stated out on such aged, student SMA level have approached a maximal intellectual efficiency, but on shortage experiences shall limit their knowledge and capability to use what he/she knows. In addition, by interview to Head of School and teachers board school indicated that all the class-room run in similar ability (homogeny).

3) Analysis on concept

Analysis on concept aimed at identifying, mention, and arrange systematically the concepts student shall learn about mainly trigonometric become concept mapping. This concept map further is suited to the learning problem based. The concept map to produce then is put on Book of students (BS) and books of teacher (BG).

4) An Analysis of Duties

The analysis of duties covering a general works and special works. The general works refers to a core competency in curriculum 2003, while specific duties refers to a basic competency and indicator achieving the performance conformed with analysis of material in this case with material is going to improve.

b. To Design

1) Arranging the test and questionnaire

The test in use are test of ability solving problem on mathematics by description. For the questionnaire containing statement to find self-study by student.
2) Finding Media and Tools

Media in use to this research such as tools simplify the calculation. Other media in use such as illustration figures to simplify student correlate trigonometric with daily life and experiences.

3) By Format

Choosing format on the learning-tools is referred to principle, characteristic and steps in PBM model. Whereas format of book by teacher, book on student and LKS is made colorful and as attractive as possible.

4) Early Design

On this stage produce RPP for 4 sessions, students’ book, teacher’s book, LKS on each session, test of ability solving problem, alternative for solution and score of point each question and questionnaire about self-study, for this design is known Draft I.

c. To Develop

The result from stage define and design may produce early plan for a learning-tools either known draft I. Following finished the learning-tools problem based in plan by draft I, go to test of validity over expert review and field test.

1) Result of Validation by expert

Before field test, the learning-tools and instrument, need firstly to validate the learning-tools and the instruments to those five validation-officials. By the result, then obtain criterion learning-tools and instruments to develop under “valid” and can be used by a bit revision. Further, instrument of research namely test of ability for solving and questionnaire for self-study should be tested in class-room outside sample, then do validity test and reliability.

2) Test I

Following fulfilling criterion valid as develop the learning-tools, then to all learning-tools is known draft II. Format of this draft II is tested on the research area such as they test I done on Grade X-2. The result of data analysis in test-I is a learning-tools that has been developed having fulfilled criterion to valid and practical, but not fulfilled be effective due to found indicator be unachievable under completing to full classic to develop the problem 70.59%. The result of full completing classically solving the problem on test I as well as the result of questionnaire in self-study can be seen on Table 1 and 2.
Table 1: Classical Completing Rate in Ability Solving the Problem by student As On Test I

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage (%)</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete</td>
<td>24</td>
<td>70,59</td>
<td>2,753</td>
</tr>
<tr>
<td>Not Complete</td>
<td>10</td>
<td>29,41</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Result by Questionnaire in Self-study as Test

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage (%)</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>5</td>
<td>14,71</td>
<td>47,88</td>
</tr>
<tr>
<td>High</td>
<td>9</td>
<td>26,47</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>17</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Very Low</td>
<td>3</td>
<td>8,82</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

From Table 1 can be seen that average ability in solving problem on Test I is 2.753 by maximum rate 4.0. Percentage of student do completed is 70.59%. This percentage is obtained by dividing frequency of student do completed noted 22 student out 34 x 100%. Refers to criterion of assessment, this percentage not fulfill classical completed as decided namely ≥ 85%. Whereas, result of questionnaire in self-study as obtained as showed table 2 indicated that average self-study of student seen 47.88 of maximum rate 72. Percentage of self-study with highly category is 14.71%. So, it is necessary to revise on Draft II upon some component of learning-tools as developed.

3) Test II

Following done a Test I on Draft II, then make correction to produce a learning-tools fulfilling an effective require. The result of revision on Test I producing draft III to be tested on further class namely on Grade X-3. This Test-II is done 4 times session refers to the plan on learning (RPP) that has been improved. The test-II was done to assess the effectiveness of learning-tools (draft III). Besidecorrecting to test I, this test II is also done to see improvement ability of solving problem and self-study by student. In whole, the classical completed rate of ability in solving problem by student on test II can be seen on Table 3 and the result of self-study by student is on Table 4.

Table 3. Classical Completed Rate ability Solving the Problem by Student on Test II

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage (%)</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete</td>
<td>30</td>
<td>85,71</td>
<td>3,04</td>
</tr>
<tr>
<td>Not Completed</td>
<td>5</td>
<td>14,29</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>35</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
Table 4. The result Questionnaire of Self-study on Test II

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage (%)</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>5</td>
<td>14.29</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>15</td>
<td>42.86</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>9</td>
<td>25.71</td>
<td></td>
</tr>
<tr>
<td>Very Low</td>
<td>6</td>
<td>17.14</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>35</td>
<td>100</td>
<td>49.82</td>
</tr>
</tbody>
</table>

Based on data on Table 3, seen that average ability solving problem on Test II noted 3.05 of maximum rate 4.0. Percentage of student completed is 85.71%. Refers to criterion of assessment, this percentage has fulfilled already classical completed decided on ≥ 85%. It is concluded that classical completed criterion is fulfilled. Further, on students’ activity is obtained that on test-II all students’ activity ranged on ideal time as determined with tolerated limit 5%. On students’ response is obtained the student responded positively on the learning-tools oriented learning problem based. Concluded that the learning-tools problem based as developed on test-II as the revision of test-I has fulfilled already the learning-tools in practical and effective.

d. Disseminate

Disseminating of learning-tools problem based as developed in this case done under providing a learning-tools over forum MGMP in school where the test to use later.

3.2 Improvement Ability Solving Problem and Self-study of Students Using a Learning-tools Oriented Learning Problem Based as Developed

Bases to the result of analysis improvement ability solving problem by students on test-I and II indicated that average ability in solving problem on test I is 2.75, whereas on test II is 3.04. Percentage of student completed it on test I is 70.59% and not completed 29.41%. Refers to the assessment criterion, percentage in completed as this 70.59% not fulfilled classical completed as decided namely ≥ 85%. While on test II, percentage of student completed full is 85.71% and not completed 14.29%. Percentage completed with this 85.71% has fulfilled already classical completed as decided.

Whereas result of analysis improvement ability in self-study obtained that average self-study by student on test-I is 47.88, whereas on test II is 49.82%. This average is obtained from dividing total score in all students with numbers of student. Percentage of students on test-I with category self-study with very high is 14.71%, with high 26.47%, low 50% and very low 8.82%. Percentage students on category very high is 14.71% obtained from numbers of student as included into category with self-study with high rate (in this case 5) divided numbers of student namely 34 and x 100%. Whereby, percentage of student on test II with category self-study is very high 14.29%, high 42.86%, low 25.71% and very low 17.14% respectively.

Representation category self-study on student obtained on test II got increased on high category. Having rise up high 16.3%, and this also indicated that percentage self-study of highest is on test I ranged on low category, whereas on test-II ranged on category high. The result of research showed ability solving problem and self-study using the learning-tools as
developed got rising. Concluded that the learning-tools problem based influenced to a rising
ability solving problem and self-study on students.

4 Discussion

Bases to validation, the learning-tools has been done valid by validator. In essentially, the
result of validation RPP, comprising of four sessions indicated that component in RPP of
category such as quite good, good, and very good with average total 4.60. Beside RPP, the
result of validation on books of student also indicated that components in that books got such
as goo and very good of average totally 4.45. Further, validation on books of teacher also
indicated that components in that book got such as quite good, good, and very good with
average total 4.47. The result of validation LKS also got such as category good and very good
with average total 4.52. This also indicated that components in LKS is categorized good.

Further, validation of test ability solving problem is available of category not valid, valid
still upon validity of content, can and be acceptable upon language and to write the questions
and to recommend without any revision, a small revision, and high revision. Following done
revision, the questions that has been improved fulfilling already criterion valid and is
acceptable to measure ability of solving problem as on field test. It is also done on
questionnaire of self-study, the result of validation indicated that components such
questionnaire as self-study also ranged on category of valid, quite valid and one point
statement is not valid upon validity of content; can and be acceptable upon the language and
how to write; and to recommend without any revision and small revision. Following done
revision, another 35 points statement as developed has fulfilled already criterion valid and be
acceptable.

Bases to field test, concluded that product expandable has fulfilled criterion practical.
Upon practical product can be seen from the data of assessment on teacher and student upon
practical of product, and observation to realization of learning mathematics with PBM model
using product as expanded.

Average score of assessment of teacher against practical of product is available on
category “very easy to execute”. Assessment by teacher, percentage of student make adjust on
product is on category minimal “easy to use” is 100% so it can be noted that product as
expanded practical to use.

The learning on mathematics is done refers to model as used on RPP, namely PBM model.
Average percentage done on mathematics with PBM model used product as expanded is
91.67%, it means the implementation has achieved minimal limit noted product as expanded
practical to use in mathematics.

In generally, product expanded fulfilled the practical criterion if existed consistency
between adjust by teacher and student with condition applied in field. Bases to test I and II, the
learning-tools oriented learning problem based as expanded has fulfilled category effective if
viewed from : (1) completed learning students classical; (2) activity of student within time
tolerated as decided; (3 ) student respond it positively on the learning-tools component
problem based.

Average ability solving problem by student in test II is 3.04 with percentage completed is
85.71%, this point is seen criterion classical completed is fulfilled.

By monitoring, students’ activity seen that it is on criterion limited learning effective as
noted on Chapter III. On test I, aspect ask questions achieved 14.47%. Even it is still in
criterion as decided, tending to ask their teacher not to other student in the same group. On test II of this aspect increased up to 15.51. Even through, on test-II the students has questioned fellow student.

Many questions asked to teacher but it correlated the teacher adjusted to condition of student can not fulfilled. This outcome is noted as one of references to revise books of student and LKS. One of points to improve is the question of point d on LKS is detailed specifically and some formulas required in solving, but student do not remember need to add on book. In order to adjust the activities, alternative to repair such as: (a) teacher lead students completed question point d and try using the outcome obtained in finding one of points known or give other solution to respond the problem given, (b) adding guidance and explanation details on the problem available found on book. Following repair, the activities of students on test II available on a tolerated limit decided.

Additionally, analysis to students’ respond related with their feeling against aspect of component of learning-tools namely their opinion upon the material, books of student, LKS and atmosphere of learning is lower than aspect of other tools. Bases to comments and interview done over to students giving negative respond, their reasonable is their refusal on group study.

Further, analysis to students’ respond is related renewal component of tools either books of student, LKS, material and atmosphere achieved 80%. Although achieved already 80%, some comments of student on questionnaire shall be consideration to revise tools before test II. One of comments by student seen about atmosphere of learning in noises with group-study.

By aspect of enthusiasm students to attend the session, mostly students respond it positively above 90%, it means students interested with involving in further learning activity. Aspect of clearly language used on books and LKS has achieved 90% already, but regarding words, sentences or instruction questioned by student during learning is noted referred repairing of language. The words or sentences not understood well added available explanation or replaced in more simple one and solution to problem in book is added conclusion or important concept need to understand. Aspect of interesting upon books and LKS is also achieved 80%.

By repairing done as on test II, aspects of students’ respond either on feelings of student against the tools, renewal on component of tools and clearly of language on books and LKS is persistent in category good. So, the final tools resulted has fulfilled criterion effective.

According to a research by Sinaga (2007) indicated that students respond positively to the learning-tools bases problem focused on Batak cultures. By exposes of research showed that concluding the components of learning-tools problem based as expanded contributed positively to students’ respond.

By having improved ability solving problem and by self-study using the learning-tools problem based as improved is seen properly, bases to average on both tests, found improvement ability of 0.29 point with 15.12% having improved completed, still improved in self-study of 1.94 point, by category, is found improvement with high category.

The result of research as above is relevant to Smith (Amir, 2010:27) stated out that various dimension and profitable of learning problem based for students such as to improve their capability to solve problem, easier to remember, improved understanding up, improved knowledge relevant to daily practicing, also to enrich their ability on leadership and cooperation, competency, and motivation.

This point is supported in outcome by Susanti (2015) got product with learning-tools problem based as expanded improving their ability solving problem and ability to connect
mathematics. It is concluded that the learning-tools problem based possibly to improve ability solving problem.

4 Conclusion

By the result of analysis and understanding to this problem, can be taken conclusion as following:

1. Validity of learning-tools as expanded including into category valid with average rate validity RPP in 4.60, books of student in 4.45, books of teacher in 4.47, LKS rate of 4.52, test of ability solving problem in category sufficient valid and valid, as well as point of statement questionnaire with self-study as student.

2. The product as the learning-tools in mathematics for SMA Grade X with PBM model that has been tested and got into criterion practical. This bases to the result of research of students indicated that product as tested got already fulfilling criterion practical. The result by teacher indicated that product as tested got already criterion “very easy to conduct”. The data was supported by data results of observation conducting learning mathematics with PBM model with average percentage applied achieved 91.67%.

3. Effectiveness of learning-tools fulfilling criterion effective, they are: (a) achieving completed studying with percentage of classical completed in 85.71%; (b) activity done by students fulfilled criterion of ideal time tolerated as decided; (c) respond of students over learning-tools is in category good.

4. Average improved ability solving problem by students on test I into test II is 0.29 point and its classical completed improved in 15.12%. Average improved self-study by students as in test I into test II is 1.94 point. In category, seemly improved on category high on test II.

References


School Violence Prevention Through Counseling Service Using Problem-Solving Approach to Improve Students’ Self Control

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Abstract. Violent acts among teenagers in senior high schools continue to increase along with the lack of emphasis on reducing the intensity of these acts by the schools’ counseling service. This research aims to describe the violence acts prevention through counseling service by using a problem-solving approach to improve the students’ self-control. This study is a quantitative research with an experimental design. The population consisted of Senior High School (SHS) students in Padang, Indonesia, and the sampling technique was cluster random sampling. Data collection was performed through the use of Firman and Yenikarneli's questionnaire (2017) which validity and reliability have been approved. Data analysis was performed through a descriptive method and the Wilcoxon Signed Rank Test. Based on the results of the analysis, it was found that violent acts prevention through counseling service by using a problem-solving approach is effective in improving high school students' self-control.

Keywords: Violent Acts, Classical Counseling, Problem Solving Approach, Self-Control

1 Introduction

Violent acts performed by teenagers continue to increase in Indonesia in the last few years, which manifest itself in the form of beating, cursing, slapping, and threatening acts among the high school students. These acts result in the victims being injured, hospitalized or even died. Students who are involved in violent acts use stones, knives, bottles, and machetes to attack the other students. Fights among students usually take place in public places, such as open ground, streets, and terminals (Nurmina. Firman and Zaheyardam, 2003).

KPAI (2018) revealed that until May 30, 2018, cases of student fights in Indonesia amounted to 161 cases, in which: 23 brawl victims cases or 14.3 percent, 31 cases of brawlers or 19.3 percent, children who are the victims of violence and bullying with 36 cases or 22.4 percent, and children who act as perpetrators of violence and bullying with 41 cases or 25.5 percent, and children who are victims of policy were 30 cases or 18.7 percent.

Cases of violence also occur in the school environment in West Sumatra Province, as residents of Padang were shocked by the circulation of videos of torture among students on Youtube, with the title “TawuranPadang Kosgoro SMK KosgoroSiksaPelajarTamsis” (Brawls in Padang between Kosgoro Vocational High SchoolTorturing Tamsis Students-ed) (Safutra, 2016). Another case discovered that as many as 21 students were arrested by the police for initiating a brawl after the flag ceremony at the Imam Bonjol Field in Padang (Sunandar,
The Civil Service Police Unit (Sat Pol PP) of Padang, West Sumatra noted that throughout 2015, 220 out of 433 brawl cases were dominated by Vocational High School students, followed by 90 cases of brawls by Junior High Schools (SMP) students, and 123 cases by non-students (Akbar, 2016).

The act of teenage violence is caused by minor problems, such as dissatisfaction, misunderstanding, and disputes that result in fights, destruction of private and public facilities, arson, and even murder. In fact, small disputes should have been solved through agreement from both sides without the use of violence that can harm oneself for others (Nurmina, Firman and Zaheyardam, 2003).

Adolescents who commit acts of violence generally lack self-control or even blame the controls imposed on them, and tend to uphold their own standards of behavior while underestimating the existence of others. The crimes they commit are generally accompanied by mental elements with subjective motives, which include achieving certain objectives through violence and aggression (Kartono, 2001). Self-control has a significant relationship with aggression behavior in students (Auliya & Nurwidawati, 2014).

Self-control is an illustration of an individual’s decision to do something through cognitive consideration by bringing together the behaviors that have been arranged to guide the results and goals in a positive direction. One intervention that can improve one’s cognitive ability to achieve self-control is through counseling services. Counseling services aim to provide understanding, knowledge, and insight that can later be used as a consideration in making a decision or taking an action (Prayitno & Amti, 2009; Azzet, 2013).

Classical guidance interventions through counseling services can be done through a problem-solving approach. A problem-solving approach is an approach that invites students to solve a problem that has been found or experienced (Jacobsen, Eggen, & Kauchak, 2009). This approach encourages students to think, analyze and make decisions by themselves. Thus, students are encouraged to think clearly before doing something because they have learned from the outcomes of the problems or the experiences they have dealt with or felt directly. Results from a study found that a problem-solving approach is a method of producing collaborative solutions from the students, resulting in a better perception based on the knowledge that comes from understanding concepts, and the study discovered that there is an increase in how the students behave, think and act in a positive direction (Kapur, 2008).

Based on this description, it is interesting to reveal further to what extent the effectiveness of classical guidance through counseling service with the use of problem-solving approach is in improving self-control of high school teenagers through this research. Disclosure of these problems is used as an effort to find solutions to prevent violent acts among high school students.

2 Method

This study is a quantitative research with an experimental design. The research population consisted of Senior High School (SHS) students in Padang and the sampling was done by using cluster random sampling technique, with the total sample of 26 students. Data collection was performed using a self-developed instrument which is called Firman and Yennikarneli’s Aggressiveness Questionnaire (2017) that has been approved in terms of its validity and reliability. Data analysis was done by using a descriptive method and the Wilcoxon Signed Rank Test.
3 Results And Discussion

Students’ Self Control Before and After Classical Counseling

Based on the results of the analysis, it was found that the Senior High School students’ self-control is as follows:

Table 1: Description of Senior High School (SHS) Students’ Self Control

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posttest</td>
<td>26</td>
<td>172.96</td>
<td>4.821</td>
<td>164</td>
<td>185</td>
</tr>
<tr>
<td>Pretest</td>
<td>26</td>
<td>163.62</td>
<td>5.367</td>
<td>155</td>
<td>171</td>
</tr>
</tbody>
</table>

Table 1 above shows that the mean score of students' self-control before joining classical guidance through counseling service is 163.62, with a minimum score of 155 and a maximum score of 171. After following the classical guidance through counseling service, the mean score of students’ self-control increases to 172.92, with a minimum score of 164 and a maximum score of 185. Therefore, after joining the classical guidance through counseling service, there is an improvement on the score of the students’ self-control as a prevention to violent acts, and the difference in the average score of students’ self-control before and after the counseling service is 9.35.

3.1 Differences in Students’ Self Control Before and After Classical Guidance

Based on the results of the tests on the experimental group and the control group, it was found that:

Table 2. Pretest and Posttest Result of Senior High School Students’ Self Control

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Rank</th>
<th>Sum of Ranks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posttest – Pretest</td>
<td>Negative Ranks</td>
<td>0</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>Positive Ranks</td>
<td>26</td>
<td>13.50</td>
<td>351.00</td>
<td></td>
</tr>
<tr>
<td>Ties</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Posttest < Pretest
b. Posttest > Pretest
c. Posttest = Pretest

Based on Table 2, it was found that 26 students experienced an increase in their self-control after following classical guidance through counseling service using a problem-solving approach to prevent violent acts. The improvement of students’ self-control is shown in the following graph:
The graph shows that before taking classical guidance through counseling service with the use of a problem-solving approach in preventing violence, 13 students (50%) had self-control below the high category. After following the classical guidance through counseling service using a problem-solving approach, students who had self-control below the high category decreased to 6 students (23.77%). More significant differences can be seen in a low category, in which there were 8 people in the low category before following the classical guidance service through counseling using a problem-solving approach; however, after following the classical guidance, there were no students with self-control score in the low category.

### 3.2 Differences in Student Self Control Before and After Following Classical Guidance

The differences in self-control of students’ self-control before and after attending classical guidance through counseling service is shown in the following table:

<table>
<thead>
<tr>
<th>Posttest – Pretest</th>
<th>Z</th>
<th>Asymp. Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-4.462*</td>
<td>.000</td>
</tr>
</tbody>
</table>

Based on the result of the comparison tests using the Wilcoxon Signed Rank Test, it shows that the significance value is 0.000. A significance value of 0.000 is less than 0.05 (0.000 < 0.05), meaning that there is a significant increase in students’ self-control in violence prevention after attending classical guidance through counseling service with a problem-solving approach.

### 4 Discussion

The results of the test discovered that the students’ self-control increased after they attended classical guidance through counseling service using a problem-solving approach. Students’ self-control in preventing violence is the ability to manage themselves related to the ability of behavioral control, cognitive control and the ability of the decision control to prevent acts of violence. Several research findings explain that self-control skills are very important in psychosocial development (Duckworth et al., 2016), in addition to other factors that affect psychosocial development, which include family, economic status and intelligence (Duckworth & Seligman, 2005; Duckworth et al., 2016; Daly, Delaney, Egan, & Baumeister, 2015).
The results of the study show that students’ low self-control will tend to contribute to violence. Self-control is useful to manage their attention, emotions, and behavior in each condition (Peterson & Seligman, 2004; Baumeister, Vohs, & Tice, 2007; Duckworth & Gross, 2014).

Students who have high self-control will avoid violence because they realize that this can harm themselves and others, such as the no smoking attitude in students who have high self-control (Fauzan, Firman, & Daharnis, 2018). Besides, students who have high self-control will consider the long-term effects of their actions and delay temporary satisfaction for more positive long-term goals (Zettler, 2011; Oaten & Cheng, 2006; Mischel & Ayduk, 2004). Good self-control will have a positive impact on students (Tangney et al., 2004; Duckworth & Seligman, 2005; Duckworth et al., 2007; Zettler, 2011; Moffitt et al., 2011).

Classical guidance activities through counseling service using a problem-solving approach is one of the interventions that can be used to prevent violence by increasing student self-control. The results of the study found that before following the classical guidance through counseling service, some students had self-control in the medium category, and as many as 6 people (23.08%) improved their self-control to a high category after attending classical guidance activities through counseling services. In addition, all students experienced an increase in their self-control after taking classical guidance through counseling services using a problem-solving approach. The average increase in students’ self-control score is 9.35.

Several studies found that counseling services using a problem-solving approach can reduce hedonistic lifestyles in students (Hasibuan, Firman, & Ahmad 2016), that counseling services are effective in reducing tendencies towards pornographic media (Asmidaryani, Firman, Gistituati, 2018), and that counseling services are effective in improving self-regulated learning (Pulungan, Firman, Ahmad, 2018). The use of classical guidance through counseling service using a problem-solving approach is effective to help students improve their self-control to prevent violence. The results of the study also found that a problem-solving approach gives students the opportunity to find the solutions to their problems at the beginning of learning activities, and by then students are better prepared to receive materials as compared to directly teaching them the materials without implementing the use of a problem-solving approach first (Schwartz & Martin, 2004).

Previous research has also shown that using collaboration during a problem solving activity can be useful for organizing conceptual knowledge so that it affects the teenagers’ attitudes and the actions they are going to take (Schwartz & Martin, 2004; Sears, 2006; Kapur, 2010, 2012; Westermann & Rummel, 2012; Mullins et al., 2011). The classical guidance in counseling services using a problem-solving approach can change the cognitive process, and it affects the students’ self-control to prevent acts of violence among themselves.

5 Conclusion

Based on the results of the research and discussion, it is concluded that:

1. After the students took part in classical guidance in counseling services with the implementation of problem-solving, they experience an increased self-control related to violence prevention.
2. There is a significant difference in students’ self-control in carrying out violence before and after attending classical guidance in counseling services through the use of a problem-solving approach.
References


Preliminary Study: Development of Algodoo-based Newtonian Teaching Materials to Improve Student’s Conceptual Understanding with Peer Instruction Method

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Abstract. Some of the worlds physics communities have observed that student learning outcomes in introductory physics courses are weak and ineffective. To overcome this, one of the efforts to complete it is the development of effective teaching materials. Excellent teaching materials will help students in solving problems in learning including deep conceptual understanding. Many misconceptions occur for students who have completed introductory physics courses. Whereas in the introductory physics courses there are many major branches of physics. Conceptual understanding is a part that cannot be missed in the whole of physics learning. Weak understanding of the concept will affect the completion of mathematical physics questions. Sometimes students can solve a physics problem that is mathematical but does not understand the concepts contained in it. One method of solving physical misconceptions in students is to use peer learning methods whose activities are arranged in instructional materials developed based on Algodoo. This method is expected to reduce the misconceptions that occur for students who take Introductory Physics courses during their first year of college.

Keywords: Teaching Material, Conceptual Understanding, Algodoo

1 Introduction

Physics is the study of matter, energy, and interactions contained in it. The knowledge contained in physics plays an essential role in the progress of humanity. Physics covers the realm of science that is widely used by chemists, computer engineers, and scientists, as well as other practitioners of physical and biomedical sciences.

Physics began to be introduced to students ranging from elementary to high school. When these students study with science majors, they are likely to return to studying physics at the beginning of the semester. There are several mentions of introductory physics courses at several universities in Indonesia such as Basic Physics, General Physics, and Physics Introductory. At Universitas Negeri Medan itself since the implementation of the KKNI-based curriculum, introductory physics courses in the first year of lectures at FMIPA are "Basics of Mechanics and Heat" and "Basics of Wave, Electricity, and Magnets."

Conceptual understanding of physics must be accepted by students well in college because the physical sciences always relate to one another. Therefore, a good conceptual understanding
will prepare students better in starting the next lesson. Conceptual errors in students will have an impact on higher learning stages (Daud et al. 2018; Widarti, Permanasari & Mukyani, 2017).

To help students' understanding in building an excellent conceptual understanding, one of them is the lecturer must apply media that suits the needs of students. Virtual media in physics learning can help students visualize physical phenomena interactively (Wibowo et al., 2016). Algodoo is one of the virtual media offered in physics learning, especially in introductory physics courses (Euler & Gregorcic, 2017). The use of Algodoo is expected to help students learn actively and creatively.

In this preliminary study, the author offers the development of Algodoo-based Newtonian teaching materials which later can be used by students in introductory physics courses. Also, the author also offers the use of peer teaching methods in solving specific problems in textbooks that will be created. The use of peer teaching methods will help students to confirm the knowledge that is in themselves (Fagen, Crouch & Mazur, 2002).

2 Method

2.1 Type of Research

This research includes development research using the Thiagarajan teaching material development model. The teaching material developed in this study is Newtonian based Algodoo material.
2.2. Development of Teaching Materials

The development model used in this study is a learning material development model proposed by Thiagarajan (Thiagarajan, 1974). The Thiagarajan model consists of four stages (four-D models): define; design; development; dissemination. However, the stage undertaken in this study is only up to the development stage, because teaching materials will be used in the university themselves.
2.3. Data Collection and Instrument Techniques

Data collection techniques by questionnaire. There are four types of questionnaires that are used to capture information and data needed in the development of textbooks, which are prepared based on the needs and suitability of the information for students in Basic Mechanics and Heat. After the preparation of teaching materials is complete, the Algodoo-based Newtonian teaching materials will be applied to students to see a Newtonian conceptual understanding of students.

2.4. Research Procedure

This research activity is divided into three stages, namely: (1) Planning; (2) Implementation; and (3) Data analysis.

2.4.1. Planning

Collect information from first semester students who take Introductory of Physics course on 1) Material to be developed; 2) Character of students; 3) Tasks and learning objectives to be developed, and 4) Preparing teaching materials based on information that has been received.

2.4.2. Implementation

The steps taken in the implementation phase are as follows:
1. Conducting a feasibility test on the product that has been compiled to material and learning design experts, by giving an assessment sheets
2. Conduct revisions based on criticism and suggestions provided by a team of material and learning experts.
3. Conducting trials on students who take Introductory of Physics courses to analyze conceptual understanding using the teaching material.

2.4.3. Data Analysis

Data analysis in this study is descriptive, which explains a symptom-problem, or the situation as it is and not tests the hypothesis. The data obtained in this study are qualitative data obtained from questionnaire answers filled by students and expert teams.

3 Discussion

In this preliminary study, the author offers an alternative method in teaching the introductory of physics to students in the Faculty of Mathematics and Natural Sciences, Universitas Negeri Medan. Newtonian teaching materials developed will apply Algodoo as an activity that can be used by students to build a better conceptual understanding of physics. Algodoo-based teaching materials will assist students in obtaining self-assessment. This strategy will help students develop instructional knowledge (Mason & Singh, 2016).
The peer teaching method will also be used to solve problems using Algodoo. This method will develop students' conceptual abilities and attitudes towards a better direction, especially for students in universities (Zang, Ding & Mazur, 2017; Martin, 2016). This method will give students the opportunity to express their initial ideas and then confirm them with their peers. Some researchers have shown positive results in the use of peer teaching methods in universities in various applied sciences (Teixeira et al. 2015; Graziano, 2017; Sayer, Marshman & Singh, 2016).

The use of Algodoo will help students improve their creativity by visualizing physical events in the Algodoo system (Gregorcic & Bodin, 2017). This strategy will undoubtedly run more effectively by learning peer teaching methods with Algodoo-based teaching materials. The author hopes that students can discuss with their peers to answer the problems in Newtonian material based on Algodoo so that the conceptual knowledge of students will be built during the discussion process.

4 Conclusions

Based on the results of the discussion, it can be projected that Algodoo-based teaching materials combined with peer teaching methods will make the learning process in the introductory physics courses run more effectively. This study was made as a preliminary study to study the potential use of Algodoo applications in preliminary Physics teaching materials at the Faculty of Mathematics and Natural Sciences, Universitas Negeri Medan.

References


Virtual Chemistry Laboratory as Pre-Lab Experiences: Stimulating Student’s Prediction Skills

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Abstract. The student’s prediction skills in chemistry experiments are important skills for pre-service chemistry students to stimulate students reflective thinking at each stage of chemistry experiments, qualitatively and quantitatively. A Virtual Chemistry Laboratory was designed to provide opportunities for students to practicing kinds of chemistry experiments everywhere, anytime, and repeatedly, before exercising the real experiment. This research was conducted by mixed method with triangulation data, in which the Virtual Chemistry Laboratory content was constructed using the Model of Educational Reconstruction and developed to enhance students ability to predict the experiment results and analysed the cause of error, calculating the accuracy and precision with carefully in using chemicals. This research bring out a new and simple experiment design inside Virtual Chemistry Laboratory, and the implementation showed student’s transformation to executing important decision, extremely beware with accuracy, but still had low concern in precision. It enhancing students level of reflective thinking skills related to their prediction skills 1 until 2 stage This study recommends for different subject matter to provide more opportunities for students to expand another chemistry experiments.

Keywords: Virtual Chemistry Laboratory, Prediction Skills, Chemistry Experiments, Pre-Lab Experiences

1 Introduction

Prediction skills are not commonly known by teachers as doctors. It’s rarely researched and get attention by experts in chemistry learning, even though it is an important skill. Prediction skills are used to determine chemical experiments results from the beginning, and preventively could avoid the danger of mistake in chemical experiments, and also become an important skills for making a decision about synthesize new compounds with an innovative and old modified method (Kurniawati, 2017).

Prediction skills are a part of higher-order thinking skills (King, Goodson, & Rohani, 2004), that indicate intelligence, wisdom, accuracy in making decisions and reflecting good abilities in understanding and implement science process skills. Teacher with smart prediction skills will be able to interconnected theories and practices with past experiences, to decide a smart solution or find a way out of various problems (Kurniawati, Permanasari, Muzakir, & Rohman, 2015).

However, previous studies indicate that the prediction skills of preservice chemistry teacher are one of the most difficult indicators of high order thinking skills to be provided
(Kurniawati, 2017). Accurate predictions make people not only solve problems and make smart decisions, they also wise and visionary. They are able to reflect well on all the problems they experience today to the past and the future.

Prediction skills are needed by a teacher, including a chemistry teacher. When a chemistry teacher has an error prediction, it could induce a negative impact on chemical learning activities, especially in chemical experiments, even could produce a bad decision that endanger students. Professional chemistry teachers should have prediction skills well (Agrawal, Gans, & Goldfarb, 2018). They have to teach theoretical chemistry or experiment by paying attention to every decision making, avoiding many problems in chemical experiments, which can affect the safety of their students in laboratory.

Prediction skills can be improved in line with increasing knowledge and experience (Schaeffer, 2011). Capable knowledge, sufficient experience in chemistry experiment and the skills to connect the two are needed (Kurniawati et al., 2015). Therefore, adequate experience in chemistry experiments are needed to be practice continuously, which are synergic with the enhancement knowledge theoretically, and making reflection on process and results experimental as habit. Repeated experiments are also needed to make the students understand chemical concepts behind the experiments well and help them through the process of reflective thinking. However, this is difficult to be facilitated by faculty. It will require a lot of additional costs, time and staff to be able to fulfill it. Students experiences in the laboratory became limited, obstructed by the cost, time and other constraints. Whereas, to improve students ability of prediction skills, experience repeatedly and continuously are a must, to take place it intelligently and better (Sirhan et al., 2001). A smart solution is needed to overcome this problems.

Experiments through virtual activities or known as Virtual Laboratory is one of the experimental practice solutions that need to be taken into account. Virtual Laboratory is a laboratory experiment without a real laboratory with certain limitations, which can help students provide more possibilities in connecting between theoretical and practical aspects, without requiring the help of real tools, which are electronically programmed in a computer to simulate experiments which resembles real conditions in a virtual laboratory (Keller & Keller, 2005). Virtual Laboratory is an experiment in an environment that stimulates the learning process in a real laboratory, because it provides tools, materials and other laboratory equipment in a virtual way to get experiment subjectively by individuals or in a group anywhere and anytime (Babateen, 2011).

VCL helps students conduct experiments without having to anxious about cost constraints, the danger of chemicals, and without being constrained by space and time (Hovakimyan, Sargsyan, Isipryan, Khachoyan, & Darbinyan, 2013), and does not require much staff (Bakar et al., 2013). VCL also can provide opportunities for students to be able to have experience and practice repeated experimental skills without being limited by space and time, at a more affordable in cost and minimal risk.

VCL can help students understanding the theory behind experiments and be able to help students connect the experiments they do with the initial knowledge they have (Levy & Wilensky, 2009). Other research also shows that the Virtual Chemistry Laboratory can help students strengthen the foundation of knowledge on some basic concepts of chemistry, improve construction thinking and help improve students' thinking skills, especially in problem solving (Aksela, 2005), and helps understanding chemistry by involving cognitive understanding skills at three levels: macroscopic level, symbolic level and microscopic level (Herga, Cagran, & Dinevski, 2016) or microscopic / molecular scale (Tatli & Ayas, 2013). VCL also addresses a variety of learning constraints related to improving
understanding of science process concepts and skills (El-sabagh, 2011), creating habituation to the work environment in the laboratory (Dalgarno, Bishop, Adlong, & Bedgood, 2009), increasing scientific attitudes (Ay & Yilmaz, 2015), as well as improving students' reflective thinking skills (Kurniawati, 2017). In addition, the experience of virtual experiments can also help students frame problems and find solutions, before real experiments are carried out (Rodgers, 2002; Schon, 1983).

The important thing in this research is that the virtual designed must have a composition of contents and construction that can bridge the understanding of concepts, reflective skills and experimenting skills, and can be assessed. In its construction, VCL can also be filled with chemical knowledge that supports experiments and designs that support the student's reflection process. Therefore, in integrating activities that can develop the predictive skills of prospective teachers in the educational environment must be designed VCL construction in a variety of scenarios so that the tendency becomes a positive attitude and a good stimulus (Fariza Khalid, 2015; Strampel & Oliver, 2007). Therefore, research is needed on how to design VCL which are expected to be a means to help experimental skills and also need to be investigated how far it could stimulate the improvement of prediction skills of preservice chemistry teacher.

2 Methodology

This research was conducted by mixed method design in which qualitative and quantitative data collection was carried out using the exploratory model (Creswell, 2002) and integrated the Model of Educational Reconstruction (Duit, Gropengießer, Kattmann, Komorek, & Parchmann, 2012) as a way of stage to design VCL. This research was carried out in two phases, the VCL design/ construction phase, and the VCL implementation phase.

In accordance with the Model of Educational Reconstruction (MER), the design phase begun with content structure analysis, followed by empirical studies conducted to explore students' difficulties and weaknesses in predicting experiments, and the extent to which they were able to interrelate concepts they understand to the experiments they were doing. The final step was to make a VCL according to the content that has been compiled. VCL courseware was built then using Adobe Flash CS-6 software.

In the VCL implementation phase, 4th semester of preservice chemistry teacher in the chemistry education departement of one of the universities in Indonesia were used asthesample. The VCL implementation was carried out on three homogeneous classes (which have been tested for homogeneity), by giving a different practicum model treatment. In class A, VCL was given as a substitute program of the real experiment (X1), class B was practicing the real experiments only (as a comparison), and class C used VCL as an exercised before doing the real experiment (X3) or class which was given the pre-lab experiences. These three test classes were intended to determine the differences in Prediction Skills in the sample that perform different forms of experiments, based on the scale adapted from Paul and Elder, 2004 and Spark-Langer et al. (1990), as shown in Table 1.
### Table 1. The Scale of Prediction Skills

<table>
<thead>
<tr>
<th>Scale</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Prediction without descriptive language</td>
</tr>
<tr>
<td>2</td>
<td>Predictions with simple / simple descriptions</td>
</tr>
<tr>
<td>3</td>
<td>Predictions with explanations according to general terminology</td>
</tr>
<tr>
<td>4</td>
<td>Predictions with explanations based on personal habits or preferences</td>
</tr>
<tr>
<td>5</td>
<td>Explanation with the principle or theory given as rationalization</td>
</tr>
<tr>
<td>6</td>
<td>Explanation with principles or theory and consideration of context factors</td>
</tr>
<tr>
<td>7</td>
<td>Explanations with broad scientific considerations but rooted in problems</td>
</tr>
</tbody>
</table>

(Adapted from Paul & Elder, 2005 & Sparks-Langer, et al, 1990)

The scale in each indicator was used to determine the extent to which students experience stimulation due to VCL assistance.

## 3 Result And Discussion

### 3.1 VCL Construction

In accordance with the stages of MER, VCL construction which began with content structure analysis, resulted in the synthesis of inorganic compounds as VCL content because they had the expected characteristics. In terms of chemical concepts, the synthesis and characterization of inorganic compounds is an experiment that involves understanding concepts that relate to the characteristics of elements and inorganic compounds, chemical bonds, solution chemistry, reactions of inorganic compounds, thermochemistry, equilibrium, reaction velocity, stoichiometry, qualitative and quantitative analysis, and chemical instrumentation. In terms of the ability to experiment, the synthesis and characterization of inorganic compounds is an experiment that involves many basic abilities of experimenting for a chemistry teacher candidate, starting from the ability to determined tools and materials, conducting substance preparation, using chemical instrumentation, designing experiments, assembling simple tools, reacting, warming up, doing qualitative and quantitative analysis, and observing experimental results, to draw conclusions then.

From the results of an empirical study it was known that there are still students who have difficulty conducting experimental activities that are very basic and should have mastered them, such as arranging glass tools for experimental needs such as reflux, distillation making a solution with a certain concentration, recrystallizing and others. These results of the analysis that have been conducted provide scientific clarification of the relationship between the chemical concepts given in the course of inorganic chemistry and experiments carried out in inorganic chemistry labs with subject matter choices to be made VCL after considering important aspects outside the content structure, such as time efficiency, cost, staff and chemical hazards, through textbook analysis. Reconstruction of the structure of this material also
involves the opinions of educators and students regarding their difficulties in understanding the material related to the experiment.

VCL development is carried out through the reconstruction of material structures that connecting theory with experiment and its reflective thinking position as seen in Figures 1 to 3.

The VCL menu as shown in Figure 1 explain that VCL can be filled with science content related to experiments, to provide students can be helped in bridging knowledge with experiments. Content selection was the result of content structure analysis at the beginning of the MER stage, as well as the core content of the VCL, namely virtual experiment screencapture as shown in Figure 2.

Virtual experiments that were inputted in the VCL are made so that they resemble the real experiments. But limitations are very likely to be seen because it was not easy to match the conditions of real experiments, in the virtual condition. The VCL was also designed so that the conditions during the experimental process have variations in results if the VCL user does not experiment accurately and carefully.
Figure 3 showed the process of managing the synthesized compound to obtain the required crystalline chemical compounds. The results of the experiment were made according to circumstances where the synthesis could not be in line with expectations. For example, improper weighing will result in the quantitative identification of synthetically produced compounds of low purity, or improper extraction of substances will cause amorphous crystals of compounds formed. So that, the characterization of compounds was also used as content in VCL to ensure the success of the process to the end.

Figure 4 showed an example of a menu related to the characterization of the synthesized compound, which was related to the identification compounds, qualitatively. This characterization menu at this VCL was provide to supporting or improving student prediction skills.

3.2. Implementasi VCL

The VCL implementation in measuring the predictive ability of prospective chemistry teacher candidates in the sample class given a different practicum method is shown in Figure 4.
The picture above showed that the VCL class gives more stimulants to students' predictive skills, compared to the real experiment class. The majority of students (80.6%) in class B are on a scale of 1, or cannot provide predictions at all when the experiment takes place. In the real experimental class, none of the students reached the scale of 4, only less than 20% of students were able to predict, even though half of the explanations were very common. The difference seen in the three test classes is the more dominance of the number of students who are on scale 1 in the real experiment class and VCL, despite the significant differences on scale 2 where the VCL class is much higher than the real experiment class. In the VCL + Real Experiment class students' prediction skills were more dominant on a scale of 3 because they provide pre-lab experiences to students. The VCL + Real Experiment class shows the same predictive skills scale on a scale of 1 and 2, as well as the dominance of students who are at level 3. Compared to the real experimental class, VCL as pre-lab experience has higher scale distributed on almost all scales.

Figure 5 also showed that the role of VCL as predictive stimulants has a synergistic role if it functioned as a pre-lab experience by continuing to carry out real experiments, because the fact that students who did real experiment activities are only able to help the majority of students get a scale of 1, 2, and a few students at scale 3 and 4. The implementation of VCL alone without being followed by real experiments was only able to help the majority of students gain skills on a scale of 1 and 2 as well as a few students on a scale of 3 and 4, although in quantity relatively better than the real experimental class. However, the VCL implementation in reality cannot measure the ability of students in actual experiments, although it can helped them provide more experience that were difficult for them to do that in real experiments due to time constraints and the cost of experiments in the synthesis of certain inorganic compounds.

Figure 5 also showed that none of the students who have predictive skills scales on a scale of 5, 6 and 7, namely the ability scale that shows students can provide precise explanations added to the basic principles of theoretical thinking, focus on context factors with broad considerations. This scale was indeed the highest level in reflective thinking which seems difficult to implement in laboratory activities for 4th semester of preservice chemistry teacher.

Previous research conducted by Seng 2004 also showed a relevant result where the results of measurements of students' reflective ability in practical activities only get the highest score up to a scale of 0.07%, with the condition of the ability to reflect reflectively
on scales 1, 2 and 3. In conclusion, Seng suggested that research be conducted in the formulation of a strategy and program that could help improve students' reflective thinking skills which could be a link between improving the ability to experiment with reflective thinking.

The VCL development in this study provides answers to this, where students' reflective thinking skills are not dominant at all on a scale of 1 and are more dominant on a scale of 2, 3 and 4, in VCL classes are continued with real experiments where VCL becomes a prediction skills stimulant that can help students predict the results of experimental activities through an analysis of experimental experiences when related to the concept of science.

This study also showed that VCL as pre-lab experiences was able to stimulate students' abilities to the level of quasi reflective as shown in Figure 6.

This level of student reflective thinking will generally showed the level of students' reflective thinking skills in each class, after conducting an experimental activity of synthesizing inorganic compounds. Levels 1-3 are categorized as pre-reflective levels, level 4-5 which are included in the level of quasi reflective level and level 6-7 which are included in the reflective level. The findings of this study indicate that the pre-reflective level of the students was still dominant, if viewed from the indicator of predictive skills, the level of reflective thinking in the class that implements VCL tends to be better followed by real experiments, and the lack of students who have reflective level skills. It means, pre-lab experiences continuously was needed.

In this study, we analysed more deeply about the accuracy and precision of students in making predictions, and how they making decision with bridging concept with experiment, reflectively. The results were obtained in this research as shown in Table 2.
Table 2. Percentage of Students Accuracy and Precision Ability in Prediction

<table>
<thead>
<tr>
<th></th>
<th>VCL</th>
<th>RE</th>
<th>VCL+ RE</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>Acc</td>
<td>Pres</td>
<td>Acc</td>
</tr>
<tr>
<td>1</td>
<td>0,0</td>
<td>0,0</td>
<td>10,8</td>
</tr>
<tr>
<td>2</td>
<td>52,4</td>
<td>67,9</td>
<td>63,4</td>
</tr>
<tr>
<td>3</td>
<td>21,4</td>
<td>21,4</td>
<td>12,9</td>
</tr>
<tr>
<td>4</td>
<td>22,6</td>
<td>10,7</td>
<td>12,9</td>
</tr>
<tr>
<td>5</td>
<td>3,6</td>
<td>0,0</td>
<td>0,0</td>
</tr>
<tr>
<td>6</td>
<td>0,0</td>
<td>0,0</td>
<td>0,0</td>
</tr>
<tr>
<td>7</td>
<td>0,0</td>
<td>0,0</td>
<td>0,0</td>
</tr>
</tbody>
</table>

The table above shows that the pre-lab experience by VCL provides support to students in terms of accuracy better than precision in predicting. The accuracy of students is better, but they still have difficulties in terms of precision. This research showed that VCL should not be designed only with the intention to replace the role of real experiment, but it was an effort so that students can prepare knowledge, develop skills, alignment and adjustment with real experimental equipment - so they can have great added value as an experiment for experimentation. the real, or when the equipment is rare, dangerous or expensive. VCL also offers simultaneous access to all classes and can be repeated as often as desired without worrying about costs and running out of material (Singh, Sampath, & Sivaswamy, 2009).

The position of Virtual Chemistry Laboratory is unsubstitutable, in the sense that it does not replace real experiments. It can work as a demonstration and students experiment, or experiment in what works in cyberspace that provides motivation, information about the object under study, information about the truth of the contents of the learning, tasks that contain problems to be solved, so that experimental activities can be improved and they can improve various functions in the cognition process, determining the single phase of observation focused on finding basic features observed by objects or systems, working outside the cognitive process, including experiments in chemistry, which are understood as a form of modeling, analyzing experiments as cognition methods, especially in terms of their functions in the cognition process, and contains practical activities in carrying out experiments on problem solving instruction (Bílek & Skalická, 2010).

Real experiments should not be for any reason removed from school laboratory practices (Bílek and Skalická 2010) because they shape and improve hands-on skills (measuring by laboratories available instruments, working with laboratory systems, daily use, working with safe and others). A large part of natural science education, can not be replaced completely by practicing through monitors and keyboards. On the other hand, hands-on skills cannot replace direct observation and work with models and instruments.

This VCL of course still needs further development to improve the quality for learning. We have to develop the appearance of concepts that require more micro-scale animation, the addition of simple synthesis experimental content that can train students’ broader reflective thinking skills, the addition of student practice questions, and the simulation of the addition of tools and materials that can affect the synthesis results and impact on depth of student mastery of prediction skills.
4 Conclusions

The research conclusions were VCL which are designed with manipulative experiment design in MER way, could help students experience of reflective thinking process to stimulate prediction skills with carefully constructed the content structure in accordance with students’ abilities and needs. The implementation of VCL which was continued with real experiment was very helpful to stimulate students’ prediction skills. However, this skill can only increase on a scale of 1 to 2, with levels that have not reached reflective. Students are also better at accuracy than precision in predicting experimental results.

References

Thinking.


Study of Ethnoscience for Making Dodol Kentang (Potatoes jam) as a Learning Media

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Abstract. Kerinci has fertile land for seasonal crops such as potatoeses (Solanum tuberosum L.). One of the varieties of potatoes that is widely consumed and utilized by the local community is the Granola variety, because it is easy to grow and has a soft texture. Not only used as vegetables, local people also use this as one of ingredients to make Dodol Kentang (Potatoes jam) as snacks. The process of making Dodol Kentang (Potatoes jam) is used as a learning media for biology by reconstructing indigenous knowledge (indigenous science) into knowledge of scientific reconstruction (scientific knowledge). The study was conducted with a qualitative based ethnoscience in the village of Lubuk Nagodang, Siulak, Kerinci district, Jambi Province. There are three stages in conducting the study, namely observation, interviews and documentation. The reconstruction process focused on community activities in making dodol kentang (Potatoes jam) and was associated with applied biology. The results showed that making dodol kentang (Potatoes jam) is still traditional and hereditary, the use of abundant natural resources of potatoeses is processed into snacks as a snack with various flavors such as pandan flavor, strawberry flavor, pineapple flavor, palm sugar flavor, red bean flavor, taste durian and purple sweet potatoes flavor.

Keywords: Ethnoscience, Dodol Kentang (Potatoes jam), Learning Media.

1 Introduction

Education plays a very important role in improving human resources. In the process of improving education, a learning process that supports it is also needed. Instructional models in applied biology is inquiry model. Inquiri means of learning activities that involve maximally all students abilities to search and investigate systematically, critically, logically, and analytically, so that they are confidence in formulating their own findings (Gulo, 2004). Inquiry model in biology has been developed and used for all of students, students learn content, processes with a scientific approach and the mentoring process carried out by lecturers / teachers towards students during the studying. Good lecturers / teachers must be able to teach how to learn, how to remember, how to think, and how to motivate themselves.

Applied biology made students are expected to be able to understand the environment and further development in daily life. Giving direct experience can be obtained from inquiry / investigation or experiment as part of scientific performance based on scientific attitude. The learning process is a factor that can influence students to reach the skills demanded for the future. Ideal learning if the lecturer is able to develop his learning plan with activities that challenge students to practice critical thinking, be able to solve problems, collaborate with
Learning of applied biology concept can be done by showing its application to phenomena in daily life such as making Dodol Kentang (potatoes jam). In this case, students are still not used to applying material that has been received with direct practice in daily life, because it is necessary to teach learning using environmental and cultural concepts as learning resources. Learning that uses cultural concepts as learning resources and learning media can improve students' ability to use science/biology knowledge.

The scientific approach suggested in education of Indonesia today is ethnics, namely indigenous knowledge in the form of language, customs and culture, morals, as technologies created by certain people or people containing scientific knowledge (Sudarmin, 2015). This approach is a strategy for creating a learning environment for ethnics and learning planning that integrates culture as part of the science/biology learning process. The application of science teaching and learning with an ethnoscience approach requires the ability of lecturers/teachers to combine original knowledge with scientific knowledge (Sarfiyo & Pannen 2015).

The word ethnoscience (ethnoscience) derives from the word ethnos (Greek) which means nation, and scientia (Latin) means knowledge. Therefore ethnoscience is the knowledge possessed by a nation or more precisely a particular ethnic group or social group as a typical system of knowledge and cognition of a given culture. The main objective is the emphasis on the system or device of knowledge which is a unique knowledge of a society because it is different from other communities (Parmin, 2017).

An important factor that influences education in creating meaningful learning is by reconstructing the knowledge of previous students. In daily life students always interact in the environment and regional culture, it can increase the potential of students' understanding of learning, especially biology learning which is developed from the perspective of local culture and organized local wisdom related to certain natural events (Ethnoscience).

In addition, through ethnic/cultural based learning, students will make observations on making dodol kentang (Potatoes jam) directly so that students can identify scientific questions, explain phenomena scientifically and draw conclusions regarding changes that occur in applied biology events and apply changes that occur through making dodol kentang (Potatoes jam).

Direct student involvement in making dodol kentang (Potatoes jam) provides a direct experience of the process of making dodol kentang (potatoes jam) which is an application of the applied biology. The active involvement of students in the learning process will bring out the values instilled through life experiences to the environment. So that lecturers not only submit applied biology theory but also can transfer the values obtained from the learning activities that have been done. Learning done outside of observation can train students to find their own concepts that are related to existing concepts. This will help students to improve students' abilities in terms of content, context and student science competencies or students' scientific literacy skills and train students to think critically about the observed phenomena.

Another supporting element in the learning process is the use of learning media. The media is the delivery of messages from the sender to the recipient of the message, thus the media is a vehicle for channeling learning information or channeling messages (Rusman, 2013).

The National Education Association (NEA) states that media are both printed and audiovisual forms of communication and equipment. The media should be manipulated, can be seen, heard and read (Arief Sadiman, et al, 2012).
Learning media is used as a means of learning in schools aimed at improving the quality of education. Media is a means that can be used as an intermediary that is useful to improve effectiveness and efficiency in achieving goals (Rusman, et al, 2013).

Levie and Lentz put forward four functions of learning media, especially visual media, namely:

a. The function of visual media attention is the core, which is to make students concentrate and attract to the lesson.

b. The affective function of visual media can be seen from the students’ enjoyment when learning (or reading) the pictorial text.

c. The cognitive function of visual media can be seen from research findings which reveal that visual symbols or images facilitate the achievement of goals to understand and remember or the messages contained in the images.

d. Compensatory function of learning media can be seen from the results of research that visual media that provides context to understand the text helps students who are weak in reading to organize information in the text and recall it (Arsyad, 2013).

Learning is done by observing phenomena in social life and reconstructing it as scientific science, one of which has been carried out in Kerinci, Jambi Province. Kerinci district not only presents beautiful natural scenery and mountains but also has fertile land for planting various kinds of plants (Wiseza, 2016). One of the plants that is used is potato (Solanum tuberosum L) which is called "kubic" in the local language. Potatoes are recognized by people as staple foods abroad. This is because potatoes contain carbohydrates. In Indonesia, potatoes are still considered a luxury vegetable. However, potatoes are good food and very nutritious (Sunarjoyo, 2015). Potatoes also contain a number of vitamin A, B-complex, C, to folic acid and contain minerals, proteins, carbohydrates and polyphenols.

The surrounding community has used this potato to be a productive process besides being consumed in everyday life (Apdelmi, 2018). The amount of potatoes that many have used by the community as snacks and souvenirs for outsiders and tourists who come to see the process of making dodol kentang (Potatoes jam). The selected potato is granola variety which has a soft texture. Actually dodol kentang (Potatoes jam) is not a typical kerinci food, but with empowerment carried out by the regional government through the dodol kentang (Potatoes jam) industry service it became a special food of Kerinci district in the late 1990s.

The process of making dodol kentang (Potatoes jam) without them knowing it can be studied with science called ethnoscience. The process of ethnoscience is an effort to reconstruct indigenous knowledge (indigeneous science) into knowledge of scientific reconstruction (scientific knowledge). The process of making dodol kentang (Potatoes jam) is related to the biological science that underlies the process of making dodol kentang (Potatoes jam), which is the subject of applied biology.

Learning science that pays attention to the wisdom of local culture as national identity, the character and customs of local culture in the era of learning ethniically related. Ethnographic learning is very important in Indonesia because Indonesia consists of various ethnic groups and various cultures that must be preserved (Sudarmin, 2015). For this reason there must be a special study that can document and identify ethnics activities in the process of making dodol kentang (Potatoes jam) in motivating and increasing knowledge of inquiry students in the subject of applied biology.
2 Material And Methods

The study was conducted with a qualitative based ethnoscience in the village of Lubuk Nagodang, Siulak, Kerinci district, Jambi Province. There are three stages in conducting the study, namely observation, interviews and documentation. The reconstruction process is focused on community activities in making dodol potatoes and is associated with applied biology. Data retrieval includes primary data collected through observation and interview techniques while secondary data with literature and document studies. To ensure the level of trust in data is carried out in several ways, it is necessary to conduct intensive observations, data triangulation and methods and prepare references. Qualitative analysis is done by describing people's knowledge about making dodol kentang (Potatoes jam) in daily life and in community life. (Parmin, 2017).

The study have started with observation, interviews and documentation. The reconstruction process focused on community activities in making dodol kentang (Potatoes jam) and was associated with biology applied. Data retrieval includes primary data collected through observation and interview techniques while secondary data with literature and document studies. To ensure the level of trust in the data is done in several ways, namely conducting intensive observation, data triangulation and methods and preparing references. Qualitative analysis is done by describing people's knowledge about making dodol kentang (Potatoes jam) in daily life and in community life.

3 Results And Discussion

Based on the results of observations and interviews with the community in the village of Lubuk Naggodang obtained information that making dodol kentang (Potatoes jam) is still done traditionally and for generations, the utilization of natural resources of potatoes is abundantly processed into snacks as a snack with various flavors such as pandan flavor, strawberry flavor, the taste of palm sugar, red bean flavor, durian flavor to purple sweet potato flavor.

Learning that is done by observation aims to invite students to recognize objects, symptoms and problems, examine these problems and then find conclusions on the concept of making dodol kentang (Potatoes jam) they learned. The conceptualization and understanding obtained by students is not directly from the lecturer but is obtained from the surrounding community. By exploring and observing the environment, students will interact with facts in the environment so that they find experience and something that raises questions and problems (Hadi & Ahid, 2017). The environment referred to is not only the physical environment, but also includes the social, cultural and technological environment.

Observation activities encourage students to actively explore the surrounding environment as a learning medium to achieve cognitive, affective and psychomotor skills. which causes students to have mastery of knowledge and skills in mastery of work, mastery of addressing and mastery of society, so that the use of the environment as a learning medium is very supportive in studying biology, especially applied biology.
Table 1. Results of Community Knowledge Reconciliation into Scientific Knowledge

<table>
<thead>
<tr>
<th>No</th>
<th>Question</th>
<th>Community Knowledge</th>
<th>Scientific Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>What is potato?</td>
<td>Potatoes are a type of vegetable commonly consumed with rice, local people said “kubik”.</td>
<td>Potatoes (<em>Solanum tuberosum L.</em>) are plants from the Solanaceae tribe which have edible stem tubers called “potatoes”. Science concept: various kinds of plants</td>
</tr>
<tr>
<td>2</td>
<td>What are the potatoes used in daily life?</td>
<td>Potatoes are used as vegetables, food mixes and appetite enhancers</td>
<td>Utilization of potatoes because of the carbohydrate content of 20% is mixed in vegetables, as a snack and staple food instead of rice, especially for diabetics. Science concept: nutrient content in potatoes</td>
</tr>
<tr>
<td>3</td>
<td>What are the kind of potatoes?</td>
<td><em>Granola</em> and <em>Cipanas</em> potatoes, have yellow skin and white flesh, there are also red potatoes.</td>
<td>Potatoes can be classified according to the color of the tuber, namely yellow potatoes, white potatoes, and red potatoes. White skinned and white fleshy potatoes. Varieties including white potatoes are <em>Granola</em>, <em>Donata</em>, <em>Radosa</em>, and <em>Sebago</em>. Other potatoes are red potatoes whose skin is red, but the flesh is yellow. Varieties which include red potatoes are <em>Desiree</em>, <em>Arka</em>, and <em>Red pontiac</em>. Science concept: Morphology and Taxonomy of potatoes</td>
</tr>
<tr>
<td>4</td>
<td>What kind of potatoes are used in making dodol kentang (Potatoes jam)?</td>
<td><em>Granola</em> variety</td>
<td>One of potato in Kerinci district used in making dodol kentang is the <em>Granola</em> Potato, because it has yellow-white bulb color, has a soft texture and has a carbohydrate content of up to 20%. Science concept: Useful plants by local people</td>
</tr>
<tr>
<td>5</td>
<td>What are the tools needed for making dodol kentang (Potatoes jam)?</td>
<td>Iron pots, fried spoons, stoves, mold tools, filters, basins, cutting boards and drying racks</td>
<td>The tools used are iron pots, fried spoons, stoves, mold tools, filters, basins, cutting boards and drying racks Science concept: Traditional tools in applied biology</td>
</tr>
<tr>
<td>6</td>
<td>What are the ingredients in making dodol kentang (Potatoes jam)?</td>
<td>Potatoes, coconut, sugar, white glutinous flour, salt, vanilla, etc.</td>
<td>The ingredients include ten kilos finely ground boiled potatoes, grated ten grains, two kilos of flour, eight kilos of sugar, flavorings and salt and</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>No</th>
<th>Question</th>
<th>Community Knowledge</th>
<th>Scientific Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>What is the process of making dodol kentang (Potatoes jam)?</td>
<td>The peeled potatoes are then washed, the potatoes are boiled until cooked, after being cooked then the stew is cooled, after a cold the potatoes are ground until smooth, add coconut milk, white glutinous flour, vanilla, sugar and salt until the mixture is well mixed. The thickened dough is lifted from the furnace and poured into the mold, flattened and cooled for the printing and cutting process according to its size. After cold, the pieces of dodol potatoes are dried in the drying rack, after drying the dodol kentang are ready to be packed.</td>
<td><strong>Science concept</strong> : Ingredients in making dodol kentang through several stages, namely: 1. Preparation 2. Boiling 3. Milling 4. Mixing the dough 5. Cooking 6. Printing and cutting 7. Drying 8. Packaging using oil paper</td>
</tr>
<tr>
<td>8</td>
<td>How long does the dodol kentang (Potatoes jam) dry?</td>
<td>Drying dodol potatoes ranges from 2-3 days.</td>
<td>The process of drying potato dodol using sunlight for 2-3 days is able to reduce excess water content in potato composition, if the weather does not support the drying process, it lasts for up to 5 days. <strong>Science concept</strong> : the concept of energy in making dodol kentang</td>
</tr>
<tr>
<td>9</td>
<td>How long does dodol kentang (Potatoes jam) stand after it's packed?</td>
<td>Dodol kentang can last one to three months.</td>
<td>Dodol Kentang (Potatoes jam) that has been packaged and without preservatives can last one to three months. <strong>Science concept</strong> : Material Sterilization without preservatives</td>
</tr>
<tr>
<td>10</td>
<td>What are the flavor variants of dodol kentang (Potatoes jam)?</td>
<td>Pandan flavor, strawberry flavor, pineapple flavor, palm sugar flavor, red bean flavor, taste durian to purple sweet potatoes flavor</td>
<td>Pandan flavor, strawberry flavor, pineapple flavor, palm sugar flavor, red bean flavor, taste durian to purple sweet potatoes flavor <strong>Science concept</strong> : Natural food coloring</td>
</tr>
</tbody>
</table>
Table 2. The Relationship Between the Process of Making Dodol Kentang (Potatoes jam) and the Basic Competencies of Biology Student Inquiry

<table>
<thead>
<tr>
<th>No</th>
<th>Competency standards</th>
<th>The Concept of Science in the Making Process Dodol Kentang (Potatoes jam)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Describe the kind of potato used in making dodol kentang (Potatoes jam)</td>
<td>There are several types of potatoes that can be used in making dodol kentang, one of which is potato Granola is one type of potato that is widely found in Kerinci, has a yellow-white tuber meat color, has a soft texture and has a carbohydrate content of up to 20%</td>
</tr>
<tr>
<td>2</td>
<td>Explain the concept of applied biology in making dodol kentang (Potatoes jam)</td>
<td>The concept of biology applied for making dodol kentang is conventional method from preparation to packaging process in making dodol kentang (Potatoes jam).</td>
</tr>
<tr>
<td>3</td>
<td>Analyze flavors in making dodol kentang (Potatoes jam)</td>
<td>Flavor variants in making dodol kentang use food coloring that is safe to consume, namely pandan flavor, strawberry flavor, pineapple flavor, palm sugar flavor, red bean flavor, durian flavor and purple sweet potato flavor.</td>
</tr>
</tbody>
</table>

4 Conclusions

The result concluded: Community knowledge with existing scientific concepts is expected as source of learning media for students in exploring and motivating inquiry knowledge in applied biology. Conceptualization and understanding obtained by students through field observations in making dodol kentang (Potatoes jam) improved students active in exploring their skills. Lecturers are expected to be able to correlate between community knowledge with existing scientific / biological concepts, so that the learning process is more active, creative and meaningful. Suggestions for further research are to explore the existing traditions and culture in Kerinci district to be constructed into scientific knowledge and utilized in the learning process.

References

Etnomathematics: A Flat-Build Application of a Quadrilateral in Masjid Agung Pondok Tinggi Kota Sungai Penuh

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Abstract. Mathematics and culture are interrelated to each other, which are found in everyday life. Various mathematical concepts can be explored and found in culture. Mathematical concepts can be seen in cultural products in the form of artifacts such as the Masjid Agung Pondok Tinggi. The Masjid Agung Pondok Tinggi can be a source of learning mathematics, because there are concrete mathematical concepts that are immediately seen by students. The purpose of this research is to explore what concepts exist in the building of Masjid Agung Pondok Tinggi which can be used as a source of learning mathematics and as an effort to develop Etnomathematics in mathematics learning. The Data is collected through exploration, observation, documentation, and literature studies. The results of the study found that in the construction of the Masjid Agung Pondok Tinggi had used mathematical concepts, even though the people in the past did not know how the concept of construction of buildings such as angles, symmetries, rectangles. Construction of the Masjid Agung Pondok Tinggi implements one of the mathematical sciences, namely geometry, one of the concept of a rectangle which includes a square, rectangle, and trapezium. Learning concrete ethnographic objects can facilitate students to understand abstract mathematics.

Keywords: Etnomathematics, Build Flat Square, Masjid Agung

1 Introduction

Education and culture is something that cannot be avoided in daily life because both of them applies in society, and education is important in society. Culture is a system of values and ideas that are lived by a group of people in a particular environment and in a certain period. Culture is defined as all things related to culture. Culture is having three aspects, namely, first, a universal culture that is related to universal values that apply anywhere that develops in line with the development of people's lives and science or technology. Second, national culture, namely the values that prevail in Indonesian. Third, local culture that exists in the lives of local people (Hadi, 2013).

Education and culture have a very important role in fostering and developing the noble values of our nation, which have an impact on character building based on noble cultural values. As in the Qur'an in the letter Jonah verse 101 mentioned:
Meaning: "Say, pay attention to what is in heaven and on earth" (Q.S Yunus: 101)

In Qur'an guides human beings to always pay attention and study the natural surroundings, because can learn and acquire knowledge. The understanding of values in mathematics, teachers has not touched all possible aspects. Once it's not wrong, both are true and in accordance with the growth of mathematics.

The purpose of studying mathematics is not only to equip students with conceptual mathematics but to prepare students to be able to solve problems of reasoning and problem solving. In connection with the purpose of learning mathematics, in teaching must be able to construct students' knowledge. Problem Based Learning (PBL) is a recommended approach to be used in improving life skills in the 21st century. Because PBL uses a constructive approach, students are able to think critically in solving mathematical problems, students can master the concepts of matter. Teaching mathematics for each person should be adapted to their culture (D'Ambrosio, 2006).

Astri Wahyuni, et al (2013: 2) said that related between culture and mathematics education isethnomatematics. Ethnomatematics consists of two words, ethno (ethnic / cultural) and mathematics. That means that ethnomatematics is mathematics in culture.

Rosa, Milton et al (2016: 2)reviewmathematics presents the way various cultural groups do their own mathematical reality because it examines how both mathematical ideas and mathematical practices are processed and used in daily activities. Teaching mathematics through cultural relevance and personal experience helps students to learn more about reality, culture, society, environmental problems and themselves by providing real content and mathematical approaches that enable them to master mathematics.

Every culture and sub-culture develops mathematics in their own way. So that mathematics is seen as the result of human reason or mind in the daily activities of society. This concludes that mathematics is a cultural product which is the result of abstraction of the human mind, as well as a problem solving tool. As expressed by Semiring that mathematics is the construction of human culture (Prabowo and Pramono, 2010).

Relation to Create both culture of mathematics is an important step to recognize various ways of thinking that can lead to various forms of mathematics; This is the field called ethnomatematics. This can mean various mathematical concepts can be explored and found in culture, so it can clarify that mathematics and culture are interrelated, mathematics can be born from culture, mathematics can be excavated in culture so that it can be used as one of the concrete and surrounding sources of mathematics learning.

Ethnomatematics can provide enrichment for the development of new topics that have never been seen by students before, the bias to show students the application of mathematics can be found not only in the fields of science, business, and daily life but students can also see the practice of mathematics cultured throughout the world.

Ethnomatematics objects contain mathematical concepts in a particular society. Ethnomatematic objects can application by traditional games, traditional crafts, artifacts, and activities (actions). The object of ethnomatematics study is obtained in two ways, namely: (1) Investigating the mathematical activities that exist in certain groups, (2). Express the mathematical concepts contained in these activities.

Cultural products in the form of artifacts such as building architecture, carved furniture, songket which originally had a motif or ornament that has been standardized were given the
opportunity to be developed through mathematical creative thinking. One of the artifacts in the form of a historic building in Kota Sungai Penuh (Kerinci) is Masjid Agung Pondok Tinggi, one of the oldest mosques in the Kerincidistrict, Sungai Penuh in Jambi Province. The mosque, built in 1874, is a real witness of the spread of Islam.

The location of Masjid Agung Pondok-Pondok Tinggi in RT 02 Desa Pondok Tinggi, Sungai Penuh. The architecture of the Masjid Agung Pondok Tinggi was built following the architectural model of the original archipelago mosque with the characteristics of three tumpeng pyramid roofs, the upper part decorated with crescent and star emblems. In building of Masjid Agung Pondok, people have used mathematical concepts, even though people in the past did not know the construction of buildings such as angles, symmetries, rectangles. But they can build magnificent and resistant buildings lama.

The uniqueness of Masjid Agung Pondok Tinggi is having a tower inside building. Inside the mosque there is a place for the muazin to azan. It has a design that is typical of ancient Indonesian mosques, with classical architecture and also various carvings of various motifs. The entire construction of the Masjid Agung does not use nails or iron. Masjid Agung walls made of wood are also installed with a pipe in such a way that it is shock resistant.

![Fig. 1. Masjid Agung Pondok Tinggi](image)

Based on the above description of the relationship between mathematics and culture and cultural potential in the approach to mathematics learning, the research aimed to exploring ethnomathematics in Masjid Agung Pondok Tinggi.

2 Research Methods

This study uses explorative research with an ethnographic approach at Masjid Agung Pondok Tinggi. The study was conducted in four stages, namely exploration, observation, documentation, and literature study. Exploration, observation and documentation were carried out to find the shape of a quadrilateral flat in Masjid Agung Pondok Tinggi. While the literature study was carried out to analyze the concept of quadrilateral flat at Masjid Agung Pondok Tinggi. To ensure the level of trust in the data is done in several ways, namely conducting intensive observation, data triangulation and methods and preparing references.
3 Results And Discussion

The concept of mathematics as a result of the activity of designing buildings, measuring, making patterns, and counting can be revealed from the making of the mosque. Mathematical concepts in development, even though the people of Sungai Penuh in the past did not know the basic material of building construction in formal education (such as the concept of angles, symmetries, rectangles, and other geometrical concepts).

Construction of the Masjid Agung Pondok Tinggi has implemented one of the mathematical sciences, namely geometry in the construction of building parts, one of which is a rectangular flat, covering a square, rectangle, trapezium, and rhombus. The space-building model includes the cube, the mathematical model includes symmetrical properties. In this study, researchers only examined the rectangular flat construction.

Based on the results of exploration, observation and documentation, the Masjid Agung Pondok Tinggi has several rectangular shapes. In this discussion presented a rectangular flat shape in the Masjid Agung Pondok Tinggi, and a mathematical concept that explains these forms.

Masjid Agung Pondok Tinggi measuring is 30 x 30 meters with a height of 3.5 meters. The mosque is equipped with 2 entrances. Mihrab mosque is square. Supported by 36 supporting poles. The 36 pillars were divided into 3 groups of poles, namely tiang panjang Sembilan (tiang tuo), tiang panjang limau (panjang lima), dan tiang panjang dua (tiang panjang dua).

The columns are arranged according to their size, composition, and location. Tiang panjang Sembilan (tiang tuo), as many as four pieces arranged to form a rectangle located in the inner room. The pole was given gold nails to refuse reinforcements and at the top was given a red and white cloth as a symbol of glory. Tiang panjang limau (panjang lima) as many as 8 pieces arranged to form a rectangle and these poles are located in the middle room. Meanwhile, 24 lengths of tiang panjang dua (tiang panjang dua) were arranged to form a rectangle and located in the outer room. The building of the Masjid Agung Pondok Tinggi consists of wooden structures.

![Fig. 2. The pillars of the buffer of the Masjid Agung Pondok Tinggi.](image)

A. Types of Build Flat

The square used in the Masjid Agung Pondok Tinggi, and relation of 2-dimentional figure Concept

1. ROOF OF MASJID AGUNG

This Masjid Agung of high hut is roofed with three layers which are increasingly upward and pointed in a pyramid shape, in the high hut language "Bapucouk Satau, Barampek Jure, Batingkat Tigea" which symbolizes the government structure of Pondok Tinggi. Based on the
results of interviews with the traditional leaders of the Bapucouk Satau high cottage, it means kepala adat yaitu Depati Payung nan Sakaki, Satu Kepala Syarak and symbol Allah. Keatas satu pucuk kebawah satu urat. Barampek Jure means empat luhah (lurah), empat Rio (ninik mamak), empat pegawai, and Bapingkat Tigea (bertingkat tiga) means sko nan tiga, sko depati berjenjang naik dan bertanggaturun.

The roof of the Masjid Agung Pondok Tinggi can be modeled geometrically, that is, on a single-storey roof consisting of 4 equilateral triangles, level 2 and 3 trapezoidal

![Fig. 3. Geometry Modeling root of Masjid Agung Pondok Tinggi](image)

Picture above describe that modeling in the form of a flat building that has four sides. The researchers analyzed concept of quadrilateral on the roof of the Masjid Agung Pondok Tinggi

![Fig. 4. Trapezoidal Concept on the Roof of the Grand Mosque of Pondok Tinggi](image)

Based on the analysis in Figure 4, it can be concluded that there is a trapezoidal concept on the roof structure of the mosque. The trapezoidal properties that can be found in roof modeling according to Figure 3 are as follows:

1) $AB \parallel CD$ (a pair of sides)
2) The number of angles adjacent between two parallel sides is $180^\circ$ ($m < A + m < D = 1800; m < B + m < C = 1800$)
2. Wall Of Masjid Agung

On the walls of Masjid Agung Pondok Tinggi have square and rectangular concepts in the construction. The uppermost part of the first row of the walls is composed of several rectangular pieces, the middle (second) section of the wall is square in shape interspersed with floral motifs and the lowest part of the wall is composed of several rectangular pieces.

Fig. 5. Geometry Modeling on the walls of the Pondok Tinggi Grand Mosque

The wall in Figure 5 can be modeled geometrically as in the bottom part of Figure 6. From the figure, describe that modeling of the a flat building that has four sides. Based on this, the researcher further analyzed the concept of quadrilateral on the wall (Figure 6).
Fig. 6. Square Concepts on the walls of the Grand Mosque of Pondok Tinggi

Based on the analysis in Figure 6, it can be concluded that there is a concept of square on the wall. The square properties that can be found in the wall modeling in Figure 2 are as follows:

1) \( AB=BC=CD=AD \)
2) \( m<A=m<B=m<C=m<D=90^\circ \)
3) \( AO=OC=BO=OD \)
4) It has four rotating symmetries and four fold symmetries, so it can occupy its frame in 8 ways

Besides being square, walls of Masjid Agung Pondok Tinggi describe geometrically modeled that concluded a rectangular concept on several walls (Figure 7).

Fig. 7. Geometry Modeling on the walls of the Pondok Tinggi Grand Mosque

Fig. 8. Rectangular Concepts of Masjid Agung Walls

Based on the analysis in Figure 8, it can be concluded that there is a concept of a rectangle on the wall of Masjid Agung. The properties of rectangles that can be found in Masjid Agung wall modeling are as shown in Figure 8, as follows:

1) \( AB=CD;BC=AD \)
2) \( m<A=m<B=m<C=m<D=90^\circ \)
3) \( AO=OC=BO=OD, \) maka \( AC=BD \)
4) Has 2 rotating symmetries and 4 folding symmetries so that they can occupy the frame in 4 ways.

Other parts of Masjid Agung Pondok Tinggi also have a rectangular concept. Some of them are the concept about rectangle on the door of Masjid Agung. The rectangular arrangement found on the mosque door can be seen as shown below:

![Fig. 9. Entrance to the Pondok Tinggi Great Mosque Looks Outside and Inside](image)

B. Utilization of Ethnomatemics at Masjid Agung Pondok Tinggi in Learning

Based on the explanation that has been explained, it can be said that the rectangular flat buildings contained in the construction of Masjid Agung Pondok Tinggi can be used in the learning process carried out by the teacher in the classroom, besides as a medium for learning especially quadrilateral material. Problem Based Learning Approach, by using media that can be directly seen by students can facilitate the understanding of students and provide opportunities for students to express ideas on solving a problem in completing the task given by teacher.

Some rectangular shapes in building construction can be used as media to use principles such as angle, side length, right angle, symmetry and so on. Students can also be asked to identify any geometry built in Masjid Agung Pondok Tinggi.

4 Conclusion

Quadrangular flat building is a flat build model that is limited by 4 segments. The mathematical concept of Masjid Agung Pondok Tinggi consists of square, rectangle and trapezoid. Teachers can utilize flat forms in Masjid Agung Pondok Tinggi as concrete learning resources. Quadrilateral flat shape can be an alternative source of learning mathematics for students. In addition students can obtain knowledge related to geometric concepts, especially in quadrilateral material. Increasing motivation in learning and facilitating students in linking concepts learned with real-world situations.
References


The Ethnobotany Study on the process of Kawa Beverage Processing (Coffea arabica L) in Kerinci District as a Media of Biology Applied Learning

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Abstract. Kawa beverage is a traditional Kerinci drinking who made from dried coffee leaves. Kerinci has the potential of 1,789 hectares of Arabica coffee garden area. The purpose of this study was to reconstruct the original knowledge of the community in the process of processing the kawa beverage into scientific knowledge which was used as a media for biology applied learning. The Location of this research was in Ujung Pasir Village, Lake of Kerinci, Regency of Kerinci, Jambi Province. The method of this research was used phenomenology method with descriptive qualitative approach. The Data were collected by observation, interviews and documentation. The data obtained was analyzed by describing, inventorying, classifying and then constructing original knowledge and scientific knowledge into the concept of biology applied learning. The results of this research showed that the process of processing the beverage was approved out in the traditional way of hereditary knowledge who consisted of drying, burning, packaging, mixing and services. And all of the kawa beverage manufacturers do not use other excitement in mixing which have tastelessness and bitter, the services is done by brewing. The process that has been interpreted into the concept of science can be implemented in the biology applied learning.

Keywords: Ethnobotany, Kawa Beverage (Coffea arabica L), Biology Applied Learning

1 Introduction

The application of biological science will certainly provide many benefits for human life, especially to improve welfare and produce goods or services for the benefit of humans. Many aspects of life can be used as applied biology studies such as aspects of agriculture, animal husbandry, medicine, industry, processing of natural resources, food, and so on. Understanding the community about the surrounding environment about the culture of hereditary knowledge needs to be introduced to the modern generation by applying it in the learning of applied biology.

Understanding of the use of plants in daily needs and ethnic customs for cultural interests is called ethnobotany. Ethnobotany is a multidisciplinary science that studies how interaction between humans and plants (Martin, 2010). Ethnobotany is a multidisciplinary science that studies how interactions between plants and human culture. Not limited to the use of plants for food, clothing and shelter but also includes their use for religious ceremonies, ornaments and health care (Meena and Meena, 2018). Research on ethnics that has been carried out about the
salt production process which is the knowledge gained by the students can be analyzed from scientific concepts so that it can be a source of learning for students (Hadi and Ahied, 2017). Related to the research the benefits and usefulness of traditional herbal medicine concluded that many community science knowledge that can be transformed into scientific science and science learning resources for students (Sudarmi n and Asyhar, 2012). In Kerinci is one area that is rich in culture, especially in the use of plants as daily necessities such as processing of coffee leaves into kawa beverage.

Kerinci Regency is an area located along the hill line and is in the most Western position of Jambi Province with an area of 420,000 Ha. Knowledge of laughing drinks in Kerinci is a nation's cultural heritage based on experiences that have been handed down from generation to generation. Kawa beverage (Coffea arabica L.) is a traditionally processed beverage in Kerinci which is made from dried coffee leaf prunings. As we know, Kerinci has the potential of 1,789 hectares of Arabica coffee planting area spread in Kerinci Regency Jambi Province. One of the Kerinci people who believe in kawa drinks is the Ujung Pasir Village, Lake of Kerinci, Regency of Kerinci, Jambi Province. People in this area are more likely to use traditional drinks than modern drinks. It is believed that traditional drinks are more beneficial than modern drinks because they can provide vitality for the body. Community belief in the efficacy of kawa beverage is considered because of the presence of caffeine compounds which have efficacy as a central nervous system stimulant, because there are 0.17% caffeine of dried kawa leaves (Rasyid, Sanjaya and Zulharmita 2013). Positive coffee leaves contain caffeine by giving violet red color with Murexid reagent. The choice of this traditional drink is due to the temporary nature of the drink so that a person's dependence on the chemical content of the drink. In addition, the costs used by the community for traditional drinks are relatively cheaper compared to modern drinks so that many people switch to traditional drinks. Nearly 60% of the Ujung Pasir community still consumes kawa beverage. This culture still continues to this day. This knowledge will gradually disappear along with the development of modern technology. One of the factors causing the extinction of public knowledge about kawa beverage is the lack of interest in the older generation to express this knowledge in written form, while the younger generation today, especially those who have integrated with modern life, rarely care about the knowledge possessed by their people. Research conducted at Ujung Pasir only saw the tradition of kawa beverage as a reinforcement and an adhesive of kinship in communication facilities (Bahar, Defrianti and Fatonah, 2017).

The traditional process of making kawa beverage at Ujung Pasir, without realizing it, can actually be studied in relation to the science referred to as ethnobotany. Ethnobotany is an attempt to reconstruct people's original knowledge into scientific knowledge. The processing kawa beverage must be learned from the natural sciences that underlie the processing process, namely the study of biology and chemistry. For this reason, there must be a special study that can document and identify ethnobotany activities in the processing of kawa beverage so that it is expected to improve the ability of the kawa beverage processing. In addition, the results of the documentation and identification of ethnobotany activities can be a source of learning in applied biology.

The purpose of this research is to reconstruct the original knowledge of the community in the process of processing the kawa beverage into scientific knowledge which is used as a medium for learning applied biology. The processing of kawa beverage is expected to be a source of contextual learning for students. In addition, it is expected that incorporating local wisdom into applied biology learning can spur students to strive to become movers in an effort to improve the welfare of the surrounding community.
2 Material And Methods

This research was conducted at Ujung Pasir in Lake Kerinci Subdistrict, Kerinci Regency, Jambi Province in 2018. The method used in this research is Phenomenology method with descriptive qualitative approach (Cresswel, 2018). Taking primary data collected through observation and interview techniques while secondary data with literature and document studies (Rusdi, 2018). The reconstruction process is focused on community activities in the manufacture of kawa beverage and is associated with applied biology. The data obtained in the analysis by describing, inventorying, classifying and then constructing original knowledge and scientific knowledge in the processing of kawa beverage into the concept of applied biology learning.

3 Results And Discussion

Based on the results of observations and interviews with the community in Ujung Pasir, it was obtained information that the processing of kawa beverage was still done traditionally from hereditary knowledge, then the reconstruct the original knowledge of the community in the process of processing the kawa beverage into scientific knowledge.

The paradigm of science education that considers ethnobotany as national identity and local cultural customs as a vehicle for science learning is being developed in several studies. Learning with ethnobotany is based on the recognition of community culture as part of local wisdom that needs to be applied. In developing countries applied ethnobotany is very much needed because of the interaction or close relationship between local communities and plants (Hamilton, 2003). Ethnobotany approach is a study of knowledge systems that study the relationship between human culture and the surrounding plant environment (Meita and Pande, 2013).

It is important to reconstruct people's original knowledge into scientific knowledge because indigenous knowledge is not yet scientifically conceptualized and textually and contextually formalized (Sudarmin, 2014). activities kawa beverage processing carried out by the community in Ujung Pasir, Kecamatan Danau Kerinci, Kerinci Regency have applied indigenous science knowledge, but have not been elaborated and conceptualized in scientific science. This research has reconstructed the original knowledge that already existed in the processing of kawa beverage into scientific knowledge. The results of ethnobotany reconstruction of kawa beverage processing in this study can contribute to enriching the science of biology and chemistry, so that there will be a tangible relationship between theory and facts in the field and can be used as a learning media for applied biology.
Table 1. Results of reconstruct the original knowledge into Scientific Knowledge

<table>
<thead>
<tr>
<th>No.</th>
<th>Question</th>
<th>Original Knowledge</th>
<th>Scientific Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>What is Kawa?</td>
<td>Kawa is a complement drink called Ujung Pasir Kerinci &quot;aye kawo&quot;</td>
<td>Kawa (<em>Coffea arabica L</em>) is a drink of coffee leaf pruning from the Family Rubiaceae with taxon levels:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Kingdom: Plantae</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Division: Magnoliophyta</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sub Division: Spermatophyta</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Class: Magnoliopsida</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sub Class: Asterida</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Order: Rubiales</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Family: Rubiaceae</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Genus: Coffea</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Species: Coffea arabica L.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>With a collection of chemical compounds whose main part is caffeine which can be made into a drink.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Science Concept:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Compounds and taxonomies</td>
</tr>
<tr>
<td>2</td>
<td>What is the motivation for</td>
<td>Maintain traditions, establish friendship, recitation, information, cohesiveness,</td>
<td>The motivation for processing kawa beverage is classified into six categories, namely (a) preserving</td>
</tr>
<tr>
<td></td>
<td>processing kawa beverage?</td>
<td>friendship, and can give your body the spirit and freshness.</td>
<td>the tradition of traditional drinks, (b) establishing friendship, (c) being a means of communication, (d) a means of bonding kinship and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>friendship, and (e) giving body spirit and vitality.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Science Concept:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Energy and Vitality</td>
</tr>
<tr>
<td>3</td>
<td>What are the benefits and side</td>
<td>Kawa drinks provide freshness and a variety of health for the body such as eliminating</td>
<td>Dry coffee leaves contain less caffeine than tea and coffee, coffee leaves contain many antioxidants, and anti-inflammatory substances.</td>
</tr>
<tr>
<td></td>
<td>effects felt from kawa beverage?</td>
<td>side effects during consuming kawa beverage.</td>
<td>Coffee leaves have efficacy as a central nervous system stimulant, because in dry coffee leaves there is 0.17% caffeine. Due to the low</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>caffeine content, it does not give side effects to health.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Science Concept:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Its compounds and functions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Science Concept:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Local wisdom</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The types of coffee are Robusta</td>
</tr>
<tr>
<td>4</td>
<td>Where do you get the knowledge</td>
<td>Derived from hereditary ancestors, parents, and fellow drink kawa drinkers.</td>
<td>Heritage knowledge, conventional, local wisdom, unformalized, and underdeveloped like scientific science.</td>
</tr>
<tr>
<td></td>
<td>of making kawa beverage?</td>
<td></td>
<td><strong>Science Concept:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Local wisdom</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The types of coffee are Robusta</td>
</tr>
</tbody>
</table>
6. What is the raw material for kawa beverage?

Coffee leaves obtained from the garden.

(Coffea canephora var. Robusta) has thin serrated leaves, Arabica (Coffea arabica L) has fragrant leaves that are concentrated green and not jagged, Liberica (Coffea liberica) has thick leaves with a rough texture, and Excelsa (Coffea excelsa) has smooth, thin and small leaves. In Kerinci there is coffee type arabica.

Science Concept: Plant Classification

7. What is the kawa beverage equipment?

Clasps (from split bamboo at the ends), firewood, shelves, plastic, plastic bags, spoons, pans / kettles and plastic bowls.

The types of plants found in Kerinci which can be useful as drinks are tubers (uber), roots (radix), stems (ligna), leaves (folia), flowers (fructus), seeds (cement), plants (herbs), and so on. Examples of each type of kawa beverage are mentioned by the respondent.

Science Concept: Plant structure

8. How is it the process of processing the kawa beverage?

Pure / fresh coffee leaves which are pruned from the garden are prepared and arranged in clasps made of bamboo which are divided at the edges, as much as 4 handheld, leaf compilation starting from the younger ones at the ends of clasps, then placing them on a shelf that is 1.5 m away from the fire source (kitchen) for 6 days for drying. After that, it is burned / accommodated by holding the in clasps directly to the source of the fire that uses firewood from various types such as mambu wood, cinnamon wood and others by going back and forth for 20 minutes until it is black and dry / crispy, then remove it from the clamp / clamp then smash it and put it

The stage of processing the kawa beverage consists of:

(a) Drying / withering stage
Fresh coffee leaves that have been selected and separated from the old and young, the preparation of leaves from the younger ones on the clamp as much as 3 kg then dried using fumigation from a fire source in the kitchen placed on a shelf with a distance of 1.5 m from the source of the fire so as not to get too close and exposed to smoke which is carried out for 6 days. Separation of the old and young leaves on the tongs is done because the leaves are easily flammable and dry so they are easily controlled in the
<table>
<thead>
<tr>
<th>No.</th>
<th>Question</th>
<th>Original Knowledge</th>
<th>Scientific Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>in a plastic bag for temporary storage</td>
<td>This fumigation is done to produce dry / wilted coffee leaves.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(b) Burning Stage</td>
<td>The withered coffee leaves are burned by holding the tongs directly to the source with a adjusting distance for 20 minutes. This combustion is done to change the structure of the leaves until they turn black and dry / crisp. This combustion will eliminate the germs and bacteria in the leaves.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(c) Packaging stage</td>
<td>Kawa leaves are already dry / crispy then crushed and put into a plastic bag for temporary storage. This packaging is done to maintain quality and not contaminated.</td>
</tr>
<tr>
<td>9.</td>
<td>How is the process of mixing and serving kawa beverage?</td>
<td>By inserting dried / shredded kawa leaves into plastic panci as much as 1/2 of the panci then pour hot / boiling water until full and back and forth using a plastic bowl until evenly mixed and stirred. served directly from the panci using a bowl / glass / cup of coconut shell</td>
<td>The stage of processing the kawa beverage consists of:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>a. Mixing stage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dry leaves are put into a panci as much (30-50gr / Liter) then poured into a plastic bowl repeatedly until evenly distributed and stirred. The more evenly distributed in the mixture will give maximum results.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Services stage</td>
<td>Kawa leaf drinks are served directly from the pan / kettle using a bowl / glass / cut from coconut shell. In Ujung Pasir generally using sayak from coconut shell, with coconut shell will give a better taste than plastic cups, because in the coconut shell there is a sugar</td>
</tr>
</tbody>
</table>
10. Are there additional ingredients in the kawa beverage?  
There is only kawa and water without additional ingredients, which has two tastes, which are tasteless and somewhat bitter.  
All processors for kawa beverage at Ujung Pasir do not provide additional ingredients in brewing drinks, people prefer the drink in the original form and do not add to other ingredients such as sugar, milk and others. People prefer the original taste as it is rather bitter compared to tastes. With pure kawa beverage without additional ingredients it will certainly avoid the risk of side effects on the drink.

Science Concept: Solution and Nutrition

11. Are the kawa beverage sold?  
Processing of kawa beverage not for sale is only made for personal needs and the surrounding community.  
All processing for kawa beverage at Ujung Pasir are not for sale but only for individuals and communities around them. People who come home sometimes contribute to the provision of coffee leaves and wood for burning.

Science Concept: Etnobotani

From table 1 it can be seen that the processing of kawa beverage in Ujung Pasir can be associated with basic competencies in learning in higher education, where students understand applied biology as a science and its relation to other sciences and can apply understanding of concepts and principles of applied biology in general in education in the community.

<table>
<thead>
<tr>
<th>No.</th>
<th>Question</th>
<th>Original Knowledge</th>
<th>Scientific Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.</td>
<td>Are there additional ingredients in the kawa beverage?</td>
<td>There is only kawa and water without additional ingredients, which has two tastes, which are tasteless and somewhat bitter.</td>
<td>All processors for kawa beverage at Ujung Pasir do not provide additional ingredients in brewing drinks, people prefer the drink in the original form and do not add to other ingredients such as sugar, milk and others. People prefer the original taste as it is rather bitter compared to tastes. With pure kawa beverage without additional ingredients it will certainly avoid the risk of side effects on the drink.</td>
</tr>
<tr>
<td>11.</td>
<td>Are the kawa beverage sold?</td>
<td>Processing of kawa beverage not for sale is only made for personal needs and the surrounding community.</td>
<td>All processing for kawa beverage at Ujung Pasir are not for sale but only for individuals and communities around them. People who come home sometimes contribute to the provision of coffee leaves and wood for burning.</td>
</tr>
</tbody>
</table>

Table 2. The Relationship Between kawa Beverage Processing Process and Basic Competences of Applied Biology Learning

<table>
<thead>
<tr>
<th>No.</th>
<th>Competency standards</th>
<th>Scientific Concept in Kawa Beverage Processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Explaining the types of coffee leaves used in processing kawa beverage.</td>
<td>The names of the types of coffee and one of them is arabica coffee. Arabica coffee (Coffea arabica L) is a type of coffee that is abundant in Kerinci District with the characteristics of fragrant leaves, thick green, and not jagged. Dry coffee leaves contain caffeine compounds of 0.17%.</td>
</tr>
<tr>
<td>2.</td>
<td>Explaining the concept of work in the processing of kawa beverage and their application in everyday life.</td>
<td>The stages of processing kawa drinks start from the preparation of drying, burning, mixing, packaging until the presentation has been arranged according to the time required at each stage.</td>
</tr>
</tbody>
</table>
3. Explaining the concept of chemistry in kawa beverage and their application in everyday life. The names of the compounds contained in the kawa beverage one of are caffeine. Compounds process for body health.

4. Analyzing the concept of compounds in kawa beverage and their application in everyday life. Coffee leaves contain many antioxidants, as well as anti-inflammatory substances. Coffee leaves have efficacy as a central nervous system stimulant, because in dry coffee leaves there is 0.17% caffeine. Due to the low caffeine content, it does not give side effects to health.

5. Analyzing varian flavors in the processing of kawa beverage Various flavors such as insipidity and bitter taste and compounds that influence it.

6. Analyzing the content of the solution in the kawa beverage Pure kawa drinks do not use preservatives and additives such as sugar, milk and others.

4 Conclusion

Based on the results of the study, it was found that the processing of the kawa beverage was carried out traditionally, which was knowledge obtained through generations. The results of the reconstruction of indigenous knowledge into scientific knowledge can be a source of learning for students. Lecturers are expected to be able to correlate between the original knowledge of the community with existing scientific concepts so that learning is expected to be more meaningful and effective. Suggestions for further research are to explore the traditions and culture that exist in Kerinci to be constructed into scientific knowledge that can be used as a learning resource for applied biology.

References


Development of Conceptual Knowledge Test on Fluid Matter for Senior High School

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Department of Physics Education, State University of Medan, Medan, Indonesia¹,²,³

Abstract. This study aimed to construct a multiple-choice conceptual knowledge test for high school in fluid subject matter according to standard qualification of a good test based on validity, reliability, difficulty index, discrimination index, and effectiveness distractor. The method of this study is Research and Development by using Borg and Gall step. The population of this study was all the students grade XII Senior High School in Medan, North Sumatera academic 2018/2019. The sample selection by stratified random sampling based on the public and private school, implementation of curriculum 2013, and accreditation. Data analysis technique used is descriptive qualitative and quantitative techniques. Qualitative data analysis includes material, construction and language while quantitative data analysis determined validity, reliability, difficulty index, discrimination index, and effectiveness of distractor. Step of this study consists of preliminary studies, research planning, design development, experts judgment, revision of expert judgment, a small group trials, revisions of small group trials, large group trials, revisions of large group trials. Furthermore, it obtained an instrument test of conceptual knowledge on Fluid in Senior High School that meets the standard test instruments.

Keywords: Validity, Reliability, Difficulty Index, Discrimination Index, Effectiveness of Distractor

1 Introduction

Assessment is an important component and cannot be separated from learning activities. Assessment is done to determine the extent to which students are able to understand and master the concept (Muslim, et al, 2017). Assessment is digitalization of the qualifications, expressing the observed qualifications via numbers and symbols (Kara & Celikler, 2015). Therefore, assessment of learning outcomes must be carried out consistently, systematically, and programmed.

Evaluation, on the other hand, is a decision making process relating to the assessed qualification, by comparing the results obtained from the assessment process with certain criteria (Özçelik in Kara & Celikler, 2015). One popular evaluation tool is used to find out whether learning outcomes are in line with the learning objectives of giving a test (Yunita, 2012). Often the tests are the assessment tools that are used for determination of the students' gains relating to the cognitive domain within the quantitative researches of education (Sönmez & Alacapınar, in Kara & Celikler, 2015). The test is very useful in education to analyze the causes of academic failure, evaluate learning outcomes, evaluate curriculum and as a means of motivating students to be a tool for making decisions such as whether students pass or not (Adeleke & Joshua, 2015).
To design effective instructional interventions, it is necessary to adequately assess students’ conceptual knowledge. The major way to evaluate conceptual knowledge of students in physics education research is by means of a multiple-choice test (Lichtenberger et al, 2017; Kara & Celikler, 2015). Multiple-choice tests are the tests with objective grade which does not tend to differentiate from person to person (Gronlund & Lind in Kara & Celikler, 2015) and are able to be graded in a short time. The aim of instilling conceptual understanding in Physics is very difficult to establish. However, as claimed by Suarez, et al (2017), high-quality conceptual multiple-choice tests may be able to diagnose students’ misconceptions and might later on lead to better understanding of the Physics concepts. This paper is intended to present the process of development test of Fluid conceptual knowledge in Senior High School.

In the study, it is aimed to analyzed the response data to provide the psychometric properties of the test. Analyzing whether the multiple choice of Fluid conceptual knowledge tests have fulfilled the validity, reliability, difficulty index, discrimination index, and effectiveness distractor qualification requirements.

2 Method

This research had done in several high schools in Medan City, North Sumatera. The population in this study were all students of class XII MIA from all high schools in Medan, on first semester of 2018/2019 academic year. Sampling is done by stratified random sampling technique, based on public or private schools, implementation of 2013 curriculum and having an A accreditation. Based on these criteria were obtained 1 Public and 4 Private High Schools, namely SMA Negeri 3 Medan, SMAS Al Azhar Medan, SMAS Al Ulum Terpadu, SMAS Amir Hamzah and SMAS Harapan Medan.

This study is research and development using Borg and Gall model. The whole process involved simplified into three major phases: (i) Preparation stage; (ii) Development test of the Fluid Conceptual Knowledge; and (iii) Evaluation Stage.

Phase 1: Preparation Stage

In the preparation stage, reviews, observations, and literature were considered, together with the necessary inputs such as syllabus and observations. These were collected to serve as base data in the development of the conceptual test.

Phase 2: Development Stage

In the development stage, a number of Fluid item test are prepared to obtain the question design package. The development phase includes: Design pre-test products, Expert validation, Small group trial, at this stage the trial design of instrument is limited to one class from one school only which consist of 25 students, then test validity and reliability of instrument, at this stage the test results are analyzed for validity, reliability, difficulty level, discrimination index, and effectiveness distractor.

The first version resulted in an 50-item multiple choice of fluid conceptual knowledge, each question consisting of 5 options will include one correct solution and 4 distractors which categorized as Table I.
Content validity of the test is determined via the opinions of 3 science lecturers, a subject teacher, and a peer reviewer. After the test is applied to students, item analysis of the test is carried out by calculating the difficulty and discrimination of the questions of the test, validity and reliability survey is performed, inappropriate questions are excluded, KR-20 reliability coefficient is used in order to review the internal consistency between the points obtained from the test applied at the same time. A test with reliability coefficient 0,70 and above, is usually considered satisfying in terms of reliability (Fraenkel & Wallen, 2006).

**Phase 3: Evaluation Stage**

The next stage is that the test items were tested on a larger number of subjects by conducting large group trials. This trial was conducted on 161 students who had received the material before. Data obtained in large group trials will be analyzed quantitatively. At the end of the testing phase the test items that were declared acceptable were assembled into instrument Test of Fluid Conceptual Knowledge.

<table>
<thead>
<tr>
<th>No.</th>
<th>Sub Matter</th>
<th>Bloom’s Taxonomy of Cognitive Domain (Item Number)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Hydrostatic Pressure</td>
<td>1 2 3 4 43 5</td>
<td>6</td>
</tr>
<tr>
<td>2.</td>
<td>Pascal Law</td>
<td>6 7 8 44 35 5</td>
<td>6</td>
</tr>
<tr>
<td>3.</td>
<td>Archimedes Principle</td>
<td>9, 33 10 11 45 12, 36 42 8</td>
<td>8</td>
</tr>
<tr>
<td>4.</td>
<td>Surface Tension</td>
<td>13 14 15 46 34 5</td>
<td>6</td>
</tr>
<tr>
<td>5.</td>
<td>Capillarity</td>
<td>16 17 18, 47 19 20</td>
<td>6</td>
</tr>
<tr>
<td>6.</td>
<td>Viscosity</td>
<td>21 22, 48</td>
<td>4</td>
</tr>
<tr>
<td>7.</td>
<td>Ideal Fluid</td>
<td>23 24, 41 49 25</td>
<td>5</td>
</tr>
<tr>
<td>8.</td>
<td>Continuity Equation</td>
<td>26 28 27 40</td>
<td>4</td>
</tr>
<tr>
<td>9.</td>
<td>Bernoulli Principle</td>
<td>29, 37 30 50 38, 31</td>
<td>7</td>
</tr>
</tbody>
</table>

**Table 1.** Categorization of the 50 Fluid Conceptual Knowledge Test.

3 **Result**

The instrument used is a set of exam questions, student response, and answer key of conceptual knowledge test on fluid in senior high school consisting of 50 multiple choice test with 5 alternative answers (A, B, C, D, and E) tested to 161 students XII class of 5 Senior high schools in Medan.

Analysis data of this study consists of qualitative and quantitative analysis. In qualitative, items that have been reviewed by experts are processed using the CVR index with a scale of 1, 2, and 3, where if the conclusion TR (can be used without revision) scale 3, RK (can be used with minor revisions) scale 2, and PK (not yet used, still need consultation) scale 1. Categories of the results of the analysis of qualitative test items are presented in Table II.

In quantitative analysis, there are two steps. First, in small group trial that presented in Table III, the validity of the item is calculated using the point-biserial formula. Then consulted with a significant level of 5%, \( N = 25 \), \( r_{tabl} = 0.396 \). Based on the results of the analysis of the 50 items, it can be seen that the questions included in the valid category are 45
items (90%). Whereas the questions that are categorized as invalid are 5 items (10%). Reliability of small group trial is estimated to be 0.950. A test with reliability coefficient 0.70 and above, is usually considered satisfying in terms of reliability (Kara & Celikler, 2015). This means that the test used has good reliability.

Almost all items (sixteen exceptions) are in the difficulty range between 0.30 and 0.90, which is reasonable. Considering the distribution of item difficulties, we find 32% (16 items) in the too difficult range (0.00–0.29), 30% (15 items) in the intermediate difficult range (0.30–0.49), 28% (14 items) in the easy range (0.50–0.69), and 10% (5 items) in the too easy range (0.70–1.00). Compared to the suggestions by Doran (Lichtenberger et al, 2017), there is a small underrepresentation of items in the too easy range and a corresponding overrepresentation of items in the moderate range. Thus, the present test especially discriminates the range from very high to moderately low performance. The discrimination index was determined by calculating the difference of the mean scores between two equal-sized subgroups of the sample, one built from the 27% highest scorers, the other from the 27% lowest scorers (Lichtenberger et al, 2017).

The results of discrimination index of the test instruments in the small group found that 40% (20 items) in very well item (> 0.40), 24% (12 items) in well item (0.30–0.40), 22% (11 items) in intermediate distinctiveness (0.20–0.29), and 14% (7 items) in too weak item (≤0.19) (Kara & Celikler, 2015).

Second, in large group trial the validity of the item is calculated using the point-biserial formula. Then consulted with a significant level of 5%, N = 161, $r_{table}$ is 0.154. Based on the results of the analysis of the 45 items, it can be seen that the questions included in the valid category are 36 items (80%). Whereas the questions that are categorized as invalid are 9 items (20%). Reliability of large group trial is estimated to be 0.817. This means that the test used has good reliability (Kara & Celikler, 2015).

### Table 2. Results Categories Analysis of Test Items Qualitatively.

<table>
<thead>
<tr>
<th>No.</th>
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<th>Item Number</th>
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<td>2.</td>
<td>Revised</td>
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<td>3.</td>
<td>Rejected</td>
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### Table 3. Empirical Analysis of Small Group Trial.

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<th>Discrimination Index</th>
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</table>

Almost all items (nine exceptions) are in the difficulty range between 0.30 and 0.90, which is reasonable. Considering the distribution of item difficulties, we find 20% (9 items) in the too difficult range (0.00–0.29), 22% (10 items) in the intermediate difficult range (0.30–0.49), 24% (11 items) in the easy range (0.50–0.69), and 33% (15 items) in the too easy range (0.70–1.00). Compared to the suggestions by Doran (Lichtenberger et al, 2017), there is a
small underrepresentation of items in the too easy range and a corresponding overrepresentation of items in the moderate range. Thus, the present test especially discriminates the range from very high to moderately low performance.

Table 4. Empirical Analysis of Large Group Trial.

<table>
<thead>
<tr>
<th>No.</th>
<th>Validity</th>
<th>Difficulty</th>
<th>Discriminatio n Index</th>
<th>Choice (N = 161)</th>
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<td>0.71</td>
<td>0.824</td>
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</tr>
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</tbody>
</table>
### Table 5. Overall Test Result from the final 45-item-version of the test, taken from sample of 161 students.

<table>
<thead>
<tr>
<th>No.</th>
<th>Validity</th>
<th>Difficulty</th>
<th>Discrimination Index</th>
<th>Choice (N = 161)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.3 – 0.9</td>
<td>≥0.30</td>
<td>A</td>
</tr>
<tr>
<td>42</td>
<td>0.620</td>
<td>0.50</td>
<td>1.000</td>
<td>81</td>
</tr>
<tr>
<td>43</td>
<td>0.418</td>
<td>0.31</td>
<td>0.529</td>
<td>50</td>
</tr>
<tr>
<td>44</td>
<td>0.401</td>
<td>0.52</td>
<td>0.235*</td>
<td>9</td>
</tr>
<tr>
<td>45</td>
<td>0.419</td>
<td>0.51</td>
<td>0.588</td>
<td>82</td>
</tr>
</tbody>
</table>

The results of discrimination index of the test instruments in the small group found that 67% (30 items) in very well item (> 0.40), 9% (4 items) in well item (0.30-0.40), 11% (5 items) in intermediate distinctiveness (0.20-0.29), and 13% (6 items) in too weak item (≤0.19) (Kara & Celikler, 2015).

### 4 Discussion

After obtaining the results of validity, reliability, difficulty level, discrimination index, and effectiveness of distractors, then from each item was decided which were accepted, revised or rejected item. The results of this study can be obtained that 34 items are accepted (76%), 2 items need to be revised (4%) and 9 items must be rejected (20%). The results of the study stated that the Student Conceptual Knowledge Test on Fluid Material in High School was good. Test reliability is calculated using KR-20, it is known that the reliability estimated to 0.817 means that the test used has good reliability (Kara & Celikler, 2015).

For items that have a good difficulty level is at a moderate level. From the data analysis, 20% (9 items) in the too difficult range (0.00–0.29), 22% (10 items) in the intermediate difficult range (0.30–0.49), 24% (11 items) in the easy range (0.50–0.69), and 33% (15 items) in the too easy range (0.70–1.00). Thus, the difficulty level of the Conceptual Knowledge Test on fluid material describes of high, medium, and low ranges (Lichtenberger et al, 2017).

From the results above, it was found that 67% (30 items) in very well item (> 0.40), 9% (4 items) in well item (0.30-0.40), 11% (5 items) in intermediate distinctiveness (0.20-0.29), and 13% (6 items) in too weak item (≤0.19). Thus, for the Conceptual Knowledge Test on fluid material test items in too weak discrimination index are 17, 18, 22, 29, 31, and 41. Test items generally have a good discriminating index if they have a point - biserial correlation coefficient ≥ 0.20 (Li & Singh, 2016).

Test participants in this large group were 161 students. So if it is calculated 5% of 161 students is 8.05, which means that in this test a distractor is effective if a minimum of 8 students are chosen. A good distractor if chosen a lot by the lower group. If
the distractors need to be revised. The results of the analysis of the effectiveness of the distractor's recapitulation showed that 9 (20%) questions were not functioning optimally and 36 (80%) questions were functioning optimally (Lichtenberger et al, 2017).

Based on the data above it is known that 36 items can be received and stored in the bank of conceptual knowledge on fluid material test in high school because it has fulfilled the validity, difficulty level, discrimination index, effectiveness distractor. There are 2 items, 20 and 44 that still need to be revised because they have not met well discrimination index. While 9 items, 17, 18, 21, 22, 23, 29, 31, 33, and 41 were rejected and could not be used because they did not meet any criteria for validity, difficulty level, discrimination index, and good effectiveness distractor (Barniol & Zavala, 2014).

Revising item is needed to improve validity, difficulty level, discrimination index, and effectiveness of distractor so all items become good value and quality items. A good quality item will be able to carry out its function as a tool for good evaluation. The application of a fine system also needs to be done to minimize the possibility of students guessing answers to multiple choice items. Giving penalties by reducing the value for each wrong answer, students will be more careful in choosing answers. If students really do not know, then students will prefer not to answer rather than just guessing answers because they fear the value will decrease (Lichtenberger et al, 2017).

![Pie Diagram of Empirical Analysis in Large Group Trial.](image)

5 Conclusion

One of the fundamental elements of a successful education is a successful assessment process. In order to carry out a successful assessment, a test with validity and reliability are ensured is required to be used. For this reason, it is aimed to develop an achievement test for Fluid Conceptual Knowledge.

Regarding to the content validity of the test, it is common in the literature that the opinions of the domain experts and lecturers to be consulted. Validity of the test which is prepared within the frame of the survey, is ensured in line with the opinions of 3 physics lecturers, 1 physics teacher, and 1 peer reviewer. As a result of the review by the domain
experts, it is determined that the content validity of the test has been provided, and is suitable for the purpose and student level that the items of which the discrimination is 0.19 and below should not be used or be reformulated, whereas that the items of which the discrimination is between 0.20-0.29 can be used as is in unavoidable circumstances, or should be corrected. Therefore, 11 questions of which the distinctiveness are below 0.30 are excluded from the test, as a result of the item analysis of the test. The final state of the test consists of 36 questions in total, 9 for each gain in the program. After the questions are excluded from the test, it is determined that the average item difficulty of the questions is intermediate (0.54) and the discrimination is in a well state (0.38). It is established that the KR-20 coefficient of the test prepared is sufficient (0.82) for the reliability of a test. As a result of the survey, a valid and reliable, multiple-choice test consisting of 45 questions of which the difficulty and discrimination is at demanded level for Fluid Conceptual Knowledge Test.

The developed test is suggested to be used by the physics teacher in order to determine the forwardness of the XII th grade senior high school students to fluid conceptual knowledge, their achievement during the training process and their misconception. In addition, the test can be used by researchers those who carry out works regarding to the effect of a certain method to the achievements relating to this knowledge.

6 Suggestion

This test instrument that has been tested and analyzed can be used as a question bank. This research shown that to make a good psychometric of the test it is necessary to endure the stages in the development of test so this will foster the motivation of the actors in the field of education to make a well physics test instrument on other material. Other researchers who want to do similar research wherever possible should take more trial subjects so as to produce more varied data. Further development can use modern test theory so that research data does not depend on the condition of students.

References

The Use of Bokashi Compost as a Soil Fertility Amendment in Increasing Vegetative Growth of Organic Tomato (Lycopersicum Esculentum Mill.)

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Abstract. Bokashi holds the promise of a solution for wastes problem, because of its ability to turnover of organic wastes fastly, requiring less land and equipment. The study about the effect of bokashi compost on vegetative growth of tomato (Lycopersicum esculentum Mill.) was conducted to determine the nutrition content of bokashi compost made from traditional market wastes and to investigate its effect on tomato’s vegetative growth. Some growth parameters such as plant’s height and leaf’s number were measured per week, while stem’s diameter and branch number were measured in third and sixth week after cultivation, root lenght and fresh weight was measured in eight weeks after cultivation. Investigation of the effect of bokashi compost fertilizer on tomato’s vegetative growth using an experimental method by using a Completely Randomized Design with 4 treatments and six repetitions. The treatments were bokashi compost fertilizer with 4 levels of dose, namely control (no fertilizer), 2.5 kg (soil:fertilizer rasio 1:1), 1.67 kg (soil:fertilizer rasio 2:1), and 1.25 kg (soil:fertilizer rasio 3:1). The obtained data was analyzed using one way ANOVA then continued with Duncan posthoc test. The study results indicated that bokashi compost consists of 0.43% Nitrogen, 2.15% Phospate (P2O5), 2.68% Potassium (K2O) and 43.4% of moisture content. According to the observation towards the bokashi compost effect on tomato’s growth, revealed that the fertilizer has significant effect on plant growth. Statistical analysis evidenced that bokashi compost with dose 1.67 kg is the best treatment for tomato’s vegetative growth.

Keywords: bokashi, compost, soil fertility, vegetative growth, organic tomato

1 Introduction

Farmers in North Sumatra were applied chemical fertilizers and synthetic pesticides to ignore plant’s pests and diseases. Eventhough the price was increased significantly, pesticides still be considered to be the most effective and simple materials to solve these problems. Several studies had been evidenced negative effects of chemical pesticides, such as pest’s resistance, overpopulation of new pest, accumulation of pesticides residues, environment pollution, harmful to humanlife and healthy, and damaging of ecosystem balance (Catillo et al,
The study about environmental hazards associated with pesticide by Castillo et al., (2014) revealed that pesticides using caused aquatic contamination in Costa Rica, quantity of pesticides capable of reaching water bodies increased during analysis period, 98% of the pesticides were classified as acutely toxic for fish and crustaceans and 73% for amphibians. Approximately, 8.4 kg of active ingredients were imported per hectare of protected areas and 24.3 kg of active ingredients per hectare of wetlands.

Chaturvedi, Sharma and Chaturvedi (2013) also said that pesticides can cause harm to humans, animals, or the environment because they are designed to bill adversely affect living organisms. Pesticides are airborne so that they can found long distances from the site of application, exposure of wildlife over and extended period of time to pesticide may result in chronic poisoning.

Using of chemical fertilizer may causes compaction layer and soil degradation in long-term (root developments and plant growth will be limited) (Massah& Azadegan, 2016). According to Rai et al. (2014) study, revealed that overuse of chemical fertilizers may decrease soil fertility, pollute air and water, release greenhouse gases, bring hazards to human’s health and environment, kill soil friendly micro-organisms and earthworms. It also depletes essential soil nutrients and minerals that are naturally found in fertile soil. Furthermore, chemical fertilizers may cause root burn or fertilizer burn and do not allow enough water intake for the plants. It is also high in nitrogen salts, when N is absorbed by the soil too quickly, it will dehydrate and dry up the plant.

The use of organic materials on cultivation of vegetable and crops has many advantages for farmers, particularly in maintaining suitable soil conditions and decreasing utilization of chemical fertilizers. Nowadays, fertilizer from organic materials has been used worldwide, such as manure, compost, microbial fertilizer, etc. The positive effects of the use of these kind of fertilizers had been published (Berova et al., 2010; Khanom et al. 2012; Jigme et al., 2015; Soeparjono, 2015; Sigit, 2016; Zerihun and Haile, 2017). Bokashi holds the promise of a solution for wastes problem, because of its ability to turnover of organic wastes fastly, requiring less land and equipment.

2 Material And Method

2.1 Preparation of Bokashi Bran

5 L bucket was prepared. Mix bran, 200 g of brown sugar, 20 mL of EM4 and 3 L of water were mixed in to the bucket. The bucket was closed tightly and incubated for 3 days. The bokashi bran prepared was bownish clots with humidity approximately 40-60%. This bokashi bran would be used for starter to the bokashi materials.

2.2 Fermentation

A layer of bokashi bran was sprinkled in the bottom of bucket. The amount of 20 kg vegetable scraps (in small pieces) was added in to the bucket, then covered it with the bokashi bran layer, for removing the air in the bucket and the mixture was pressed down using the “mid lid”. It was repeated until the bucket full and the bucket lid was closed tightly. The mixture in the closed bucket then fermented for two weeks and not allowed to open during fermentation process.
2.3 Decomposition Process

Decomposition process was carried out in outdoor by digging a hole about 50 cm depth. The bokashi bucket was poured into the hole and then the hole was covered to prevent animal to dig it up. The decomposition process was took for 2 weeks and ready to use.

2.4 The Application of Bokashi on Tomato

Observation the influence of the bokashi on tomato growth was measured by using a Completely Randomized Design consisted of four treatments and six repetitions. The treatments of bokashi fertilizers application as soil amendment with ratio of soil:bokashi were 1:1 (2.5 kg/polybag), 2:1 (1.67 kg/polybag), and 3:1 (1.25 kg/polybag) and control treatment (no bokashi).

The implementation of the research began with the nursery process; then the 1-week old seedlings were transferred to the treatment medium. Growth observations were conducted for eight weeks. The parameters measured to determine plant growth were as follows: (1) plant height; (2) number of leaves/plants; (3) stem diameter (4) bud number; (5) root length; and (6) plant fresh weight. The comparison of plant growth between treatments was analyzed by using one-way ANOVA (using SPSS 21 program) then continued with Duncan's Posthoc test at α=0.05 level.

3 Results And Discussion

3.1 The Composition of Bokashi Compost

Before the bokashi was applied on the tomato, the composition analysis was measured to investigate the contain of nitrogen (N), phosphorous (P), and potassium (K) concentration. The composition of bokashi was shown in the following Table 1.

<table>
<thead>
<tr>
<th>No.</th>
<th>Parameter</th>
<th>Composition (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Moisture Content</td>
<td>43.4</td>
</tr>
<tr>
<td>2.</td>
<td>Nitrogen (N)</td>
<td>0.43</td>
</tr>
<tr>
<td>3.</td>
<td>Phosphate (P₂O₅)</td>
<td>2.15</td>
</tr>
<tr>
<td>4.</td>
<td>Potassium (K₂O)</td>
<td>2.68</td>
</tr>
</tbody>
</table>

The bokashi contained a high of kalium (K) and phosphorus (P) content, but low concentration of nitrogen (N) compared to cow manure. According to Syarief (1989), cow manure contained 0.6% of N, 0.15% of P₂O₅ and 0.45% of K₂O. But the bokashi content of N, P, K is lower than chicken manure. Chicken manure contained 2.2% of N, 2.9% of P₂O₅, and 2.1% of K₂O (Hartatik and Setyorini, 2009).

Tomato growth was taken under greenhouse condition with temperature average was 32°C to 38°C and relative humidity was 42% to 66%. Performance of tomato was influenced by different bokashi treatments. The following showed data results obtained after eight weeks of cultivation.
3.2 The Effect of Bokashi on Tomato's Growth

The growth of tomato was highly influenced by applications of Bokashi. The plant’s height rose consistently from the first week to the eighth week.

![Graph showing plant height over weeks](image)

**Fig. 1.** The vegetative growth of tomato based on plant height (cm) in all treatments during eight weeks of observation.

Bokashi also affected number of leaves significantly during the observation (Figure 2). Plants treated with bokashi is the tallest, as reported by El-Hamied (2014). In the following Figure 2 can be shown that the bokashi with ratio 3:1 was outstandingly influenced the number of leaves compared with another treatments. Number of leaves was increased rapidly during observation. The BKO 2:1 and 1:1 were also highly influenced the leaves number of plant compared to control treatment. The trend revealed that bokashi has positive impact on plant growth with 3:1 as the best treatment.

![Graph showing leaf number over weeks](image)

**Fig. 2.** The vegetative growth of tomato based on number of leaves (sheet) in all treatments during eight weeks of observation.
Bokashi influenced tomato’s growth significantly (p<0.05), particularly in treatments with dosage 2:1 and 3:1. Bokashi could provide nutrients for the plant and enriched soil with organic materials which helped by micro-organisms decomposition ability repaired soil structure and porosity. It also improved soil permeability, controlling secondary soil salinization (Xiaohou et al., 2008).

Bokashi with dosage 2:1 seen to be the appropriate concentration to increase plant height and leaves number. The formation of plant’s leaves was strongly influenced by nutrients intake contained in the soil. With high content of P and K, bokashi improved soil capability to supply nutrients for plant. Phosphorous is one of essential elements which function as a part of the nucleic acid backbone and it also has central function in intermediary metabolism. In addition, organic P is not available for uptake by plant, but it must be converted to an inorganic form first by micro-organism in the soil. While, potassium (K) activates enzymes (respiration and photosynthesis) and functions in osmoregulation. Furthermore, it also related to starch and protein synthesis. The high content of P and K in bokashi studied, soil properties could be improved and affected plant growth positively.

Table 2. Plant height (cm) and leaves number of tomato in age 8 weeks old after cultivation (wac) in all treatments.

<table>
<thead>
<tr>
<th>No</th>
<th>Treatments</th>
<th>Plant’s height (cm) 8 wac</th>
<th>Leaves number (sheet) 8 wac</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Control (no bokashi)</td>
<td>15.46±2.293&lt;sup&gt;a&lt;/sup&gt;</td>
<td>6.33±0.816&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2</td>
<td>BKO 1:1</td>
<td>82.1±2.587&lt;sup&gt;b&lt;/sup&gt;</td>
<td>18.17±1.472&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>3</td>
<td>BKO 2:1</td>
<td>87.33±3.764&lt;sup&gt;c&lt;/sup&gt;</td>
<td>20.67±1.033&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>4</td>
<td>BKO 3:1</td>
<td>81.75±3.088&lt;sup&gt;b&lt;/sup&gt;</td>
<td>22±1.265&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Notes: Values followed by the same letter showed are not significantly different at α=0.05.

According to study result, stem diameter, branch number, root length and plant fresh weight were also highly influenced by the addition of bokashi (p <0.05). Plant structures were also related to the nutrients intake by plant. Based on the study, bokashi could supplies nutrients especially N, P, and K, which are essential for plant in metabolic process. This result was also found by Christel and Gorres (2014) that evidenced the bokashi influence in spinach. The bokashi treatments had a more steady and prolonged supply of plant available nitrogen. The C/N rasio influenced the activity of micro-organism in decomposition process. High content of C/N rasio (more C than N) caused competition between plants and micro-organism, there will be a lot of energy available for their formation and development. The low C/N rasio indicates that decomposition process had properly (nitrification process goes well). However, the net nitrogen mineralization was also affected by incubation period. In this study, concentration of nitrogen was not too high that might be caused by the time of incubation process (2 weeks). Based on Boechat et al. (2013) revealed that wastes can enhanced organic matter degradation, resulting in quickly available quantity of net nitrogen.

The application of bokashi in this study proved to be very effective in improving plant’s vegetative growth. This finding was also showed by several researches (Wijayanto et al.,...
2016; Adel&Hamied, 2014; Christel&Gorres, 2014; Wasis&Fathia, 2010). Based on the results it can be seen that EM-bokashi was suitable for vegetative growth of tomato, nutrients content of the bokashi could supplied nutrient needed by the plant. It also improved soil fertility, enriched soil with essential elements and environment friendly.

Table 3. Bokashi effect on stem diameter (mm), branch number, root length and plant fresh weight (g) of tomato in age 6 and 8 weeks after cultivation (wac).

<table>
<thead>
<tr>
<th>No</th>
<th>Treatments</th>
<th>Stem diameter 6 wac (mm)</th>
<th>Branch number 8 wac</th>
<th>Root length 8 wac (cm)</th>
<th>Fresh weight 8 wac (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Control (no bokashi)</td>
<td>12.17±1.08&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.67±0.516&lt;sup&gt;a&lt;/sup&gt;</td>
<td>13.5±3.619&lt;sup&gt;a&lt;/sup&gt;</td>
<td>36.45±6.58&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2</td>
<td>BKO 1:1</td>
<td>19.5±1.686&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.33±0.516&lt;sup&gt;b&lt;/sup&gt;</td>
<td>16.13±3.246&lt;sup&gt;b&lt;/sup&gt;</td>
<td>61.73±3.664&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>3</td>
<td>BKO 2:1</td>
<td>20.33±2.2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.67±0.516&lt;sup&gt;b&lt;/sup&gt;</td>
<td>17.5±2.829&lt;sup&gt;c&lt;/sup&gt;</td>
<td>59.41±3.21&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>4</td>
<td>BKO 3:1</td>
<td>21.33±1.855&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.67±0.516&lt;sup&gt;b&lt;/sup&gt;</td>
<td>16.79±1.92&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>58.5±3.31&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Notes: Values followed by the same letter showed are not significantly different at α= 0.05.

References

TORA Software for Modification of Distribution Network

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Department of Mathematic, State University of Medan Jalan Williem Iskandar Pasar V Medan, Indonesia¹,²,³

Abstract. In this paper, the modification of the network system for pipe water distribution at PDAM Tirtanadi Medan was constructed. The Minimum Spanning Tree as a mathematical modeling, among other things, was discussed. The model was constructed using TORA Software to solve the networking problem. The modification result showed the required optimality of the distribution network

Keywords: Minimum spanning tree, TORA Software, Network.

1 INTRODUCTION

PDAM Tirtanadi Medan is a water utility company. According to [1] PDAM Tirtanadi hasn’t built new installation for 10 years. It is predicted that distribution network still forming a circuit so that hasn’t been optimized [2]. The network will be optimal if a pipe installed isn’t forming a circuit without reducing the function of the pipe water. Modification network deleted circuit can be done by looking for minimum spanning tree. Many literatures contain several algorithms to solve minimum spanning tree problem like travelling salesman problem [3,4], Prim’s algorithm [5-7] and Kruskal’s algorithm [8]. In this work, the examination of a circuit done with a minimum spanning tree using TORA software.

1.1 Minimum Spanning Tree

G is a tree if a connected graph G of order has no cycle. Suppose G contain cycles. An edge e of a graph is a bridge if and only if e lies on no a cycle of G. Let e₁ be an edge lying on a cycle of G. Let e₂ be an edge lying on cycle of G-e₁. Then, a set \( U = \{e₁, e₂, \ldots, eₙ\} \) is a tree, such that \( V(U) = V(G) \) as a spanning tree. Now, let G be a connected graph thus each edge has the weight is called a weighted graph. Denote \( w(e₁), \)

\[
w(H) = \sum_{e \in E(H)} w(e)
\]  

than, a minimum spanning tree is a spanning tree of G which the weight is most minimum among all spanning trees of G. The problem of minimum spanning tree is to find a minimum of spanning trees of graph G. The minimum spanning tree problem has been solved using a number of algorithm, and then TORA software apply to check and delete the cycle.
1.2 Tora Software

François Ndayiragije [9] obtain the same result using the TORA software in solving Linear Programming Problem. In this work, TORA software is used to find the minimum spanning tree. An initial data to a connected weighted graph assigning the ends of pipe as vertex and a length of pipe as edge (Fig 2). To result the minimum spanning tree by removing the cycle, that the weight $w(e_i)$ input as a problem to TORA software then it would be output iteration as the result (Fig. 1).

![Fig. 1. Input problem and Iteration in TORA software](image)

2 The Case Study

Illustration using TORA software produces result output as minimum spanning tree of $w(e_i)$ for some integer $i$ with $1 \leq i < n-1$. All the $w(e_i)$ collected from regional Krakatau as sample at Tuasan Branch PDAM Tirtanadi Medan. The solution obtained after the iteration 56 as described at Fig.3 as below:

![Fig. 2. Regional Krakatau: Input w(e_i), some iteration and last iteration as result using TORA Software](image)
The examination of a minimum spanning tree using tora software is restricted a maximum of 100 edges. Hence, the branch Tuasan divided into 3 area namely regional Pancing, regional Krakatau, and regional Letda Sujono-Meteorologi that on the examination divided into three phases as shown in Fig.3.

Fig. 3. The Graph Network of Pipe Distribution at PDAM Tirtanadi

The output summary of minimal spanning tree after process inputing for regional Krakatau can be seen in figure 4 which started at node N1 that connect V97 to V67 with length 435,00. The last iteration end at N9 that connect V75 to V111 with length 115,00.
The same process was carried out in all regions in the branch area until network modifications were obtained. The modification of distribution network using TORA software reported at Fig. 5 but it still contain cycle.
Fig. 5. The Graph Network obtained using TORA software
Examination on the cycle at graph network by doing the removal of the having the greatest weight \((u,v)\). Input the cycle and the TORA software will produce the minimal spanning tree from graph \(G\) contain cycle

![Image](image.png)

**Fig. 6.** Input cycle to produce minimum spanning tree

### 3 Result and Conclusion

From the examination obtained some delete cycle \((u,v)\) is \((v_{66},v_{90}), (v_{69},v_{89}), (v_{67},v_{97}), (v_{77},v_{71}), (v_{5},v_{6})\) and \((v_{152},v_{151})\) with the total weight is 3.036 meters. The total weight minimum spanning tree \((u,v)\) that obtained from some iterations using TORA software is 56.830 meters, subtract with delete weight \((u,v)\) 3.036 thus 56.830 - 3.036 = 53.794 meter.

This paper has shown that we can use the TORA software which is one of the reference softwares in solving pipe water distribution networking problem. In future, hope to get new TORA software in solving any optimization problem when the total of the node is more than 100, thus without doing manual subtracting.

### References


Analysis of Feasibility Level of Integrated Science Practical Guide Book Based on BSNP for Junior High School Grade VII

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Abstract. This study aimed to analyze the feasibility level of the VII grade junior high school integrated science practical guide book. This research was a descriptive analysis study conducted at State Junior High School 10 Medan. This research was limited to the result of feasibility of the practical guide book which is used in 3 schools. Samples of this study were 3 books consisting of 2 LKS books (Student Worksheets) and 1 book created by teacher. Data collection techniques were carried out using a BSNP (National Education Standard Board) questionnaire. This questionnaire is used to assess the feasibility of the guide book. The results of the study show that 1) aspect of feasibility the content in practical guidance integrated guided inquiry model and used school subject have an average of 4.15, 2) The aspect feasibility of language in practical guidance integrated guided inquiry model and used school subject have an average of 4.00, 3) The aspect feasibility of presentation in practical guidance integrated guided inquiry model and used school subject have an average of 4.06, 4) The aspect feasibility of graphing in practical guidance integrated guided inquiry model and used school subject have an average of 4.08.

Keywords: Analysis, Practical guide book, Questionnaire

1 Introduction

Education is an effort made by humans consciously and sustainably to gain knowledge widely both cognitive, psychomotor, affective and good skills needed by themselves and society. According to the Law on National Education System Number 20 of 2003, "education is a conscious and planned effort to realize a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character and the skills needed by him, the community, the nation and the State."

One effort to improve the quality of education in Indonesia is through efforts to improve the teaching and learning process at all levels of education. The quality of education in Indonesia needs to be seen by some influencing elements, such as curriculum, educational content, learning process, evaluation, teacher quality, school facilities and infrastructure and textbooks. (Handayani, et al. 2014).

With the enactment of the 2013 curriculum, which is a curriculum that can produce Indonesian people who are: productive, creative, innovative, affective through strengthening...
Integrated attitudes, skills, and knowledge and having 4 major changes, namely: (1) a balanced curriculum concept between hard skill and soft skills starts from Competency Standards for Graduates, Content Standards, Process Standards, and Assessment Standards (2) The use of student books is more emphasized in the activity base is not a reading material (3) Each book contains learning models and (4) projects that students will do and an assessment process that supports student creativity. (Winarso, 2015)

Based on the interviews and the results of the analysis of the integrated science worksheet taken from the three schools, there were some disadvantages including (1) the absence of the number of equipment used, (2) the absence of specifications and MSDS from the materials used, (3) the presentation of work safety not attached, (4) in some experiments there are no questions that explore the curiosity of students, (5) practicum made only covers a number of KD, (6) goals that are not listed in some experiments, (7) book skin illustrations have not provided an overview of the material teach science, and so on.

In connection with this matter, it is necessary to have a practical guide specifically designed for junior high school science lessons. Through the integration of scientific learning models with practicum so that it can create quality learning outcomes and human resources with character.

2 Literature

2.1 Research and Development

Research and Development is a research that is directed to produce products, designs, and processes. In the world of education and learning, especially development research focuses its study on the field of design or design, in the form of design and design models of teaching materials and products such as media and learning processes. (Setyosari, 2012). According to Gay (1990), development research is an attempt to develop a product that is effective for school use, and not to test theory. Whereas Borg and Gall (1983) define development research as a process used to develop and validate educational products.

The Dick & Carey development model consists of ten steps, namely: needs analysis, learning analysis, learning analysis and context, general and specific goals, developing instruments, developing learning strategies, developing and selecting teaching materials, designing and conducting formative evaluation, revision and evaluation summative.

Borg & Gall (1983) proposed a series of steps that must be taken in this approach, namely: “Research and information collecting, planning, develop preliminary form of product, preliminary field testing, main product revision, main field testing, operational product revision, operational field testing, final product revision, and dissemination and implementation”.

2.1 Curriculum 2013

Development of the 2013 Curriculum is a further step in the development of the Competency Based Curriculum which was initiated in 2004 and the 2006 KTSP which includes integrated competencies in attitude, knowledge, skills. Then, with regard to national education objectives, it is affirmed in Law Number 20 Article 3 of 2003, namely: Educated
humans who believe and fear God Almighty, are noble, healthy, knowledgeable, capable, creative, independent, and become citizens democratic and responsible.

The 2013 curriculum aims to prepare Indonesian people to have the ability to live as individuals and citizens who are faithful, productive, creative, innovative, and affective and able to contribute to the life of society, nation, state and world civilization.

2.1 Development of Integrated Science Learning in 2013 Curriculum

The development of integrated science learning broadly includes three main activities, namely: planning, implementation, and assessment.

a. Planning

Planning for integrated science learning is carried out by considering the conditions and potential of students (interests, talents, needs, and abilities of students), as well as other supporting resources (teacher ability, availability of learning facilities and infrastructure, and concern of stakeholders in schools (Kemdikbud, 2013) Activities in planning activities include:

1. Identify the science concept in one KD through an analysis of the Graduates Competency Standards (SKL), Core Competencies (KI), and Basic Competencies (KD).
2. Determine the integrated model (connected, webbed, shared and integrated).
3. Creating a concept / matrix / map relationship concept in KD with the theme / topic of integration.
4. Formulate indicators.

The formulation of links and the selection of topics in integrated science learning must be relevant to the integrated KD. These activities are also made by paying attention to issues that are actual, interesting, and contextual so as to foster the curiosity of students who have a sustainable effect in the form of seeking answers to curiosity through discovery. Examples of the flow of the IPA concept mapping in the Ministry of Education and Culture (2013) are illustrated in Figure 2.1.

![Fig. 1. Flowchart of the science concept mapping (Kemdikbud, 2013)](image)

b. Learning Implementation

The implementation of learning is contained in the RPP as outlined in the syllabus. Learning activities start from preliminary, core and closing activities and are carried out with a scientific approach (asking, observing, processing, presenting, concluding, and creating). The
step or learning syntax is modified according to the selected integration model. Examples of integration models with the topic "Mixed Separation" are presented in Figure 2.2.

![Fig. 2. Models connected with mixed separation topics](Kemdikbud, 2013)

### 2.1 Feasibility Standards According to BSNP

- Assessment of primary and secondary education textbooks issued by the National Education Standards Board (BSNP) consists of special instruments in the form of questionnaires with certain scoring. Each book assessment instrument in the National Education Standards Agency (BSNP) contains items of assessment and descriptions that are used as a reference in assessing the quality of textbooks so that the textbooks can be used in the learning process. Assessment instrument for textbooks based on the National Education Standards Agency (BSNP) consists of two stages and a score for each component is included. This conformity analysis with the National Education Standards Agency (BSNP) is carried out with reference to first and second stage. Each stage of the assessment of lesson textbooks contains components and assessment items that can be described as follows:

  a. **The First Stage Assessment Instrument**

     1. Components of content eligibility
        a) Competency standards (SK) are implicitly listed
        b) Basic competencies (KD) are implicitly listed
        c) Compatibility of book contents with competency standards (SK) and basic competencies (KD). (BSNP, 2006)

     2. Component of Presentation
        a) Table of contents
        b) The purpose of each chapter
        c) Concept map or summary
        d) Key words
        e) Questions / practice questions in each chapter
        f) Bibliography

     3. Graphical components
        a) Book skin
        b) Fill in the book
        c) Readability (suitability in the selection of letters, illustrations and formats)
d) Quality of prints (clarity, flatness and print color)
e) Physical strength of books (fill paper, leather material, and binding system)

b. The Second Stage Assessment Instrument (Sub Component)

1. Components of content eligibility
   a) material coverage
   b) material accuracy
   c) up-to-date
   d) contains insight into productivity
   e) stimulate curiosity (curiosity)
   f) develop life skills
   g) develop a sense of diversity
   h) contains contextual insight

2. Linguistic Components
   a) according to the level of development of students
   b) communicative
   c) dialogical and interactive
   d) straightforward
   e) coherence and thoughtfulness of the flow of thought
   f) conformity with Indonesian language rules
   g) use of terms and symbols / symbols

3. Components of presentation
   a) presentation techniques
   b) supporting material presentation
   c) presentation of learning

4. Graphical component
   a) book size
   b) the leather part of the book
   c) section of book contents (BSNP, 2006)

2.5 Curriculum 2013

Inquiry model is a core part of the contextual-based learning activities. Knowledge and skills students are expected not from the results given set of facts, but the result of finding it on their own (Trianto, 2010). Inquiry model is a process that varies and includes activities to observe, formulate relevant questions, evaluating books and other information sources critically, plan investigation, reviewing what is already known, carry out experiments to obtain data, analyze and interpret data and communicate results (Suyanti, 2010). Inquiry model is a teaching method that tries to put the base and develop a scientific way of thinking. In applying this method, more students are required to learn on their own and trying to develop creativity in development a problem that it faces its own. Inquiry teaching methods will create conditions conducive to effective learning and, as well as simplify and expedite the learning activities (Sudjana, 2004).
3 Research Method

This research uses research and development (R & D) method. This research has been conducted in Junior High School in Medan, North Sumatra. The study was conducted in September-October 2018.

The population in this study is science teachers in junior high schools in Medan. The sample in this study were twenty of science teachers. The teacher sample must be minimum MIPA undergraduate qualification and were actively involved in the laboratory (as a validator of the practicum guide developed). Determination of the sample was done by purposive sampling technique.

The procedure of this study is a modification of the development model by Borg and Gall (1983) and the development model of Dick and Carey (2005) which becomes 5 stages, including: analysis phase, development stage, validation stage, revision stage and evaluation stage. but in this study only focused to the analysis of research stage by 20 science teachers. In summary, the flow of the research procedure is shown in Figure 3.1.

In this research used a questionnaire to validation of practical guidance with the scale of research used to analyze the standard of teaching materials is 1 to 5. Where 1 as lower score and 5 as higher score. Determination of the range can be known through the highest scores.
range reduced range of the lowest score divided by the highest score. The criteria for the validity of the analysis of the average used can be seen in Table 3.1 below:

<table>
<thead>
<tr>
<th>Average</th>
<th>Criterion Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,75</td>
<td>Valid and not need revision (very decent)</td>
</tr>
<tr>
<td>5,00</td>
<td></td>
</tr>
<tr>
<td>3,26</td>
<td>Valid and not need revision (decent)</td>
</tr>
<tr>
<td>4,00</td>
<td></td>
</tr>
<tr>
<td>2,51</td>
<td>Sufficiently valid and does not need</td>
</tr>
<tr>
<td>3,25</td>
<td>revision (sufficient)</td>
</tr>
<tr>
<td>1,76</td>
<td>Less valid, most of the contents of the</td>
</tr>
<tr>
<td>2,50</td>
<td>book needs to be revised (less decent)</td>
</tr>
<tr>
<td>1,00</td>
<td>Invalid and need revision total (not</td>
</tr>
<tr>
<td>1,75</td>
<td>decent)</td>
</tr>
</tbody>
</table>

4 Result And Discussion

This research was conducted on the science practice manual for junior high school written by Pratama Mitra Aksara, Mediatama and the teacher's own essay. Feasibility analysis is carried out on aspects of content, language, presentation and graphics.

I. Aspect of Feasibility Content

There are eight (8) components indicator feasibility of contents standarization in practical guidance chemistry integrated guided inquiry model grade XI in high school, namely: 1) suitability practicum with the material; 2) The purpose of practicum; 3) Basic theory; 4) Tools of practicum; 5) Material of practicum; 6) Procedure of experiment; 7) Observation table; and 8) Questions.

Fig. 4. The Feasibility in Practical Guidance Integrated Guided Inquiry Model and Practical Guidance Used School Research is Based on the Aspect of Feasibility Content.
II. Aspect of Feasibility Language

There are four (4) components indicator feasibility of language standardization in practical guidance chemistry integrated guided inquiry model grade XI in high school, namely: 1) conformity with the development of learners; 2) Communicative; 3) Compliance with the rules of English language is good and true; 4) The use of terms and symbols.

![Language Feasibility Graph](image)

**Fig. 5.** The Feasibility in Practical Guidance Integrated Guided Inquiry Model and Practical Guidance Used School Research is Based on the Aspect of Feasibility Language.

III. Aspect of Feasibility Presentation

There are four (4) components indicator presentation feasibility of standardization in practical guidance chemistry integrated guided inquiry model grade XI in high school items, namely: 1) consistency of systematic in practical guidance; 2) The ability to stimulate the depth of thinking learners; 3) Attachment: Reference; 4) centered on the students.

![Feasibility Presentation Graph](image)

**Fig. 6.** The Feasibility in Practical Guidance Integrated Guided Inquiry Model and Practical Guidance Used School Research is Based on the Aspect of Feasibility Presentation.

IV. Aspect of Feasibility Graphing
There are three (3) components indicator presentation feasibility of standardization in practical guidance chemistry integrated guided inquiry model grade XI in high school items, namely: 1) Typographic practical guidance covers; 2) The illustration practical guidance covers; 3) Typographic contents of the practical guidance.

**Fig. 7.** The Feasibility in Practical Guidance Integrated Guided Inquiry Model and Practical Guidance Used School Research is Based on the Aspect of Feasibility Graphing.

**5 Conclusion**

Based on the aspect of feasibility the content in practical guidance integrated guided inquiry model and used school subject have an average of 4.15 (valid that meaning decent and doesn’t need revision) and 2.69 (valid that meaning sufficient and doesn’t need revision (sufficient)). The aspect feasibility of language in practical guidance integrated guided inquiry model and used school subject average of 4.00 (valid that meaning decent and doesn’t need revision) and 2.59 (valid that meaning sufficient and doesn’t need revision). The aspect feasibility of presentation in practical guidance integrated guided inquiry model and used school subject have an average of 4.06 (valid that meaning very decent and doesn’t need revision) and 2.56 (valid that meaning sufficient and doesn’t need revision). The aspect feasibility of graphing in practical guidance chemistry integrated guided inquiry model and used school subject have an average of 4.08 (valid that meaning decent and doesn’t need revision) and 2.58 (valid that meaning sufficient and doesn’t need revision).

**Acknowledgments.** This research was supported by thesis supervisor Prof. Dr. Ramlan Silaban, M.Si. And Dr. Ir. Nurfajriani, M.Si that have given the suggestion in order to complete this research.

**References**

Synthesis of A and X Zeolites from Non Magnetic Ash of Rice Husks Through the Hydrothermal Process in the Alkaline Bases Condition

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Abstract. In the general, rice mills produce rice, husks and brand around 72, 20 and 8 % respectively. The burning of rice husks produce ash around 18 %. Ash of rice husks contain silica which is zeolite-forming mineral around 88%. The purification ash of rice husks was conducted through a magnetic separation process using a bar magnet in water. Magnetic separation process produce 92.36 % non magnetic ash of rice husks and 5.64% impurities magnetic. The synthesis of zeolite from non magnetic ash of rice husks through hydrothermal process in an alkaline condition. It was carried out by starting process of forming sodium silicate and aluminate compounds through the reaction of non magnetic ash of rice husks with Al₂O₃ and NaOH in water accompanied by stirring at 600 rpm in the room temperature for 10 hours. Then the results of reaction was refluxed at 70°C for 3 hours so that a mixture of gel was produced. After being stored for 12 hours or more at room temperature, the mixture of gel was refluxed again at 100°C for 7 hours until A-zeolite was produced. However, the production of X-zeolite which the mixture of gel was refluxed at 120°C for 8 hours. The results of FT-IR and XRD charaterization showed that the A-zeolite has infrared absorption bands in the wave number region of 426.26, 603.24, 1000 cm⁻¹ and diffraction peaks at 2θ angles of 12.42, 17.65, 21.63, 28.70 and 33.51 degrees. Whereas the X-zeolite showed infrared absorption bands in the wave number regions of 440.70, 606.44, 745.14, 1007.88 cm⁻¹ and diffraction peaks at 2θ angles of 12.34, 17.51, 21.53, 27.90, 28.50 and 33.22 degrees.

Keywords: Ash of rice husks, zeolite, synthesis, characterization.

1 Introduction

Environmental pollution is a common problem because it concerns health and safety life of humans and living things. The burning of rice husks can produce toxic gases of CO and CO2 which cause a depletion or leakage of the ozone layer. The results of chemical composition analysis showed that ash of rice husks contained around 96.26 - 97.10% of silica (SiO₂). It was very potential as a material to synthesize zeolite (Usman et al., 2014). Zeolite synthesis includes the stages of gel formation and crystallization carried out through a hydrothermal process at a temperature smaller than 300 °C under alkaline conditions. The amount of 1-3 M NaOH solution need an optimum condition to process the gel formation and zeolite crystallization. Of aluminum and silicon became an aluminate [Al(OH)₄]⁻ and a silicate [Si(OH)₄]⁻ which are very important in the zeolite formation process. Murat et al. (1992) has successfully synthesized zeolite A from the kaolin which has been calcined through
hydrothermal treatment in an alkaline condition. Meanwhile, Shigemoto et al. (1993 and 1995) showed that the melting of fly ash and NaOH solution followed by a hydrothermal reaction at 100 °C produced zeolite Na-X. On the other hand, zeolite Na-A produced by reaction fly ash and NaOH with added aluminium to the reactant. Zeolites are defined as crystalline alumina silica with a frame of three-dimensional arrangement formed from tetrahedral alumin. Silica which are interconnected through the use of shared oxygen atoms to form regular molecular dimensional cavities. In simple terms the zeolite structure can be imagined as the designation of honeycomb with cavities formed by tetrahedral of alumina and silica relationships (King, 1994).

Zeolites with their distinctive structure look interesting in physical and chemical properties. Some of the chemical properties of zeolite which are widely studied and utilized extensively are the nature of adsorption selectivity, ion exchangers and active catalysts. Zeolite from ash of rice husks can be used as a active catalyst in the converter to increase its power so that it is known as a catalytic converter.

2 Experimental

2.1 Chemicals

Al2O3, NaOH, Na2EDTA were used directly. The pulp waste and ash of rice husks must be prepared before used.

2.2 Rice Husk Ash Preparation

The amount of 20 grams of rice husk ash mixed with 100 ml of distilled water were stirred using a bar magnet for a few seconds. Then, the bar magnet was taken and the ash attached to the magnet was removed as a magnetic impurity. The process of disposal of magnetic impurity was repeated until the ash left behind. It was only non-magnetic rice husk ash which will be used as a materials to synthesize zeolite.

2.3 Synthesis

2.3.1 Synthesis of Zeolite A

Zeolite synthesis is carried out through a hydrothermal process as follows a total of 5 g of non-magnetic rice husk ash was mixed with 13.6 g of NaOH, 8.075 g of Al2O3 and 1.5 g of Na2EDTA in distilled water up to a total volume of 100 mL. The mixture was stirred on a hot plate with magnetic stirrer at 600 rpm for 10 hours at room temperature. Then the mixture was refluxed for 3 hours at a temperature of 70°C. The mixture was stored for a night at room temperature then refluxed again for 8 hours at 90-100°C. Solid substances resulting from reflux are washed until got a neutral pH in the washing water.

2.3.2 Synthesis of Zeolite X

Zeolite synthesis was carried out through a hydrothermal process as follows a total of 5 grams of non-magnetic rice husk ash mixed with 12.66 g of NaOH, 6.21 g of Al2O3, and 1.5 g
of Na$_2$EDTA in distilled water up to a total volume of 100 ml. The mixture was stirred on a hot plate with magnetic stirrer at 600 rpm for 10 hours at room temperature. Then, the mixture was refluxed for 3 hours at a temperature of 70°C. The mixture was stored for a night at room temperature then refluxed again for 8 hours at 110-120°C. Solid substances resulting from reflux were carefully washed in the water until a neutral pH was achieved.

2.4 Characterization

2.4.1 Infrared Spectroscopy

Infrared spectroscopy is one of the easy and rapid methods to characterize the structure of zeolite. The fundamental vibrations of zeolite structure appear in the wave number area of 1500-300 Cm$^{-1}$ which is a medium infrared region. But in this study according to the available tools, measuring infrared spectroscopy was carried out in the wave number area 1500-400 Cm$^{-1}$.

2.4.2 Powder X-ray Diffraction

Powder X-ray diffraction is an appropriate method for characterizing zeolites both qualitatively and quantitatively. Qualitative information for a zeolite can be achieved by the powder X-ray diffraction method. The fingerprint area diffract to gram zeolite can be estimated. It can be matched with a standard diffract to gram. The crystallinity and purity level of the zeolite synthesized and the characterization was carried out by X-ray diffraction at the area of diffraction angle (2θ): 4 - 40 degrees.

2.4.3 Atomic Absorption Spectroscopy

Atomic Absorption Spectroscopy is a quantitative elemental analysis method whose measurements are based on the absorption of light with a certain wavelength by a metal atom in a free state. The measurement of Al and Si levels used wavelengths ($\lambda$) 309.3 and 251.6 nm respectively.

3 Results And Discussion

3.1 Non Magnetic Ash of Rice Husks

Rice husk ash was obtained from burning rice husks at 600°C for 4 hours. The ash produced from the burning of rice husks is shown in Table 1.
The ash produced from burning rice husks averaged around 19.2%. This is in accordance with the results of Usman, et al (2014), the burning rice husks at a temperature of 500-900°C for 2 hours produced ash around 17.57-21.83%. While the results achieved by Sapei, et al (2015) from burning rice husks at 750°C for 5 hours produced ash around 22.6%. In the burning of rice husks, compounds such as cellulose, hemicellulose, and others contained in rice husks were converted to CO₂ and H₂O with ash remaining around 13.1-29.04% (Houston, 1972). Furthermore, rice husk ash was treated with magnetic separation so that it obtained non-magnetic rice husk ash which would be used as material for zeolite synthesis. The results of magnetic separation of rice husk ash are shown in Table 2. Magnetic separation successfully removed magnetic impurities from rice husk ash around 5.5-6.5% so that non-magnetic rice husk ash was produced around 91-93%.

<table>
<thead>
<tr>
<th>Rice husk ash (g)</th>
<th>Rice husk ash (%)</th>
<th>Material lost (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.0</td>
<td>4.8</td>
<td>19.2</td>
</tr>
<tr>
<td>25.0</td>
<td>4.9</td>
<td>19.6</td>
</tr>
<tr>
<td>25.0</td>
<td>4.8</td>
<td>19.2</td>
</tr>
<tr>
<td>25.0</td>
<td>4.7</td>
<td>18.8</td>
</tr>
</tbody>
</table>

Table 2. Results magnetic separation of rice husk ash.

<table>
<thead>
<tr>
<th>Rice husk ash (g)</th>
<th>Non magnetic ash of rice husks (g)</th>
<th>Non magnetic ash of rice husks (%)</th>
<th>Magnetik impurity (g)</th>
<th>Magnetik impurity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.0</td>
<td>18.6</td>
<td>93.0</td>
<td>1.1</td>
<td>5.5</td>
</tr>
<tr>
<td>20.0</td>
<td>18.2</td>
<td>91.0</td>
<td>1.2</td>
<td>6.0</td>
</tr>
<tr>
<td>20.0</td>
<td>18.2</td>
<td>91.0</td>
<td>1.3</td>
<td>6.5</td>
</tr>
<tr>
<td>20.0</td>
<td>18.4</td>
<td>92.0</td>
<td>1.2</td>
<td>6.0</td>
</tr>
</tbody>
</table>

Analysis of the chemical composition of non magnetic rice husk ash through spectrometry using x-ray fluorescence equipment produces spectra as shown in Figure 1.

Fig. 1. Spectra results from the analysis of the chemical composition of non magnetic fly ash.
Based on the peaks that appear can be identified the type and concentration of elements contained in the non-magnetic rice husk ash as shown in Table 3.

<table>
<thead>
<tr>
<th>Element</th>
<th>Concentration (Wt %)</th>
<th>Intensity (cps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mg</td>
<td>0.161</td>
<td>92.0</td>
</tr>
<tr>
<td>Al</td>
<td>2.083</td>
<td>661.0</td>
</tr>
<tr>
<td>Si</td>
<td>88.180</td>
<td>58679.0</td>
</tr>
<tr>
<td>P</td>
<td>0.922</td>
<td>208.0</td>
</tr>
<tr>
<td>S</td>
<td>0.762</td>
<td>244.0</td>
</tr>
<tr>
<td>Ag</td>
<td>2.468</td>
<td>311.0</td>
</tr>
</tbody>
</table>

The presence of Si elements in the non-magnetic rice husk ash as silica (SiO2) is evidenced from the results of the characterization of infrared spectroscopy and powder X-ray diffraction in Figures 2 and 3.

Fig. 2. Infrared spectra of non-magnetic rice husk ash

Infrared absorption bands in the wave number region 1101, 794, and 468 cm\(^{-1}\) are characteristic silica absorption bands.

Fig. 3. Diffractogram of non-magnetic rice husk ash
The diffraction peaks that appear at angles (2θ˚) between 21 - 25° indicate amorphous silica. Because of non-magnetic rice husk ash contains high levels of silica around 88.18%, it is very suitable to be used as a material for zeolite synthesis.

3.2 Zeolite A

Zeolite A is produced from the hydrothermal process of a mixture of non-magnetic rice husk ash and alumina compound (Al2O3) with a mole ratio of Si/Al around 1.00. Lowenstein's rule which rejects the existence of Al-O-Al bonds says that there is generally a mole ratio of Si to Al equal to 1 in zeolite A but it is possible the ratio is higher or the mole ratio of Si to Al is greater than 1 (Dwyer and Dyer, 1994). In the mixture of non-magnetic rice husk ash and alumina compounds were added Na2EDTA compounds because in the non-magnetic rice husk ash there were magnesium (Mg) metal ions which could interfere the zeolite formation process. Catalfamo et al. (1994) found that materials with a calcium ion content of more than 3% by weight of material could not be converted into zeolites, due to the specific interaction between calcium ions and silicates which dissolved aluminasila gel. The interaction of calcium ions with silicates can be suppressed as small as possible with the addition of EDTA, which can selectively form complexes with calcium ions. Magnesium ions have properties similar to calcium ions which can interfere the zeolite formation.

Furthermore, the synthesized zeolite from non-magnetic rice husk ash was characterized by infrared spectroscopy shown in Figure 4. The absorption band that appears in the wavenumber region of 443.2 cm⁻¹ marks the buckling vibration of the T-O bond from the tetrahedral TO4 (T is Si or Al). While the strong absorption band that appears at 1000 cm⁻¹ its asymmetric stretching vibration. These two types of vibrations are TO4's internal tetrahedral vibrations. Whereas the external vibration between the tetrahedral junction of TO4 is shown in the absorption bands which appear at 603.2 and 678.2 cm⁻¹ which indicate the double ring vibration. The absorption bands contained in this spectrogram are the characteristics of zeolite A because the infrared spectogram with absorption bands that appear in 4 wave number regions 1250-950, 650-500, 500-420 and 400-300 cm⁻¹ are typical infrared spectograms of zeolite A. Of the four typical infrared absorption bands of the zeolite, there are two absorption bands at 1250-950 and 500-420 cm⁻¹ are generally applicable to all zeolites, while the absorption band at 650-500 cm⁻¹ is a typical absorption of zeolite A which marks vibrations of double 4 ring (Flanigen et al, 1971).

![Fig. 4. The infrared spectrogram of synthesized zeolite A from non-magnetic rice husk ash](image-url)
To determine the purity and crystallinity degree of synthesized zeolite A, were characterized by powder X-ray diffraction at diffraction angle (2θ): 0-50° as shown in Figure 5.

The peaks diffraction which indicated the presence of A zeolite were shown at the diffraction angle (2θ): 12.42, 17.65, 21.36, 28.07, 30.81, and 33.35. The six diffraction peaks correspond to the main peaks of zeolite A. Imbert et al. (1994) which revealed that the crystallinity of zeolite A synthesized was determined by the total intensity of the 10 main peaks at d: 2.626, 2.987, 3.278, 3.407, 3.714, 4.107, 5.510, 7.110, 8.750 and 12.290 which correspond to the diffraction angle value: 34.1, 30.0, 27.2, 26.2, 24.0, 21.6, 16.1, 12.4, 10.1 and 7.2°. Based on the number of typical zeolite A main peaks that compared to the number of typical zeolite A main peaks which resulted by Imbert et al. It can be estimated that zeolite A produced from non-magnetic rice husk ash has a level of crystallinity around 60%. However, the solid zeolite can be estimated to have a high purity levels which are indicated by the absence of diffraction peaks of other minerals. The diffraction peaks have high intensity and sharp.

Based on the results of Atomic Absorption Spectroscopy measurements at wavelengths of 309.3 and 251.6 nm, Si and Al levels in synthetic zeolite A were calculated about 16.5 and 14.8% respectively. Thus, the Si to Al mole ratio in zeolite A from non magnetic rice husk ash is around 1.075 or 1.1. This is in accordance with Lowenstein's rules (Dwyer and Dyer, 1994).

### 3.3 Zeolite X

Zeolite X is produced from the hydrothermal process of a mixture of non-magnetic rice husk ash and alumina compound (Al2O3) with a mole ratio of Si/Al around 1.30. The synthesized zeolite from non magnetic rice husk ash was characterized by infrared spectroscopy in the area (300 - 1500) cm⁻¹ to identify the fundamental tetrahedral vibration of TO4 (T is Si or Al) which are the building units of the zeolite X structure. The fundamental vibration of zeolite structures in the medium infrared region can be classified in 2 classes of vibration, namely internal vibrations and external vibrations. The vibrational frequency observed for tetrahedral TO4 does not distinguish between tetrahedral silica and alumina, but it’s the mean frequency of the tetrahedral vibrations. Moreover, all peaks caused by internal
Vibrations are very sensitive to composition in the structure of the zeolite framework. For example, the increase in Si content causes the absorption peak in the 568 cm\(^{-1}\) wave number area to shift towards the higher wave area (Hamdan, 1992).

Infrared spectra show absorption bands in four wave number regions 440-540, 500-650, 750-820 and 1000-1120 cm\(^{-1}\) which mark the typical structure of zeolite X. The presence of a strong absorption band at a wave number of 1007 cm\(^{-1}\) marks the vibrational range internal asymmetry of O–Si–O or O–Al–O of TO4 (Wang et al. 2013 and Bahri et al., 2015) while the absorption band at 745 cm\(^{-1}\) marks the vibration of the external symmetry range of O–Si–O or O–Al–O (Socrates, 1994). Meanwhile the absorption band at 440 cm\(^{-1}\) shows the bending vibration of O–Si–O or O–Al–O. As for the six double ring vibration (D6R) which is characteristic of the zeolite X is shown by the infrared absorption band at wave number 606.1 cm\(^{-1}\).

Furthermore, the synthesized zeolite X was characterized using powder X-ray diffraction to determine its purity and crystallinity. The diffractogram is shown in Figure 6.

![Diffractogram of zeolite X as a result of synthesis from non magnetic rice husk ash](image)

The peaks diffraction which indicate the presence of X zeolite were shown at the diffraction angle (2\(\theta\)): 12.34, 17.51, 21.53, 27.9, 28.5 and 33.22. The six diffraction peaks correspond to the main peaks of zeolite X. Von Balmoos (1984) suggested that the crystal structure of zeolite X as shown by diffraction peaks at the following angles (2\(\theta\)): 6.12; 10.00, 11.73, 15.43, 18.42, 20.07, 22.47, 23.31, 26.65, 29.21, 30.30, 30.94, 31.98, 33.59, 34.18 and 37.34\(^{\circ}\). Among these diffraction peaks, the peak that appears at an angle (2\(\theta\)): 6.12, 10.00, 11.73, 15.43, 23.31, 26.65, 30.94, 31.98 and 33.59\(^{\circ}\) are the main typical peaks of zeolite X which have relatively higher intensity than other peaks. X-zeolite synthesized from non-magnetic rice husk ash has six peaks which correspond to the typical peak of zeolite X according to Balmoos with the highest intensity at the diffraction peak of 27.9. This means that the zeolite synthesized by crystallinity is around 66.7\%. But these zeolite solids can be estimated to have high purity levels which are indicated by the absence of diffraction peaks of other minerals and the diffraction peaks that appear to have high intensity and sharp.

Based on the results of AAS measurements at wavelengths of 309.3 and 251.6 nm, Si and Al levels in synthetic zeolite A were calculated about 16.34 and 12.7\% respectively. Thus it can be determined that the Si to Al mole ratio in zeolite X from non magnetic rice husk ash is around 1.23.
4 Conclusions

The burning of rice husk produce ash around 19.2% and the magnetic separation results non-magnetic ash of rice husk around 91-93%. The non magnetic ash of rice husk content SiO₂ around 88.18% so it can be used as material for synthesis of zeolite.

A and X zeolites produced from non magnetic ash of rice husk have a level of crystallinity around 60 and 66.7% respectively.

Acknowledgements. Thank you to the Medan State University Research Institute for funding this research through the Expertise Lecturers Group research scheme. Appreciation is expressed to Rizky Kurniawan and Essy Risa Pradina Perangin-angin who had helped the implementation of this research.

References

The Improvement of Student Communication and Mathematical Disposition Ability Through Problem Based Learning Model at UNIMED FMIPA Students

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Abstract. The active involvement of students in learning must be supported by providing special activities that are student-centered so that they can do "doing math" to find and build mathematics facilitated by lecturers. One aspect of "doing math" is to improve mathematical communication skills. The existence of communication skills will certainly bring students to a deep mathematical understanding of mathematical concepts. In addition to mathematical communication skills, an attitude that must be possessed by students is needed, including appreciating the beauty of mathematics, having high curiosity and learning mathematics. With such an attitude, students are expected to develop mathematical abilities, use mathematics to solve problems faced in their lives, and can develop mathematical dispositions. This research conducted on students of FMIPA with the aim of: (1) knowing students' mathematical communication skills taught by using problem based learning learning model and talking learning model; (2) knowing the differences in students' mathematical disposition abilities taught using Problem Based Learning model and talking learning model; (3) produce a mathematical learning device in the form of an appropriate LAS used to improve students' mathematical communication; (4) produce teaching materials in the form of textbooks with appropriate problem-based learning model used to improve students' mathematical communication

Keywords: Mathematical communication, mathematical disposition, Problem Based Learning

1 Introduction

Mathematics as a means of scientific thinking is needed to develop the ability to think logically, systematically and critically. Similarly, mathematics is the basic knowledge needed to support success in higher education, even needed by everyone in everyday life. However, the quality of education has not shown the expected results. Constraints faced in the learning process of mathematics are the lack of interesting teaching materials for students and also the low ability of students to communicate mathematically to solve problems given. If the learning resources are less attractive and seem monotonous, it will reduce the quality of learning so that students' understanding of the material being taught becomes hampered.

One of the initial activities in improving learning is designing learning tools that refer to a model to facilitate learning. Learning design can be used as a starting point for efforts to improve the quality of learning. This means that the improvement of the quality of learning...
must begin with improving the quality of learning design, and designing learning with a system approach. In addition to learning devices, factors that influence the low quality of education include student mathematical communication skills. However, in the field shows students' mathematical communication skills are still low. The low mathematical communication of students can be seen with the low results achieved by students if given questions that are different from the existing examples. Students who know the basic concepts are not able to connect between conditions that are related to solving different problems.

The learning model provided so far still gives an impression that is not good for students and can educate them to be individualistic. They are more likely to view mathematics as a collection of rules and exercises that can bring boredom, because students' activities only repeat procedures or memorize algorithms without being given the opportunity to interact more with others. Thus most of the activities of students are practicing solving problems. Whereas what is desired is to be an independent student, and able to face challenges. The active involvement of students in learning must be supported by providing special activities that are student-centered so that students can do "doing math" to find and build mathematics facilitated by the teacher / lecturer.

From the statement above, one aspect that is emphasized in the curriculum and NCTM is to improve students' mathematical communication skills. Mathematical communication skills are basically goals and learning outcomes that will be achieved in learning at any level, therefore mathematics learning should always be aimed at the realization of mathematical communication skills so that in addition to mastering mathematics well students also perform optimally. In addition, the low learning competence of mathematics is also influenced by the lack of active participation of students in classroom learning. This greatly inhibits students from solving problems. This participation is closely related to students' mathematical communication skills. The low mathematical communication skills make it difficult for students to digest the questions given so they cannot solve the problem. Mathematical communication skills refer to the indicators outlined above, namely presenting mathematical statements verbally, written, pictures, and diagrams.

From the assessment of the affective domain, it can be seen how important it is to increase mathematical dispositions in the learning-learning process of mathematics. In the teaching-learning process, mathematical dispositions can be seen from students' desire to change strategies, reflect, and carry out analysis until a solution is obtained. Students' disposition of mathematics can be observed in class discussions. For example, how much students want to learn mathematics, the desire to explain the solutions they obtain and maintain their explanations. However, the attention of the teacher / lecturer in the teaching and learning process towards students' mathematical dispositions is still lacking.

Recognizing the importance of mathematical communication and disposition skills the teacher / lecturer must strive for learning by applying learning models that can provide opportunities and encourage students to practice mathematical communication and disposition skills. In mathematics learning with the lecture approach, students' communication skills are still very limited only to short verbal answers to various questions posed by the lecturer. Lecturers can accelerate the improvement of mathematical communication by giving mathematical tasks in various variations. Mathematical communication will play an effective role when conditioning students to listen actively as well as they talk about. Therefore, the change in learning view from the teacher teaching to students learning has become the main focus in every mathematics learning activity.

Many learning models can be used to develop students' abilities. The learning model used should be able to help students to solve their problems independently. Here requires the role of
lecturers to be able to bring their students to have this ability. The learning model chosen should be tailored to the methods, media and other learning resources that are considered relevant in conveying information and guiding students to be involved optimally, so that students can gain learning experience in order to develop their abilities such as mental, intellectual, emotional and social skills and or cognitive, affective and psychomotor. Thus the selection of appropriate learning models can arouse and encourage students to improve students’ understanding of certain learning materials. In the teaching and learning process (PBM) Problem based Learning learning models are very in line with the new paradigm of education. This learning is a systematic and structured learning strategy. For that reason, one of the solutions offered in improving the mathematics learning process, especially to improve the mathematical communication and disposition skills of FMIPA Unimed students is by using the Problem Based Learning learning model.

2 Review Of Literature

2.1 Problem Based Learning Model

Problem Based Learning (PBL) is a learning model that uses real world problems as a context for learning about critical thinking and problem solving skills, as well as acquiring essential knowledge and concepts from subjects. Ibrahim, et al (2015: 3) states that Problem Based Learning (PBL) is learning that presents to authentic and meaningful problem situations that can facilitate them in conducting investigations and inquiry. Likewise Arends (2015: 56) problem-based learning is a learning model in which students work on authentic problems with the intention to compile their own knowledge, develop inquiry and higher level thinking skills, develop independence and confidence.

From the opinions of experts taken the conclusion of problem-based learning is a learning approach that uses the problem as a starting point for learning. Problems that can be used as a learning tool are problems that meet the real world context, which are familiar with the daily lives of students. Through these contextual problems students rediscover knowledge of essential concepts and ideas from the subject matter and build them into cognitive structures. Problem-based learning characterized as follows:

a. Submission of Problems or Questions.

Problem-based learning organizes learning around questions and social problems that are important for students and society. The question or problem is authentic (real) for students and does not have a simple answer. The question or problem must meet the following criteria: authentic, mystery, meaningful, broad, and useful

b. Focusing on Interdisciplinary Linkages

Problems raised in problem-based learning may be centered on certain subjects. The proposed problem should be truly authentic so that in the solution students review the problem from many aspects or relate it to other disciplines.

c. Authentic investigation

Problem-based learning requires students to conduct authentic investigations to find real solutions to real problems. Students must analyze and define problems, develop hypotheses and make predictions, collect and analyze information, conduct experiments (if necessary), make references, and form conclusions.

d. Produce Products / Works and Showcase them
Problem-based learning requires students to produce certain products in the form of works and demonstrations that explain or represent the form of problem solving found. The product can be in the form of reports, physical models, videos, or computer programs. The work is displayed by students in front of his friends.

e. Collaboration

Problem-based learning is characterized by students working with each other in small groups. The advantages of working together in small groups among which students can give each other motivation to engage in complex tasks and increase opportunities to share inquiry and dialogue and to develop social skills and thinking skills.

2.2 Talking Learning Model

Talking learning model is a teaching center model. According to Arends (2015: 294), this model is one of the teaching models specifically designed to support student learning processes related to well-structured declarative knowledge and procedural knowledge that can be taught with a step-by-step activity pattern.

The characteristics of the learning model (in Trianto, 2016: 46) are as follows:

(1) Objectives and student learning outcomes

Learning theorists generally distinguish two kinds of knowledge, namely declarative knowledge and procedural knowledge. Memorizing certain laws or formulas in the fields of mathematics, chemical physics is an example of simple declarative knowledge. Procedural knowledge requires mastery of prerequisite knowledge in the form of declarative knowledge. The teachers always want students to obtain both types of knowledge, so that they can do an activity and do everything successfully.

(2) Syntax or overall pattern and flow of learning activities.

Direct teaching according to Kardi (in Trianto, 2009) can take the form of lectures, demonstrations, training or practice, and group work. Direct teaching is used to convey lessons that are transformed directly by the teacher to students.

(3) Learning environment and management system

Direct teaching requires careful planning and implementation on the part of the teacher. The learning management system carried out by the teacher must ensure the involvement of students, especially paying attention to, listening to, and reciting (question and answer) planned. This does not mean that learning is authoritarian, cold, and humorless.

2.3 The Ability of Mathematical Communication

Communication skills of students is the ability of students to communicate mathematics that is learned as the content of the message that must be delivered. Thus, mathematical communication is the ability of students to communicate which includes the activity of using the skills of reading, writing, listening, studying, interpreting, and evaluating ideas, symbols, terms, and mathematical information observed through the process of listening, presenting, and discussing. Ansari (2013: 54) describes the notion of mathematical communication in an outline consisting of oral and written mathematical communication. Oral mathematical communication can be interpreted as a mutually interacting event (dialogue) that occurs in a classroom or small group environment, and there is a transfer of messages containing mathematical material that is being studied both between the teacher and students and between students themselves. While mathematical writing communication is the ability or skill of students in using their vocabulary, notation, and mathematical structure both in the form of
reasoning, connection, and in problem solving. If we look at this understanding, communication in mathematics can be interpreted as an interconnected event / dialogue that occurs in a classroom environment, where a message transfer occurs. The message that is transferred contains about the mathematics material learned in class. The parties involved in communication events in the classroom are teachers and students. While the way to transfer messages can be done in writing or verbally. Therefore, with the discussion in groups, conversations that express mathematical ideas will help students to hone their minds so that they will understand mathematics better. The communication process also helps students develop their own language to express mathematical ideas, and help build understanding and accuracy of ideas and make them delivered to others.

Mathematical communication skills can occur when students: 1) express mathematical ideas through speech, writing, demonstration, and visualize them in different types, 2) understand, interpret, and assess ideas presented in writing, verbal, or in visual form, 3) construct, interpret and relate various representations of ideas and relationships. In this study, mathematical communication skills are limited to writing communication, which is seen from the aspect of (1) representations: writing mathematical situations or ideas into drawings, explaining in writing pictures into mathematical ideas, formulating mathematical ideas into the model mathematics, and (2) explanations: explain the procedure for settlement.

2.4 The Ability of Mathematical Disposition

Mathematical disposition is a student's attitude towards mathematics that can be realized through his actions in completing mathematical tasks. Mathematical disposition is called Sumarmo (2014: 85) as a desire, awareness, tendency and strong dedication to students to think and act mathematically in a positive way. Student's disposition of mathematics is realized through attitudes and actions in choosing an approach to completing a task. Whether done with confidence, curiosity in finding alternatives, diligence, and students' tendency to reflect on their thinking.

Mathematical disposition is one factor that determines the success of student learning. Students need a disposition that will make them persistent with more challenging problems, to take responsibility for their own learning, and to develop good habits in mathematics. Unfortunately, teachers tend to reduce the burden of learning mathematics with a view to helping students even though it is something that is important for students.

As for seeing the mathematical disposition of students, can be done by making a disposition and observation scale. The disposition scale contains the statements of each of the disposition components. For example “to understand the question given, I tried to solve it in various ways”. While through observation, students' dispositions can be seen whether there are changes when students get and work on the questions and assignments given. For example when the learning process is taking place it can be seen whether students in solving math problems are difficult to give up or keep trying in various ways so that they get the right answer.

Based on the mathematical disposition indicators that have been stated above, the indicators of mathematical disposition in this study are: (1) confident in using mathematics, (2) flexible in doing mathematical work (mathematical), (3) persistent and tenacious in doing math tasks, (4) having curiosity in mathematics, (5) reflecting on ways of thinking and performance on oneself in learning mathematics, (6) appreciating mathematical applications, and (7) appreciating the role of mathematics / opinions about mathematics.
3 Methods

This study was a quasi experiment, that was a research means to know whether or not a result of something that is important to students, in other words, the experiment research was trying to search whether or not the causal relation. Its implementation involves two groups of experiments, i.e. classes that are taught by using a model Problem Based Learning was referred to as experimental class A and class being taught by using a model of talking called as an experimental class B. The design of the research using Pretest-Posttest Control Group Design. The sample that has been taken was grouped by two group experiment i.e. the first group as experimental class of A and second group as experimental class of B. Both sample class give the pretest to find out the ability or students understanding about the material that will be taught before we do the learning and to retrieve the homogen sample.

4 Research Procedure

4.1 Preparation Stage

In the preparation stage, the activities carried out are as follows:
   a. Determine the place and arrange a research implementation schedule that is adjusted to the schedule in the school.
   b. Determine population and research sample.
   c. Develop Student Worksheets
   d. Prepare data collection tools, in the form of pretest and posttest.

4.2 Implementation Phase

At the implementation stage, the activities carried out are as follows:
   a. Validating the research instrument questions then tested the validity of the test, reliability of the test, the level of difficulty of the problem.
   b. Giving pretest to both classes to measure students' initial ability to the material to be taught in both classes and to obtain a homogeneous sample.
   c. Conduct learning in two classes with the same material and time, only different learning models.
   d. Provide the posttest to both classes to measure the level of mastery of the material that has been taught. The time and duration of the posttest implementation in both classes are the same.

4.3 Final Stage

In the final stage, the activities carried out are as follows:
   a. Calculate the difference between the results of the pretest and the results of the posttest for each class.
   b. Compare these differences by assessing and reviewing the process of answers.
   c. Test hypotheses of students' mathematical communication and disposition abilities using t statistics to determine whether the score difference is significant or not.
5 Relevant Research

In connection with the improvement of the learning process through the use of Problem Based Learning learning models that aim to improve the ability of student communication and disposition, it has been carried out through several preliminary studies by the research team. Among them: Efforts to Improve Reasoning Ability and Mathematical Communication By Applying Discovery Learning Model assisted by Student Worksheets (Purba, 2018); Improvement of Mathematical Problem and Disposition Ability through Cooperative Learning Model Type TGT (Nurain, 2013); Difference between Problem Solving Ability and Mathematical Communication Between Students Given Problem Based Learning and Direct Learning (Marzuki, 2014). Another similar study is the ordering theory test method for the development of calculus subject matter, learning innovations to improve mathematical reasoning skills by using coop-coop type cooperative models, and improving student learning outcomes with reciprocal teaching (Simanjuntak) learning strategies. And also the 2013 study by (Rajagukguk and Simanjuntak), Development of Mathematics Teaching Materials Based on Integrated Problems to Improve Critical Thinking Ability of Middle School Students. Suhendra’s (2015) research results in his research on high school students concluded that student learning outcomes in aspects of mathematical communication skills for students who received problem-based learning in small study groups were significantly better than students who had classical problem-based learning as well as students who learned conventional.

Harijanto’s (2013) research results are also not much different, namely the use of teaching material products with the application of Problem Based Learning shows an increase in student learning outcomes, which is indicated by differences in the mean scores of pre-test and post-test. In his research shows that the use of instructional material products from the development can increase student scores by 26.50%.

Innovations made in these studies have succeeded in improving student learning outcomes and get a good response to the learning process that is not monotonous centered on the teacher / lecturer. Based on the experience of researchers who have also carried out research can ensure the success rate of high research plans. Researchers are experienced and successful in improving the learning process through the innovation of the use of learning methods and media. The results of the study have also been applied in the classroom as a contribution to the researchers for improving learning.

Acknowledgements. Authors retrieve the support from State University of Medan. Authors say thank you for the support from research institution of State University of Medan and the Faculty of Mathematics and Natural Science of this university

References


Analysis of Student Anxiety Level in Science Integrated Learning Process

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Abstract. This study aims to determine the students anxiety level in learning at Madrasah Tsanawiyah Negeri 3 Kabupaten Tebo. This research is a qualitative descriptive research with the subject of research of class VIII students consisting of 2 classes. Data obtained through observation, documentation, interview and questionnaire on students covering physical, cognitive and emotional aspects. The results showed that students anxiety level in class VIII A was 50% (medium category) on physical aspect, 58% (medium category) on cognitive aspect and 56% (moderate category) on emotional aspect. In class VIII B data students anxiety level acquired 55% (medium category) on physical aspect, 56% (medium category) on cognitive aspect and 61% (high category) on emotional aspect. Based on these results it can be concluded that the students anxiety level in learning at Madrasah Tsanawiyah Negeri 3 Kabupaten Tebo is in medium category.

Keywords: Student Anxiety, Science Integrated Learning

1 Introduction

At Junior High School level/MTs, Biology, Chemistry and Physics are studied integratedly on Natural Science subjects. Depdiknas (2011) in Putri (2013) showed that integrated science learning is an approach to science teaching that connects or integrates various fields of IPA study into a single unit. Integrated science learning should also include the dimensions of attitudes, processes, products, applications, and creativity in the learning environment and students are expected to have holistic science knowledge to deal with daily life issues contextually through integrated science learning. The breadth of the scope of the Integrated IPA learning that must be mastered by the students requires readiness in the implementation of the learning process because students' readiness in receiving the lessons will ultimately affects the learning outcomes. Soejanto (1991) in Dessy Mulyani (2013, p. 27-28) showed that students' readiness is very important to achieve success in learning activities. The success of students doing readiness before following the lesson can determine the success of students in learning, so that it will affect student’s achievement. If the student is not ready to accept the lesson, it will affect the student’s psychic condition. For example, the student feels nervous when the teacher askshim/her to stand in front of the class.

According to MOH RI (1990) in Ika (2014, p. 126) anxiety is a tension, insecurity and anxiety arising from perceived unpleasantness. anxiety can also be interpreted as someone’s excessive concern for the future and his past as well as his abilities (Cowden, 2010). In each
student, the symptoms of anxiety that appear are different. Usually it is seen from the physical conditions that ultimately affect the ability of these students in learning. Robert Priest in Namora (2009, p. 15-16) reveals that in times of anxiety the body reacts to physical reactions including the throbbing symptoms; trembling; tension; anxious and restless. Related to learning, there are two kinds of anxiety, survival anxiety and learning anxiety. Learning anxiety can arise because of fear of trying new things that are feared to be too difficult to do, besides that fear will make us look stupid in the effort. Learning anxiety is also influenced by concerns to get out of the comfort zone that has been lived. However, learning anxiety will always be there but if students accept and understand their need to learn, then this can be overcome (Coutu, 2012). Bolliger & Halupa (2012) found that there was a real relationship between anxiety and satisfaction in learning. It can be stated that students who have low or moderate levels of anxiety have a high level of satisfaction and the other hand.

The results of observation which is conducted at MTs N 3 of Tebo District on February 13th, 2017 showed that there are some symptoms such as sound and shaking legs, cold sweats, disturbed concentration, and nervousness. All of these symptoms occur when the student is asked by the teacher or asked to speak in front of the class, this is done by the teacher to keep the students focus during the learning but not all students match with the method of learning like this. Based on the results of the study, shows that anxiety affects academic achievement (Harris & Coy, 2003; McCratty, 2003 in Yaman (2014, p. 1118), mathematical connection ability (Ika, 2014), attitudes and retention (Elliot & Smith, 2003; Gaudry & Spielberger, 1971; Levitt, 1966; Miller et al, 2001 in Hullinger & Hogan, 2014, page 32). In addition anxiety can be affected by increase of grade level, mother and father education level and decrease on academic achievement scores for science lesson (Karakaya et al, 2016, page 29). If this anxiety is not dealt immediately, it can lead to other disorders such as panic and stress, but if it can be controlled, the students will gain optimal learning achievement. Based on the problems above, it is necessary to analyze the Anxiety level in integrated science learning process.

2 Research Method

This research is a qualitative descriptive research. The subject of the study were the students of class VIII MTs Negeri 3 Tebo Regency. The total number of the subject was 40 which were divided into 2 classes namely class VIII A and class VIII B.

The data were obtained through anxiety questionnaire which consisted of 20 statements which were analyzed by using Likert Scale, 5 answer choices consisting of Very Frequently (SS), Frequently (S), Rarely (J), Ocassionaly (KK), Never (TP). The average score of student anxiety level was then categorized by percentage as seen in table 1 below:

<table>
<thead>
<tr>
<th>Percentage (%)</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>81 – 100</td>
<td>Very high</td>
</tr>
<tr>
<td>61 – 80</td>
<td>High</td>
</tr>
<tr>
<td>41 – 60</td>
<td>Average</td>
</tr>
<tr>
<td>21 – 40</td>
<td>Low</td>
</tr>
<tr>
<td>0 – 20</td>
<td>Very low</td>
</tr>
</tbody>
</table>
In addition, the data were also obtained from the interview and observation on the implementation of learning in the classroom. Symptoms of student’s anxiety that were studied included the physical, cognitive and emotional aspects.

3 Results And Discussion

After tested the validity and reliability of the questionnaire, it was obtained the result that there were 20 statements declared valid and reliable to use. The results of the questionnaire showed that there were three aspects which have anxiety ranges between 50-60% with the details in table 2 below:

<table>
<thead>
<tr>
<th>Aspects</th>
<th>VIII A</th>
<th>VIII B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical</td>
<td>50 %</td>
<td>55 %</td>
</tr>
<tr>
<td>Cognitive</td>
<td>58 %</td>
<td>56 %</td>
</tr>
<tr>
<td>Emotional</td>
<td>56 %</td>
<td>61 %</td>
</tr>
</tbody>
</table>

Table 2 above shows fluctuations in the percentage of anxiety levels on the physical, cognitive and emotional aspects. The students’ anxiety level was categorized Medium category. The emotional anxiety aspect in class VIII B is at High category. Basically the relationship of anxiety level of students in the learning process is very important because if students are too anxious in the process of learning, the learning process cannot runs efficiently.

Some of the students which were interviewed said they felt anxious when they are asked to come to the front of the class. The anxiety makes the body tremble and the heart beat fast resulting in shame, nervousness, fear and tension. This is in line with the teachers’ statement. Furthermore, the teachers stated that the things that cause the anxiety that were experienced by the students are they are not ready to receive the lesson, many students who play games when the teacher convey the material and they do not listen to the material explanation conveyed by the teacher. The teacher also stated that the student's attitude can be solved by themselves because the anxiety they feel comes from themselves.

What the students expressed was supported by the observations in the learning process. It seemed that the students were lack of attention in the learning process. It is indicated by some students who were chatting and playing games in the classroom, bored; saturated and drowsy. It is assumed that the problem caused by the lack of method and media used by the teacher, therefore, the students were lack of attention and not interested in the lesson. Basically, the teachers play an important role in creating an active and fun learning atmosphere. Fisher (1988) in Novita and Anita (2006) states that classroom teachers can help to reduce students’ anxiety by creating an interesting classroom atmosphere, such as using humor, games and activities with a high level of relaxation. Students’ anxiety can also be reduced by providing students with a sense of security, a relaxed but organized atmosphere, as well as a well-organized curriculum and schedule. Competitive class situations should also not be implemented. Basically, teachers are expected to apply a method of learning that can reduce
students’ anxiety levels. As a result, the students’ behavior and achievement can be better. When the environment in which the student is in support (both at home and at school) they can get success and good academic experience (Cowden, 2010).

Grainger in Sri (2010, p. 13-14) suggests that individuals make decisions about their anxiety based on two factors namely internal factors and external factors. The internal factors are related to everything that comes from the inside of the student that supports learning, such as intelligence, talent, motor skills of the senses, and thinking scheme. External factors are everything that comes from outside of the students that condition them in learning. For example, experience, social environment, teaching-learning methods, learning strategies, learning facilities.

Basically, every individual is always trying to overcome anxiety by making adjustments to the causes of anxiety arise. This anxious reaction describes the subjective feelings that arise in the form of uncomfortable tension. Based on that, Burhnhem in Sri (2010: p.13-14) who said that the source of anxiety would be more easily explored by examining three basic causes: 1) confidence that may be threatened by doubt about outward appearance and ability 2) our personal well-being may be threatened by uncertainty about the future, doubts in decision making and material concerns, 3) our well-being may be threatened by unsolved conflicts.

People with anxiety disorders generally often struggle with anxiety that is difficult to control. Their attempts to control fear usually fail and they suffer from a number of symptoms, both physical and psychological affecting social aspects, occupations and life functions in general. They are very easy helpless and often feel depressed and difficult to focus, sometimes they feel so great tension that they can not to think. When this disorder arises in children, the anxiety and fear they feel is usually associated with school performance or athletic activity. They constantly feel worried, if they cannot do schoolwork, even they are worried about the situation when they are not evaluated. Most cases occur when the individual is at a young age.

Basically anxiety in low and moderate levels have a positive effect on student learning performance, one of which can increase learning motivation (Supri et al, 2013, p. 287), but it will contribute to learner if his/her target is significant. Because of this, families, school administrators and teachers should not be in ideas and expectations that will increase learning anxiety on learner (Karakaya et al, 2016, page 29). Some things that can be done by teacher to reduce the level of student learning anxiety is problem-based learning, discussing with students the test procedures that can be done by them, sharing knowledge and testing skills. Parents can teach their children the skills that needed to have control over the lesson. With this assistance both teachers and parents play a role in controlling the learning anxiety felt by students (Dobson, 2012: p. 32).

4 Conclusion

From the results and data analysis, it can be concluded that the level of anxiety students in the learning process in MTs Negeri 3 Kabupaten Tebo are categorized as moderate level. The factor of anxiety are the unpreparedness of students in receiving lessons and the lack of attention and interest of students in the learning process.
References


Improvement of Learning Outcomes by Direct Instruction (DI) Learning Model in General Chemistry Course

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Abstract. The learning activities of General Chemistry course are still more dominated by lecturers by requiring students to do assignments and solve chemical concept questions. This led to a lack of understanding of students which resulted in low learning outcomes of general chemistry courses. Even though the concept can be related to students' daily lives by applying effective learning models in accordance with teaching materials. The purpose of this study was to determine whether there were significant differences in learning outcomes between the classes taught with PBL models and the classes taught in the DI model in the General Chemistry course at the Chemistry Education department of FMIPA Unimed. The population consists of 2 classes, each of which consists of 26 students taught with different learning models. After the data is tested normal and homogeneous by using SPSS, the hypothesis is tested using t test. Based on the results of the hypothesis test, it is known that the value of Sig. 0.065 <0.10. So it was said that there were significant differences in learning outcomes of classes taught with PBL models with classes taught with the DI model in General Chemistry courses. This study concludes that for the General Chemistry subject learning, it is better to use the PBL model than the DI model.

Keywords: PBL model, DI model, General Chemistry

1 Introduction

Improving human resources in Indonesia, for instance by renewal in the field of education, namely by improving the quality of educators and education personnel by taking advanced study programs that are relevant in domestic and abroad, conducting training and upgrading, implementing Tri Dharma PerguruanTinggi for lecturers, the existence of lecturer certification, Higher Education Accreditation and so on. But the reality on the ground shows that educational achievement in Indonesia is still far below other Asian countries. Based on the United Nations Development Program (UNDP) report, it was seen that the 2013 HDI (Human Development Index) was ranked 121 of 187 countries. Whereas in 2015, it is still around the order of 108 out of 187 countries (UNDP, 2015).
Chemistry studies about the composition, structure, properties, changes in material, and changing energy changes. Chemistry subject can be packaged more simply than it actually is. Learning especially chemistry lessons, teachers are required to have adequate ability in carrying out their learning activities and must be able to realize an effective learning environment and are better able to manage their class so that student learning achievement is high.

The 2012 results of the Program for International Student Assessment (PISA) show that the science scores achieved by Indonesian students are also still below the international average score, which is 382. This achievement ranks Indonesia 64th out of 65 participating countries (Pambudi, 2016). According to data from the Ministry of Education and Culture (Kemendikbud, 2016), Indonesia the average score of the National Chemistry Examination in 2014/2015 from 67,478 students is 77.90 where more than 20% of student scores are still below 70.00. This shows that there is still a need to increase the value of Chemistry learning in Indonesia.

In Unimed, the subjects which are closely related to the mastery of basic chemical materials are General Chemistry courses. From the profile data of the organizer of the subject education process with General Chemistry shows that the results of the General Chemistry course joint examination for the last 5 years are still low, where in each semester it does not reach 50% graduation (archive of chemistry education majors, 2016). The learning done so far is still dominated by lecturers and has not considered the learning model. In this study, in addition to the Direct Instructional (DI) model that has been commonly used, Problem Based Learning (PBL) learning models will be used. The use of the right learning model is one of the important things as a means of teaching and learning activities to convey knowledge to students and improve learning success (Assriyanto, 2014).

2 Subject Of General Chemistry

General Chemistry Courses are compulsory subjects for new students, Semester 1 and 2 at FMIPA Unimed. This is because this course is a joint subject that must be mastered to be able to achieve a bachelor's degree at FMIPA Unimed. During this time, learning activities are still dominated by lecturers by requiring students to work on tasks and solve chemical concept questions. Even though the concept can be related to students' daily lives by applying effective learning models in accordance with teaching materials. The use of the right learning model is one of the important things as a means of teaching and learning activities to convey knowledge to and improve learning success (Assriyanto, 2014).

Chemistry was born from the desire of chemists to get answers to what and why the nature of matter exists in nature, each of its will produce facts and theoretical knowledge about matter whose truth can be explained by mathematical logic. Some aspects of chemistry are visible which means that concrete facts can be made and some aspects are only abstract (invisible) meaning they are not proven by mathematical logic so that rationality can be
formulated. Chemistry is defined as a science that studies the structure, composition, nature, and changes in material and energy that accompany these material changes (Ministry of National Education, 2003).

Chemistry as a process can mean all scientific activities to perfect knowledge and to find new knowledge. The chemistry learning process emphasizes giving direct experience to develop competencies so that students are able to explore and understand the natural environment in a scientific manner. Obtaining experience in applying the scientific method through experiments or experiments, where students test hypotheses by designing experiments through instrument installation, retrieval, processing and interpretation of data, and delivering experimental results orally and in writing, is a scientific process that must be carried out to obtain knowledge new ones for students. Limitations of tools and materials in chemical learning can be overcome by using a Virtual lab.

3 Pbl Model And Di

The learning process is an interaction of learning between teachers and students. While the problem in essence is a question that contains answers. So that problem-based learning is an interaction activity between the teacher and students by using questions that contain answers (Asra, 2013). Problem-based learning, later abbreviated PBL, is a learning model that involves students to solve a problem through the stages of the scientific method so that students can learn knowledge related to the problem and at the same time have the skills to solve problems (Ngalimun, 2014) Kivela (2005) describes a problem-based learning model as a learning model that can encourage students to learn independently and improve thinking skills. In short, it can be said that learning starts from one problem and solving problems is the goal of each lesson.

In PBL there is working group and discussion that requires students to interact with their friends so that new knowledge and skills arise. This knowledge is built through the process of asking questions, group work, discussion and debate when presenting their work, which requires thinking skills, which students can learn communicatively and effectively. In connection with this, Asra (2013) writes that problem solving ability requires a thought process. If the problem can be solved, the student learns something new. Therefore the ability of students to think needs to be improved. .

Direct Interaction teaching model later abbreviated as DI is a teaching model that is teacher center. According to Arends in Trianto (2014). Direct teaching model is one of the teaching approaches specifically designed to support student learning processes that are related to well-structured declarative knowledge and procedural knowledge that can be taught with a step-by-step, gradual activity pattern. In addition, direct learning models are also intended to help students learn basic skills and obtain information that can be taught step by step. Joyce, Weil (2011) wrote that the direct learning model begins with the teacher's explanation of new concepts or skills to students.

David (2009) explained that direct learning is learning that is designed to teach knowledge and basic skills that students need for subsequent learning. Direct learning is very useful especially when there are skills that can be mapped into specific steps. Direct learning steps emphasize the role of educators and activate the role of students to build concepts in students. In this case learning should use a variety of appropriate media, such as films, pictures, demonstrations, as well as virtual labs.
4 Virtual Lab

Virtual lab is a form of learning media by using a laboratory to make observations or experiments through software run by a computer, where all the equipment needed by a laboratory is contained in the software (Eko, 2014). There are two main concepts of computer laboratories (Tyder, 2008), namely real estate computer replacements so that experiments take place in the form of virtual animation or experimentation, and laboratory experiments are described as virtual when experiments are not controlled by direct manipulation of laboratory equipment but with computer equipment. Virtual laboratories provide many benefits that are very useful as a medium to teach safe and cheap, effective to teach abstract concepts that are difficult to understand to overcome the lack of facilities, tools and materials in the laboratory, the expensive tools and chemicals can be overcome with the help of computers.

5 Research Methodology

This research was carried out in 2018 at the Chemistry Education Study Program at FMIPA Unimed. The population in this study were all students of chemistry education study programs who were taking course of General Chemistry which amounts to 4 classes. The class sample was determined as much as 2 classes from 4 classes that were available in the Chemistry Education study program by random sampling. While the research sample consisted of 26 students in each class.

Data Analysis Technique uses descriptive analysis to describe the data, including: average value (mean), median, standard deviation (SD) and data tendency using the SPSS program.

Analysis requirements test used in the form of normality test (NPar Tests), with One-Sample Kolmogorov-Sminov Test and homogeneity test using the OneWay Test of Homogeneity of Variances. While to see whether there is a difference in student learning outcomes, the t test is used.

Testing criteria are:
Reject H0, if “t” counts>“t” table

6 Research Result And Discussion

<table>
<thead>
<tr>
<th>No.</th>
<th>A1</th>
<th>A2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>90</td>
<td>80</td>
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<td>2</td>
<td>87.5</td>
<td>77.5</td>
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<tr>
<td>3</td>
<td>85</td>
<td>77.5</td>
</tr>
<tr>
<td>4</td>
<td>82.5</td>
<td>75</td>
</tr>
<tr>
<td>5</td>
<td>82.5</td>
<td>75</td>
</tr>
<tr>
<td>6</td>
<td>80</td>
<td>72.5</td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>72.5</td>
</tr>
<tr>
<td>8</td>
<td>77.5</td>
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<td>77.5</td>
<td>70</td>
</tr>
<tr>
<td>10</td>
<td>75</td>
<td>67.5</td>
</tr>
<tr>
<td>No.</td>
<td>A1</td>
<td>A2</td>
</tr>
<tr>
<td>-----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>11</td>
<td>75</td>
<td>65</td>
</tr>
<tr>
<td>12</td>
<td>72.5</td>
<td>65</td>
</tr>
<tr>
<td>13</td>
<td>70</td>
<td>62.5</td>
</tr>
<tr>
<td>14</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>15</td>
<td>77.5</td>
<td>80</td>
</tr>
<tr>
<td>16</td>
<td>77.5</td>
<td>77.5</td>
</tr>
<tr>
<td>17</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>18</td>
<td>72.5</td>
<td>75</td>
</tr>
<tr>
<td>19</td>
<td>70</td>
<td>72.5</td>
</tr>
<tr>
<td>20</td>
<td>72.5</td>
<td>72.5</td>
</tr>
<tr>
<td>21</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>22</td>
<td>70</td>
<td>70</td>
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<tr>
<td>23</td>
<td>67.5</td>
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<td>65</td>
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<tr>
<td>25</td>
<td>62.5</td>
<td>65</td>
</tr>
<tr>
<td>26</td>
<td>60</td>
<td>62.5</td>
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<tr>
<td>SUM</td>
<td>1955</td>
<td>1867.5</td>
</tr>
<tr>
<td>MEAN</td>
<td>75.2</td>
<td>71.8</td>
</tr>
</tbody>
</table>

Note:
A1 = Group of student taught by PBL model
A2 = Group of student taught by DI model

Table 2. Normality Test N Par Test.

<table>
<thead>
<tr>
<th></th>
<th>A1</th>
<th>A2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td><strong>Normal Parameters</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>75.1</td>
<td>71.8</td>
</tr>
<tr>
<td>Std.</td>
<td>923</td>
<td>269</td>
</tr>
<tr>
<td>Deviation</td>
<td>7.34</td>
<td>5.36</td>
</tr>
<tr>
<td>n</td>
<td>585</td>
<td>459</td>
</tr>
<tr>
<td><strong>Most Extreme</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absolute</td>
<td>.086</td>
<td>.127</td>
</tr>
<tr>
<td>Positive</td>
<td>.069</td>
<td>.098</td>
</tr>
<tr>
<td>Negative</td>
<td>-.086</td>
<td>-.127</td>
</tr>
<tr>
<td><strong>Test Statistic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.086</td>
<td>.127</td>
</tr>
<tr>
<td><strong>Asymp. Sig. (2-tailed)</strong></td>
<td>.200(^{c,d})</td>
<td>.200(^{c,d})</td>
</tr>
</tbody>
</table>

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

Based on result of Normality test Kolmogorov Smirnov, known that value of Sig. Class A1 and A2 > 0.05. Therefore if Sig > 0.05, data is normally distributed, so can be concluded that distribution of postest outcome Class A1 and A2 are normal.
Homogenity Test

Table 3. Normality Test N Par Test.

<table>
<thead>
<tr>
<th>Model</th>
<th>Levene Statistic</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.730</td>
<td>1</td>
<td>50</td>
<td>.194</td>
</tr>
</tbody>
</table>

Table 4. Anova

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>f</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>147.236</td>
<td>1</td>
<td>147.23</td>
<td>3.</td>
<td>.</td>
<td>6</td>
</tr>
<tr>
<td>Within Groups</td>
<td>2068.510</td>
<td>5</td>
<td>41.370</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2215.745</td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on result of Normality test Kolmogorov Smirnov, known that value of Sig. Class A1 and A2 > 0.05. Therefore if Sig > 0.05, data is normally distributed, so can be concluded that distribution of postest outcome Class A1 and A2 are normal.

Table 5. Hypotesis Test of T-Test

<table>
<thead>
<tr>
<th>Model</th>
<th>Kelas PBL</th>
<th>Kelas DI</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>6</td>
<td>75.192</td>
<td>3.087</td>
<td>1.44064</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>6</td>
<td>71.826</td>
<td>5.36459</td>
<td>1.05208</td>
<td></td>
</tr>
</tbody>
</table>

7 Conclusion

This research conclude that study the course of General Chemistry is better to use learning model of PBL than learning model DI, where the outcomes of study the student using PBL model higher than DI model.
Acknowledgements. Acknowledgments to DRPM DIKTI for the support of the doctor's dissertation research (PDD) and the Unimed Leader who has given me permission to study permit.

References

[12] UNDP, Human Development Index and its component Tabel 1( diakses tanggal 15 Februari 2016)
Antibacterial Activity Analysis of Zanthoxylum Acanthopodium DC Extract on Bacteria of Bacillus Subtilis, and Salmonella Typhi

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Abstract. Research has been conducted on the antibacterial activity analysis of Zanthoxylum acanthopodium DC extract on Bacillus subtilis, Salmonella typhi using disc diffusion method. This study aims to determine the ability of Zanthoxylum acanthopodium DC extract in inhibiting the growth of Bacillus subtilis, and Salmonella typhi. Zanthoxylum acanthopodium DC was extracted by maceration method using 96% ethanol. In this extraction process, phytochemical test was carried out to find out the secondary metabolite content in Zanthoxylum acanthopodium DC. Phytochemical test indicate Zanthoxylum acanthopodium DC contained alkaloids, tannins, saponins, and steroids. Antibacterial activity analysis were measured in three concentrations of 25%, 50%, 75%. The best antibacterial activity was observed on Salmonella typhi bacteria with 75% extract concentration which produced a clear zone diameter of 19 mm and 20 mm.

Keywords: Zanthoxylum acanthopodium DC, antibacterial, disc diffusion

1 Introduction

Indonesian society has hundreds of years had the tradition of using plants from the surrounding environmental as traditional medicine. Spices are also used in the pharmaceutical industry (medicine) and cosmetic industry.

Food is a major human need and composed of chemical compounds which are nutrients also needed by microbes to help their growth. The presence of microbes in food come from various sources, such as raw materials, apparatus used during the processing, food storages, people involved in processing and the surrounding environment. Based on the collected data from several cases of poisoning in community, most are caused by bacteria of Bacillus subtilis, and Salmonella typhi. Bacillus subtilis is a Gram-positive bacteria form an oval-shaped endospore in the central part of cell. (Aini et al. 2013), whereas Salmonella typhi is a bacterial strain that causes typhoid fever.

Based on the research conducted by Helwina Shasti, et all in 2017 on “In Vitro Antibiotic Activity Test of (Zanthoxylum acanthopodium DC) Andaliman extract on growth of Staphylococcus aureus”, the extract of andaliman (Zanthoxylum Acanthopodium DC) has the effect of antibiotics on bacterial growth of Staphylococcus aureus. In this study, it would like
to examine of Antibacterial activity analysis of Zanthoxylum acanthopodium DC Extract On Bacteria Bacillus subtilis, and Salmonella typhi”

2 Research Method

The andaliman extract was obtained by maceration using ethanol. The dried andaliman fruit was made into powder and then macerated for 3 days using ethanol. The extract was concentrated by rotary evaporator to reduce the solvent. Concentrated extract was prepared into solution in different concentration (25%; 50% and 75%). The antibacterial activity was analysed using Kirby-Bauer method as a method for testing the antimicrobial susceptibility of bacteria based on the growth of inhibition zones size on a lawn culture around disks impregnated with the antimicrobial agent. The extract was also tested for its secondary metabolites content to determine the secondary metabolites presence. The secondary metabolites were analysed including the flavonoids, alkaloids, saponin, tannin, steroids and terpenoids.

3 Results And Discussion

Phytochemical screening and antibacterial activity are presented in the tables below.

Table 1. Secondary Metabolite Phytochemical Screening Test on Ethanol Extract

<table>
<thead>
<tr>
<th>No</th>
<th>Phytochemical Screening</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Flavonoid</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>Saponin</td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>Tannin</td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td>Steroid</td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td>Alkaloid</td>
<td>+</td>
</tr>
<tr>
<td>6.</td>
<td>Triterpenoid</td>
<td>-</td>
</tr>
</tbody>
</table>

Description: (+)= Exist; (-)= Not exist

Table 2. Antibacterial Test Results

<table>
<thead>
<tr>
<th>No</th>
<th>Bacteria</th>
<th>Concentration</th>
<th>Clear Zone diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>$d_1$</td>
</tr>
<tr>
<td>1.</td>
<td><em>Bacillus subtilis</em></td>
<td>25 %</td>
<td>10 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 %</td>
<td>11 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75 %</td>
<td>14 mm</td>
</tr>
</tbody>
</table>
In Table 1, it can be seen that andaliman phytochemical screening contains saponins, tannins, steroids and alkaloids. The antibacterial activity of andaliman extract on Bacillus subtilis (14 mm and 15 mm) and Salmonella typhi (19 mm dan 20 mm) shows the highest activity at 75% concentration. The concentration of 25% of two bacteria was classified as medium strength while the extract with a concentration 50-75% is strong because it has inhibition zone of 11-20mm, 5-10 mm of medium strength, while <5 mm is categorized to be low strength.

Referring to general standard issued by David Stout it indicated microbes are susceptible to antibacterial if the plant has a size of inhibition of 10-20 mm. It confirm that andaliman extract with concentration of 50-75 % can be used as an antibacterial.

4 Conclusion And Recomendation

Conclusion
1. Extract of andaliman has the best antibacterial activity with Salmonella typhi at a concentration of 75 % with 19 and 20 mm of inhibition zone.
2. Secondary metabolite compounds found in andaliman extract which have antibacterial activity are alkaloids, steroids, tannins and saponins.

Recommendations
1. Further research is needed to determine the andaliman contents when using non-polar, and semi-polar solvents.
2. It also necessary to determine the structure of alkaloids, saponins, tannins, steroids and tannins which function as antibacterial.

Acknowledgement. The authors thank the Indonesia Kemenristek Dikti through Unimed Research Institute for funding this research.

References
The Use of Ethical Dilemma in Mathematics Lesson to Cultivate Students’ Ethical Awareness

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Abstract. Indonesian educational community has been focusing on character education recently. Character is usually cultivated upon a set of assumed values that is embraced in one’s social environment. This set of values closely related to awareness of ethical values and social relational system in society. Ethical consideration emerges upon the existence of others. The question is if we need to cultivate ethical awareness and consideration then how can we approach this ethical consideration in mathematics education. The researchers team believe that there are values in mathematics itself moreover in mathematics education. With this kind of assumption the researchers team are called to find a way to cultivate students’ ethical awareness through learning activities. According to some research one possible way for this purpose is the use of ethical dilemma problems. Dilemma occurred in a proposed problem will push a person to consider ethical values before making a decision. Hence, this article aims to describe the possibility of using such ethical dilemma problem in mathematics lecture to cultivate students’ ethical awareness. The research described in this article using critical interpretivism paradigm and represented in a narrative inquiry method.

Keywords: Ethics, Ethical Dilemma, Narrative Inquiry, Critical Interpretivism.

1 Introduction

Character education takes a special attention in Indonesian national education policy recently. Characters may be cultivated through a values embedded social and education environment. Thus the learning environment has an important role in the cultivation of individual characters. For this reason, teachers are expected to be able to integrate character values in learning. This ability needs to be developed since in the teacher's education process. Experiences gained by prospective teachers during their study in university are valuable capital for them that can be reapplied in the practice of their teaching when they become teachers later.

Considering this reason we, the researchers team, are encouraged to offer learning experiences in lectures of a particular subject that allow students to grow their awareness of ethical value considerations. By considering all courses available then we chose to conduct the study in the Selected Topic in Mathematics course. This course was chosen because this course covers topics that will be taught at school. By utilizing the topic in this course in cultivating ethical value awareness, it is expected that students as prospective teachers can
provide similar experiences to their students in the future. Hence, the question that arises now is how to grow students' ethical awareness through this Selected Topic in Mathematics course. Simanjorang (2016) states that there are two opportunities available in an attempt to integrate ethical values in mathematics learning. First is through uncovering the potential values in mathematics material itself and second is through its pedagogy. We believe that there are values in mathematics. As example consider the importance of universe in mathematics. The result of an operation of numbers depend on the universe where the operation is applied. In Integer $2 - 3 = -1$ while in positive number $2 - 3$ is undefined. In other words, correctness or truth in mathematics depend on it’s universe. Different system may come with different truth. In Euclidean geometry it is impossible to have two right angle in one triangle, while in particular Non-Euclidean geometry it is possible for us to have two right angles in a triangle. There is a potential value in this principle. Before deciding whether one’s answer is correct we need to consider the universe where the operation is applied. If this principle is applied in real life analogically, before we judge one’s opinion we need to consider the assumption one has as the basis for the opinion. Because, different assumption may implicate different consequence hence may result in different judgment. Awareness of the possibility of different truth that related to the assumption used emphasize the need for us to consider first other point of view before making our judgment. There are many other potential value within mathematics.

For this reason, it is necessary to consider the potential values embedded in the mathematical topic that will be taught and what kind of approach can be applied in learning so that ethical values are uncovered in the practice of learning. By paying attention to these two opportunities, thus one way to integrate ethical values in learning is to take advantage of the mathematical problems offered in mathematics learning. Selecting appropriate problems needs to be considered. In this regard we need to consider contexts that close to one’s life. The closer the problem offered to the individual's daily experience, the more likely it is that the problem triggers the individual's feelings and imagination (Simanjorang, 2016; Simanjorang, cs., 2017). When problems related to individual experience contain ethical considerations, awareness of ethical values itself will be cultivated. The ethical-dilemma problem is the right example for this purpose.

Settlemaier (2002) states that the use of ethical issues in learning through dilemmas can contribute to the development of social and emotional abilities and critical reflection of individuals. The dilemma encourages individuals to consider choices that both have unpleasant consequences (Settlemaier, 2002). The placement of individuals in this situation encourages him to consider the set of values he adopts before making his choice. If such problems can be formulated in mathematics learning then the mathematics learning class will be enriched with ethical values and students will be able to raise their ethical awareness through mathematics learning classes. The question is how mathematical problems used in learning can involve this ethical dilemma. This is the focus of this study. The problem in this study can be summarized as, "how is the form of the problems that contain ethical dilemma, which can be used in lectures in mathematics selectivity so that students' ethical awareness can be grown?" Hence, the purpose of this study is to develop problems that contain ethical dilemma, which can be used in lectures in mathematics, so that students' ethical awareness can be grown.

1.1 Ethics

Ethics is an ancient term that is interpreted differently over time. The history of ethics can be traced back to the ancient Greece. Socrates (William, 2006; Ahbel-Rappe & Kamtekar,
2009) asks, "How should someone live?" The efforts to answer this question subsequently led to various concepts about ethics. Aristotle raised a view on ethics of character that makes an individual a good human being (Crisp, 2004), thus good or bad depends on individual character. Another view came from the utilitarian who viewed that the goodness of an action is based on the consequences or outcomes of the action (Hinman, 2008). If an action ends in a good condition then the action can be seen as a good action. Meanwhile the Kantian views that doing good is the duty of each individual, and that any good action will be recognized anywhere in similar situations (Hinman, 2008). These three views attempt to answer Socrates' question by providing guidance on how to live with others from both the character and action point of view.

In addition to these three views there are other views that are not centered on character or action but rather on relationships between individuals. An individual needs to consider ethical values because of the presence of others around him (Chritchley, 1999). Meanwhile the existence of other people is not determined by any individual so the idea of the existence of others should come from the awareness and understanding of the existence of other individuals. The problem is that it is impossible to totally understand other individuals. What usually happens is that there is one’s tendency to reduce the original existence of other individual to an existence that can be absorbed and understood by that one person. Levinas (in Chritchley, 1999) said that ethics should be a place for the existence of individuals other than oneself who cannot be reduced to the same as the self. In other words, an individual should respect other individuals as they are, without trying to equate other individuals with oneself or reduce other individuals to the point of conditions that can be absorbed and understood by oneself. Moral awareness requires us ‘to respond to’ and ‘to welcome’ the presence of others without trying to reduce and absorb the essence of other people's existence to the point of how we are able to understand them. Welcoming the presence of others in this case means that in relationships with others one needs to respect the differences and uniqueness that other people have. Thus doing good is not the end result of ethics, but the experience of the true existence of others and the recognition of that existence (Simanjorang, 2016). Critchley (1999) asserts that moral awareness does not lead to experience of value but an access to the existence of individuals other than oneself.

1.2 Values in Mathematics Learning

One's view of something is based on one’s assumptions. Because of this, differences in views about the existence of values in mathematics need not to be debated because they are related to assumptions about mathematics itself. Ernest (1993) explained that mathematics is related to human knowledge, so that mathematics is bound to human culture and is embodied with the values and cultural context that is owned by its creator. Ernest further said that mathematics has rules and values that exist in the rules. When one considers these rules in a mathematical process it can be said that the person thinks mathematically.

Soedjadi (Gijse, 2010) said that students often do not use their mathematical abilities in everyday life but rather their mathematical thinking abilities. This mathematical thinking can be seen as a form of mathematical value itself. Swadener & Soedjadi (1988) provide a number of examples of values in mathematics characteristics. One is the importance of universe in mathematics. Different universe may determine different results of an operation in mathematics. So the truth in mathematics is very much related to the universe where the operation is applied.
The analogy of this value in everyday life may help students to appreciate different views and foster the desire to listen to the opinions of others with the consideration that there is a possibility of truth in the views of others. This awareness of the universe in mathematics may also increase awareness of the limits of one's point of view and the environment in which a person is located.

1.3 Ethical-Dilemma

Ethical-dilemma is a problem that places a person in two or more choices, each of which has unpleasant consequences (Settlemaier, 2002). Moral considerations itself is not far from the dilemma. The use of the dilemma problem in learning is based on the research of Kohlberg (1996) who developed six stages of moral development. Dilemmas can be presented in the form of stories, films or biographies (Frazer & Kornhauser, 1986). But the dilemma story is more often suggested to be used as a means to arrive at critical reflection and ethical discussion in the classroom (Settlemaier, 2003). Based on Kohlberg's theory the suitability of the dilemma problem in moral education lies in the ability of the dilemma to lead students to the value clarification stage, where students trace their own values through critical reflection and then compare and discuss them with the values believed by their peers, which if successful will lead to cognitive disequilibrium conditions (Piaget, 1977) which ultimately allows students to learn about ethical values.

2 Method

This research was built on the basis of a multi-paradigm view that is critical-interpretivism, which combines the paradigm of critical-theory and interpretivism. We, researchers team, chose to combine these two paradigms because the characteristics possessed by these two paradigms allow us to explore opportunities for the integration of ethical values into mathematics learning.

This research is intended to bring about changes in mathematics learning, involving consideration of ethical values in it through developing ethical dilemma problems that can be used in mathematics lesson, thus it is hoped that mathematics education can bring about a change in society towards a better future. This is in line with the view of critical-theory which tends to increase critical awareness and encourage the construction of a better moral vision of society (Taylor and Medina, 2013). In this case the researcher provides opportunities for students, as prospective teachers, who are the participants of this study to increase their awareness of the values and beliefs that shape their role in learning so far (Taylor, 2008) to further enable them to critically and creatively develop a better learning approach based on critical awareness of these values and beliefs. Critical-theory tend to highlight the problem of social inequality and emphasize positive changes in society (Carspecken, 1996). This is in line with the aim of this study, namely to bring change in society towards a better direction through increasing individual awareness of ethical values through related learning designs.

We use the interpretivism paradigm because in this study we wanted to build understanding based on the context of our own experiences (Taylor, Settlemaier & Luitel, 2012) in teaching Selected Topics in Mathematics courses to cultivate students' ethical awareness. Through reflection on this experience we may interpret our and other people's thoughts regarding the values and beliefs of each and how we and others are socially related.
Because each individual has a unique interpretation, which is inseparable from the subjectivity of the individual, related to the experience that passes through, the interpretive research allows researchers to utilize their subjectivity in the inquiry process to build understanding (Taylor et al., 2012).

By developing this research on the critical-interpretivism view, the appropriate methodology considered in this study is critical-autoethnography. The critical term in this methodology represents the view of critical-theory brought in this study that emphasizes change towards a better future. While autoethnography was chosen because in this study we wanted to explore how to integrate ethical values through the use of ethical-dilemma in learning, which utilizes the local context.

An understanding of such integration of the ethical values is traced through the life experiences of individuals involved in this study including us the research team ourselves. In other words, the efforts to understand the learning environment conditions that involve ethical values are approached from the researchers' personal experience in relation to the participants involved. This condition is in accordance with the characteristics of autoethnography which tend to link autobiograpy and personal with culture, social and politics (Elis, 2004). Through reflection on personal experiences we use our views to see how we relate to our cultural environment where we had those personal experiences (Simanjorang, 2016). The cultural environment in this case is the mathematics learning environment. Steps taken in this study are shown in figure 1. Data analysis in this study was conducted at the same time with the data collection because the revisions and changes that needed to be done at each lesson were based on the analysis of the previous lesson.

Fig. 1. Fishbone diagram for research steps

This is an on-going research that is being conducted in the Selected Topics in Mathematics course which includes those students who are participating in the course as participants. The research team will act as lecturers and observers. A number of data collection methods such as observation, interviews and student reflection notes will be used in this study, to meet the crystallization quality standards. The crystal has a large but symmetrical surface with a certain angle so it can reflect light beautifully. This crystal metaphor is used to represent how different views in research are valued and used to build deeper, more complex and rich understanding (Richardson, 2005).

3 Discussion

This research is still on-going. So far we are doing field study and data analysis steps in the process of developing ethical dilemma problems that may be used in mathematics lesson
to cultivate students awareness of ethical values. In the first lesson we used the idea of footprint calculator provided by WWF (accessible in https://footprint.wwf.org.uk). This calculator try to calculate our carbon footprint by considering four aspects of our daily life in its calculation such as: ‘Food’ which covers diet, food waste and buying habits, ‘Home’ which covers energy type and usage in the house and the presence of energy-saving measures, ‘Travel’ which covers personal and public transport usage for leisure and work, and flights, and ‘Stuff’ which covers the purchases of consumable items. This calculator than summarizes our average carbon emission also provides suggestion for us to reduce our carbon emission. Although this calculation is based on United Kingdom life style, it can be used as a starting point to trigger our students environmental awareness. By revealing our carbon emission footprint, it helps us to realize what we have done and what we should do for a better environment. Our students responses show the impact of introducing this footprint calculator to their awareness.

Lecturer: What do you have in mind after having your carbon footprint calculation result?
Student1: I become more aware about the nature and realize that we need to respect the nature and what it offers to us in order to have a sustainable nature.
Lecturer: So what intention do you have now?
Student1: Changing my lifestyle.
Lecturer: And how will you do that?
Student2: Reducing plastic usage, for example bringing our own shopping bag instead of using plastic bag from the shop.
Lecturer: What else?
Student3: Using our own container instead of bottle drink.
Student1: Reducing our traveling.
Lecturer: How can reducing our traveling contribute to the nature?
Student1: It may reduce the production of carbon.
Lecturer: What if we are traveling by bike?
Student1: Oh yes, it’s recommended.
Lecturer: Ok, what else do you have in your mind?
Student2: Using public transport.
Lecturer: How can using public transport contribute to the nature?
Student3: By using public transport we may reduce the amount of vehicle on the road since it may accommodate more people.

This conversation show how the discussion about carbon footprint calculator influenced the students and pushed them to think more about the nature. It is noticeable how they become more aware of the effect of their lifestyle. They also began to creatively and critically think a way for them to contribute to the nature sustainability. By asking the student to reflect on what we have just done in the lesson, they started to realize that it is possible to raise students’ awareness of environment and values through the application of mathematics in solving a problem. Hence, we may start to introduce the idea of using problems to cultivate students’ awareness of ethical values.

After that we chose statistic to discuss about the problem of plastic waste. In order to do that we started with some facts about plastic waste and problem caused by it. Through this discussion we can see how students’ empathy to the animals, which became victims of the irresponsible plastic waste disposal, were raised and they also became worried about the graveness of plastic waste problem to human and nature. After that we asked the students to collect data about plastic usage in their local area. In the discussion about the data they
collected we raise a question whether it is alright or not to continue using plastic. With their awareness of the graveness of plastic waste problem, they found that this question is a dilemma. Plastic is useful and there are many aspects in daily life that use plastic but it also may harmful to the nature and human. Actually it does not matter whether they choose to continue to use plastic or to stop using it. What is more important is the consideration they had before making that choice. Following conversation reveals students’ thought in the discussion about the dilemma.

Lecturer  So, what do you think about using plastic, is it still alright to use plastic?
Student1 Using plastic is bad, so we need to stop it. Consequently we need to develop an innovation to replace plastic in order to fulfil people needs. As an example there is someone who create an edible bag from seaweed. So, instead of using plastic bag we can use this edible bag.

Lecturer  Ok, this is a good idea. What we need daily is a container not the plastic. So, if we have to stop using plastic then we need to consider other material to replace plastic. This edible bags from seaweed is a good example for that. If it is edible then there will be no such plastic waste. Is there any other idea, please?
Student2 We can still use plastic, but instead of throwing it away after one time usage, we can clean it and use it again and again.
Lecturer  You mean ‘reuse’ the plastic, good. In some countries there is a policy to ban the usage of single use plastic. They encourage people to reuse plastic container that they have, this way they can reduce the plastic waste. Ok, any other idea, please?
Student3 In my opinion we can still use plastic, but instead of throwing it away we need to think of recycling it, for example to make toys.
Lecturer  Ok, if previous idea is about ‘reuse’ then now we have the idea of ‘recycling’. There are many toys or equipment we have that were created from recycled material including plastic. This is another good way to reduce plastic waste. Ok, any other idea, please? So far we have one person who suggest to stop using plastic while the other two suggest we can still use it with additional consideration.. Have you ever heard about 3Rs?...You haven’t... Ok, it’s reduce, reuse and recycle. You have raised the idea of reuse and recycle. The one left from 3Rs is reduce. If we can reduce our usage of plastic product then we can also reduce plastic wastes. For example why do we need to use a straw if we can drink straight away from a glass or bottle, or why do we need more plastic bags if we can use one? By reducing our usage then consequently the amount of plastic waste we produce later will be reduced too.

This conversation reveals different choices taken by the students and their suggestions as a consequence of their choice. All these thoughts are alternative solution they can come with after realizing the problem that come from plastic waste. Getting involved in such a discussion have pushed them to realize and to think about the problem. Being able to propose an alternative solution may be seen as an evidence that they have thought and reflected on the existing problem in other words aware of the problem. In addition to this, by hearing different ideas and choices with different consideration in the discussion they were getting in touch with different point of views. This opportunity may allow them to broaden their view in considering and responding to a particular problem.
4 Conclusions

Dilemma pushed students to reflect deeply on particular choices, because the unpleasant consequence from each choice demand them to think carefully before making a choice. Ethics is about one’s awareness and recognition of the existence of other then ethical dilemma will pushed students to be aware and to recognize the existence the other. From previous discussion it can be seen that it is possible to find an ethical-dilemma context that can be used in mathematics learning. The two examples discussed before show two different way to approach this possibility, they are: the application of mathematics concept and the task used in learning mathematics. The first example (carbon footprint) uses mathematics operations to help students being aware of the carbon problem. In other words, by applying mathematics concept students realize that the problem exist. The second example shows how collecting data process and presenting the data reveals the problem to the students. There will be different effect if the data was given to the students to be analysed. By collecting the data, students face and witness the fact and the summarize obtained from analysing and presenting the data enable the students to see the problem clearer. In this case,analyzing and representing data have a similar role with the application of mathematical operations in the first example.

References

ETHICS (Effective Technical and Human Implementation of Computer Based Systems): A human oriented information system development

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Abstract. The policy about teacher professionalism has been applied for last decade in Indonesia. However, science and technology development, changes in society, innovation in teaching and learning theory, and all other changes demand a sustainable teacher empowerment system. Considering this demand, it is necessary for UniversitasNegeri Medan, as an educational institution and also teacher training university, to develop a policy that support the empowerment system of professional teacher. In previous funding term such a system had been developed and one of components of this system is informational system. This article describes an aspect of this informational system development process, which is the development method used to build the informational system. There are many informational system developmental methods available. The question is which one is more suitable for the purpose of empowering teacher sustainably. Considering that the function of the informational system is to connect UniversitasNegeri Medan with the stakeholders including teachers, than the system needs to put importance to the human aspect. Hence the model described in this article is called ETHICS (Effective Technical and Human Implementation of Computer Based Systems). One that balances the human and technical aspects in developing the informational system.

Keywords: Informational System, ETHICS, Professionalism, Professional Teacher, Teacher Empowerment.

1 Introduction

Teacher professionalism is one of the policies that has been implemented since the past decade in Indonesia. The Act of the Republic of Indonesia number 14 year 2005 outlines a number of conditions that must be met by professional teachers including academic qualifications and a number of competencies that teachers must possess. This Act also guarantees the right of teachers to get the opportunity to improve their competence and academic qualifications through training and professional development in their fields. The question are how to manifest this guarantee; what policies need to be developed to support teacher professionalism; What efforts need to be made to improve the competence and qualifications of professional teachers?
As one of teacher training institutions in Medan Universitas Negeri Medan needs to think about the answers to these questions. Universitas Negeri Medan needs to develop policies that support current legislation for the sake of professional teacher empowerment through teachers self-development. This professional teacher empowerment in the end is expected to improve the quality of education and educational personnel in Indonesia. In this case the policy developed must be based on the principle of professionalism as described in the Act of the Republic of Indonesia number 14 year 2005 article 7 paragraph 2, that the self-development carried out should be democratic, just, non-discriminatory and sustainable by upholding human rights, values religious, cultural values, national pluralism, and professional code of ethics.

As a manifestation of Universitas Negeri Medan’s concern to the quality of professional teachers in North Sumatra region an integrated service center system for empowering teachers in North Sumatra has been developed previously in a different research. One variable in this integrated service system is the information system of the integrated service system itself. For that, as a continuation of previous research, this research is intended to develop an information system of integrated service systems developed in the previous year.

However, after the development of the model, a question then arises, "what information system is appropriate with the integrated service center system of professional teacher empowerment that has been developed before?". Such information system is expected to contribute to the efforts of improving the quality of national education services through the empowerment of professional teachers.

Information systems acts as a means to integrate the entire system and also to connect Universitas Negeri Medan as a service provider with service users (stakeholders). Thus, the information system also acts as a means of dissemination that disseminates important information to anyone who needs it.

2 Information System

As previously explained, the information system is one of the integrated service system variables, which function is to integrate the whole system and also to connect Universitas Negeri Medan as a service provider with service users (stakeholders). As a means of connecting the information systems should provide necessary information for stakeholders. Besides that this information system must also provide alternative communication channels between Universitas Negeri Medan and stakeholders.

A system is an integrated and organized unit that is formed from a number of different components and has the same purpose (Ossenbrugen, 1994). There are a lot of notes available for analysts who want to simplify the system. System theory generally tries to understand the nature of a broad and complex system, the same is true in information systems. However, system theory proposes that any model adopted by an analyst needs to consider things beyond the limits set by the adopted model and try to view the system as a whole. Information systems generally have human and computer elements and these two elements are interrelated. Technical elements (computers) are clear and predictable, while human aspects are often open and uncertain. Human aspects tend to be more complex than technical aspects in an information system, because technical aspects tend to be predictable. Many information system methodologies only emphasize technological aspects. This can lead to solutions that do not work effectively, because often methodologies underestimate the importance and
complexity of human aspects (Avison & Fitzgerald, 1996). Therefore in this study the research team did not want to be trapped in the rigidity of a particular information system model, but rather try to develop a system that balances human and technical aspects.

Trying to define a system development in this case is not easy because there is no strict agreement regarding this definition in the development of information systems (Huisman & Iivari, 2002; Avison and Fitzgerald, 1995; Wynekoop and Russo, 1997; Iivari et al., 1999). Even in the early development of computer-based information systems there was no known explicit development methodology (Coady & Pooley, 2007; Broady, Walters & Hartley, 1994). Furthermore Coady and Pooley suggested that any method adopted by an analyst needs to consider things beyond the limits set by the method and try to look at the system as a whole. This is necessary to balance the human element and technical elements in an information system.

3 Ethics

ETHICS is an abbreviation of Effective Technical and Human Implementation of Computer-based System. Mumford (1985) defined ETHICS as an approach in designing an information system which is structured and covering organization, administration and working life quality factor, it is also a participatory problem solving method. As the name implies ETHICS is designed to promote ethical and human values. These values are considered by engaging and accommodating the human in the information system. These engagement and accommodation may be seen from stakeholder participation (Leitch & Warren, 2010) in the development process. Participation may be defined as the involvement of stakeholders, who will be affected by the new system, in the decision-making process regarding system design and operation. Furthermore Mumford (2003) described that this participation may be viewed from the structure, content and process aspects.

The structure aspect is related to the mechanism in which the participation occurs, which are through consultation, representation and consensus. In ETHICS approach all stakeholder are encouraged to discuss and to contribute in the designing process. This is how the consultation mechanism happens. This approach also suggests that the representations of the stakeholders are involved in the process. While in the process the development team need to have a consensus with stakeholders regarding the ideas and solutions that are necessary to the system development. The content aspect is related to decision making regarding the development of new information system. This content may explain stakeholders right and level of authority in the new system. The procedure aspect is related to giving user enough knowledge about the new information system that are being developed.

4 Socio-Technical Approach

ETHICS uses socio-technical approach in its implementation, which means that in the development process it considers the technical and social aspects. Long (2013) explained that socio-technical is a movement that designs a system in an organization by acknowledging human participation and human’s interaction with technology. In other words socio-technical approach is an approach that acknowledges the interaction between human and technology which will result in technically efficient information system and provide satisfaction for the
users (Mumford, 1985). This satisfaction may come from the correspondence between employee’s expectations and assigned tasks. When there is conformity between the expectation and given task then there will be satisfaction. In ETHICS the satisfaction may be measured by using Parson and Shils (1951) framework. This framework based on five dimensions of conformity: knowledge, psychology, efficiency, assignment and structure, and ethics.

Knowledge conformity is satisfied when the employee has enough knowledge to do the work and there is opportunity to improve the knowledge for better competence for doing the work. Psychology conformity is satisfied when the work is compatible with employee’s status, improvement and working interest. This dimension may be influenced by employee’s age, background, education or social strata. The efficiency dimension related to three components: negotiation between the work and the reward, strictness in work control, and supervision system. Shortly satisfaction may be achieved when there are conformity between workload and the reward, conformity between control strictness and employee’s expectation, and conformity between supervision facility provided and the needs. The fourth dimension is measuring the conformity between work demand and the satisfaction from the work. It may related to necessary skills, targets, follow up mechanism, the importance of a task, autonomy and control level possessed by the employee.

5 Conclusions

Information system is designed to be used by user, hence it is necessary to consider human aspect in developing the information system. The balance between technical aspect and human aspect may help in developing a more suitable information system. ETHICS includes this consideration in its developmental approach. The socio-technical foundation used in ETHICS shows how it emphasizes the balance of technical and human aspects. Conformity dimension framework used in ETHICS may provide a broad comprehension of the stakeholders’ satisfaction which further may be seen as an evidence of its concern on the balance of human and technical aspects.

References


The Effect of Application of Learning Models with Scientific Approach to Learning Outcomes and Creativity of Students

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Abstract. This study aims to determine the effect of the application of scientific learning models in improving chemistry learning outcomes on aspects of students' cognitive knowledge and creativity. This research was conducted in SMAN 1 Langsa in January-June 2018. The research method used was an experimental method with a sample of 120 students in class X. The instrument used was a test question and then analyzed with the Spearman Rank correlation test using the SPSS program while to see students' creativity using the questionnaire method. The results showed the achievement of the 2013 curriculum-based scientific learning model implementation of PBL and PjBL occupied the highest position from the cognitive aspect, followed by DBL and IBL because PBL and PjBL enabled students to solve problems with active participation. Based on the results of data analysis both pretest and posttest given to each class using SPPS it was found that there was a positive influence on student learning outcomes and creativity after the application of the 2013 curriculum-based learning model.

Keywords: Learning Model, Scientific Approach, Learning Outcomes and Creativity

1 Introduction

National development priorities as outlined in the PlanNational Long Term Development (RPJP)Year 2005 - 2025 (Law No. 17 of 2007)among others is in realizing people who are noble, moral, ethical, cultured, and civilized based Pancasila philosophy ". One attempt torealizing it is by the waystrengthen the identity and character of the nation through education. This effort aims toforming and building Indonesian peoplewho is devoted to God Almighty, obey the rule of law, maintain harmony internal and inter-religious, carry outintercultural interaction, developing capital, applying cultural noble values nation, and has pride as Indonesian people in order to establish spiritual, moral and ethical foundation National development.

National education functions develop abilities and shape dignified national character and civilization in order to educate the life of the nation, which aims to develop potential students to become human beings believe and fear God Who Almighty, noble, healthy, knowledgeable, competent, creative, independent, and a citizen a democratic and responsible country answer. Education is an important part from human life that can never be abandoned [1].

In 2013, the government began implementing the 2013 curriculum as one of the efforts to improve the quality of education in Indonesia. Implementation of the 2013 Curriculum is
expected to produce graduates who are productive, creative, and innovative [2]. This is possible because this curriculum is based on character and competence. This 2013 curriculum emphasizes the activeness of students in the teaching and learning process. Students are required to master the learning material with their own abilities with the creativity of each individual to understand the concept of the material, while the teacher is only as a facilitator in learning.

In the implementation of the 2013 curriculum the teacher is required to professionally design effective and meaningful learning, organize learning, choose the right learning approach, determine effective learning and competency formation procedures, and set success criteria. The implementation of the 2013 curriculum which is full of character and competence, should be accompanied by a full, continuous, and continuous assessment in order to reveal various aspects of assessment such as aspects of knowledge, attitudes and skills as a whole and proportionally, in accordance with predetermined core competencies [3].

In the Minister of Education and Culture Regulation No. 69 of 2013 concerning KD and curriculum, chemistry is one of the subjects in the 2013 curriculum. Chemistry is the learning that is included in the 2013 curriculum which includes the scientific approach. Successful learning processes require certain models according to the characteristics of the students' goals, materials, and resources, so that appropriate and effective strategies are needed. One of the important objectives of chemistry subjects in high school is that students understand concepts, principles, laws, chemical theories and their application to solve problems in everyday life [4].

According to [5], the inclusion of the character through the study of religion and nationality is not enough. This is because both the new subjects encompass cognitive knowledge about values. Religion and nationality learning activities not encourage internalization of values. Character education needs to involve all disciplines. However, teachers are still lacking in attention to character development, especially high school teacher. High school teacher only focus on the material that they teach [6].

According to respondents experts, character education in chemistry learning can be organized through the nature of the chemical itself, which includes products, processes, and attitudes. Chemical products which include principles, laws, and theories can foster a sense of awe at God. Chemical products reveal about regularity, equilibrium processes, and benefits for life. A sense of awe in God can develop religious character, the character of the subject to be possessed learners. According to [2], the chemical process is a procedure in solving problems that include: (1) identification of the problem, (2) the formulation of a hypothesis, (3) designing an investigation, (4) investigation, (5) data collection and analysis, (6) drawing conclusions, (7) the communication results of the investigation.

Chemical process can introduce learners other things about the character of an honest, curious, objective, able to work, logical thinking, critical, creative, and innovative. Attitudes can be curiosity be a natural phenomenon, causality can be solved through proper procedures. Respondents teachers have not looked through the cultivation of character chemical integrative. Some consider planting a character through the material or chemical products, in part through a chemical process. So it is still necessary socialization about how the chemistry learning organized for the establishment and development of character [7].

Curriculum 2013 that applies today in Indonesia, in essence it is not an educational formulate new ones, but it is an advanced stage of previous curriculum, based curriculum Competence (KBK) 2004 and Level curriculum 2006 Education Unit (KTSP). Curriculum 2013 is also called a competency-based curriculum and character. In the 2013 curriculum for
high school level in Indonesia, has components that have new concepts in it which is an improvement of the curriculum KTSP [4].

The implementation of the 2013 curriculum that has not been comprehensive and its application is still relatively new in schools has caused its implementation in teaching and learning activities to be not optimal [8]. One important aspect to be considered for the smooth implementation of the 2013 curriculum is the application of the scientific approach as one of the approaches in this curriculum. A successful learning approach that requires a particular model so that an appropriate and effective strategy is needed.

For that, the most effective learning model is needed to obtain optimal learning outcomes, both learning outcomes in terms of cognitive students. Learning models that have scientific approaches include Inquiry Based Learning (IBL), Problem Based Learning (PBL), Project Based Learning (PBL), and Discovery Based Learning (DBL). Of the four learning models, it is possible to have the most optimal scientific learning model in the process so that the objectives of the 2013 curriculum implementation can be obtained with optimal results as well.

2 Method

2.1 Participant and Design

The method used in this research is the experimental method. This research is a quantitative research with quantitative descriptive problem formulation. Descriptive problem formulation in this study to see the effect of the implementation of the 2013 curriculum that has been implemented on improving student learning and creativity.

This research was carried out in SMAN 1 in Langsa City, Aceh Province, in the tenth semester of the odd semester of 2018/2019 academic year. The study carried out six meetings from the beginning of the material until the material was completed, the meeting consisted of one time for habituation and five times for the learning process.

2.2 Measurement

Collecting data in this study through test and observation techniques. To get the data that answers this research question, the authors compile an instrument consisting of test questions and observation sheet instruments. The preparation of instruments through several stages, namely the selection of test items, translation, translation validation, readability and revision tests.

Data analysis techniques in the study used three activities flow, namely: 1) statistical data processing, 2) data presentation, and 3) conclusion or verification of data. Statistical data processing using SPSS program. To provide an overview, data analysis is expressed in proportion correct form. Proportion correct is calculated using the formula:

\[ p = \frac{JB}{N} \]

Information:
- \( p \) = proportion correct
- \( JB \) = total score obtained by all students on certain test items
- \( N \) = total score if all students correctly answer certain test items
Meanwhile, to find out whether there are significant differences in learning outcomes of students taught with the IBL, PBL, PRL, and DL models, One Way Anova test is conducted if the data is normally and homogeneously distributed or the Kruskal Wallis test if the data is not normally distributed and is not homogeneous using SPSS program. As for knowing whether there is a effect between cognitive knowledge learning outcomes and learning outcomes of creatificatin formation, the regression test was conducted using the SPSS program.

3 Results

3.1 Achievement of 2013 Curriculum Implementation Judging from Cognitive Aspects

Based on the analysis of research data from the instrument questions given to class X students of SMA Negeri 1 Langsa consisting of four classes after being given different treatment obtained results of Problem Based Learning Model get the highest n-gain value among other learning models. This means that the implementation of the 2013 curriculum through four models of scientific approaches, PBL models have a greater chance of actively creating students when viewed from a cognitive aspect. The cognitive aspect that is intended is that students are able to solve the given questions and are able to go through the stages in observing, formulating problems, collecting data, drawing conclusions and communicating the concept of hydrocarbon principles. Graph of achievement of 2013 curriculum implementation in terms of cognitive aspects can be seen below.

\[\text{Fig. 1. Graph of Achievement of 2013 Curriculum Learning Model Implementation Judging from Cognitive Aspects}\]

Based on the results of data analysis both pretest and posttest given to each class using SPPS, it was found that there were significant differences in learning outcomes and student character formation after the application of the 2013 curriculum-based learning model. This can be seen in the table below.
Table 1. Anova Table 2013 Curriculum-Based Learning Model for SMAN 1 Langsa with student learning outcomes

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Outcomes</td>
<td>4.838</td>
<td>0.037</td>
</tr>
</tbody>
</table>

Table 1 shows that Before continuing the test it should be remembered that one of Anova's assumptions is the same variance. From the Test of Homogeneity of Variances table, it can be seen that the test results show that the variants of the three groups are the same (P-value = 0.067), so the Anova test is valid to test this relationship. Next to see whether there are significant differences in the application of the four 2013 curriculum learning models to student learning outcomes.

We see the ANOVA table, from the table in the Sig. obtained P value (P-value) = 0.037. Thus in the real level <0.05 we reject Ho, so the conclusion obtained is that there is a significant difference in the average learning outcomes based on the application of the four learning models.

3.2 Achievement of 2013 Curriculum Implementation Judging from the Aspects of Character Building That is Creativity

Furthermore, based on the analysis of research data from questionnaire instruments with character indicators in the form of creativity, the results obtained for SMAN 1 Langsa PjBL get the highest percentage value among other learning models. The difference in the percentage of creativity is influenced by the availability of facilities and infrastructure for preparing tasks given by the teacher. SMAN 1 Langsa has more complete laboratory facilities, therefore students are very enthusiastic in creating their chemical work.

Graphs of the 2013 curriculum implementation achievements in terms of character building aspects on the creativity indicators can be seen below.

![Graph of Achievement of Implementation of 2013 Curriculum Learning Models Against Student Creativity](image-url)
4 Discussion

The achievement of the 2013 curriculum learning model implementation for SMAN 1 Kota Langsa shows that the problem-based learning model occupies the highest position of the cognitive aspects, followed by DBL, IBL and PjBL. PBL allows students to solve problems with active participation. In PBL, students work with others and reflect on what they have learned. Students can be active in search and decision-making processes by increasing their practical thinking skills [9].

This result is also the same as the research conducted by [10] where the teacher in the field of study stated that the PBL model was accompanied by a good task applied in chemistry learning, because students were more active and had direct experience in solving chemical problems through experiments.

Furthermore, PjBL gets the lowest gain value compared to other learning models both in SMAN 1 in Langsa City. This is due to the availability of project material that must be prepared by students, the availability of time to complete the project as well as the lack of teachers who guide students in working on the project [11]. As is known, the design principle of PjBL includes a context that involves students in an extension of authentic inquiry through preliminary questions, collaborative work that allows students to communicate their ideas, learn technology to find and deliver solutions and from those activities created artifacts that students will demonstrate as a basis for discussion, feedback, and revision [12]. This is similar to the research conducted by (Surya, et al., 2018) where the time spent in project learning was felt to be lacking because there was a lot of time spent in group discussions and presentations so that material reinforcement was felt to be lacking in the classroom learning process.

Based on the results of the research that has been done it was found that the application of 2013 curriculum-based learning models such as IBL, PBL, PjBL and DBL are learning models that train and develop the ability to solve problems that are oriented to authentic problems from the actual life of students and stimulate higher-order thinking skills. This is consistent with one of the studies conducted by [13] where problem-based learning (PBL) is learning gained through the process towards understanding the resolution of a problem. The problem is first met in the learning process that is able to provide motivation and curiosity to increase as well as make changes in learning, especially in terms of the role of the teacher.

5 Conclusion

The results of the study based on the data found were:

1. Achievement of the 2013 curriculum learning model implementation both for SMAN 1 Langsa city shows the PBL model occupies the highest position from the cognitive aspect, followed by DBL, IBL and PjBL this is because PBL allows students to solve problems with active participation.

2. Based on the results of data analysis both pretest and posttest given to each class using SPPS, it was found that there were significant differences in learning outcomes and character building of students after the application of the 2013 curriculum-based learning model.

3. Based on the results of data analysis both pretest and posttest given to each class using SPPS, it was found that there were significant differences in learning outcomes
and student character about creativity formation after the application of the 2013 curriculum-based learning model.

Reference

Reinforcement Implementation of Six Tasks Through the Application of Edmodo-Based Blended Learning Model in Research Methodology for Physics Education Course

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Abstract. This study aims to improve the quality of the student learning process and student learning outcomes in Research Methodology for Physics Education course by reinforcement the implementation of six tasks. The study was designed with classroom action research methods. Students in blended learning are integrated between face-to-face lectures in class with online learning through Edmodo learning with the reinforcement of six tasks namely routine assignment, critical book report, critical journal report, mini research, project and engineering ideas will be directed to produce products in the form of feasible research proposals proceed to thesis guidance. The results obtained 71% of students' thesis proposals in Research Methodology for Physics Education course score above 80. Based on the results obtained it can be concluded that Reinforcement the implementation of six tasks can improve students' ability in preparing thesis proposals.

Keywords: Six Tasks, Edmodo-Based Blended Learning Model, Research Methodology for Physics Education

1 Introduction

The Indonesian National Qualification Framework (KKNI) is a competency classification qualification framework that can pair, equalize, and integrate between education and job training fields as well as work experience in the framework of providing recognition of work competencies in accordance with the work structure in various sectors. The Indonesian National Qualification Framework is a reference in curriculum and education quality assurance so as to produce graduates according to the IQF competency, students are better prepared to become responsive and adaptable graduates to the competition that occurs in the era of globalization, not only excel in academics, but also have the character as a stock to face job market. For this reason, UNIMED develops learning models that encourage student independence in learning. One of them requires each student to complete 6 assignments for each subject for each semester since the 2016/2017 Academic Year.

Six tasks required of students the first task is Routine Tasks are tasks performed on every meeting. The second task is Critical Book Report which examines the books based on the concept or theory learned in a course to determine the critical position that does study. The third task is the Critical Journal Report. Is reviewing all components of a research report or journal critically. With the main goal, find the advantages and disadvantages of a research or
journal and display relevant suggestions to maintain strength and overcome the weaknesses of the research or journal. The fourth task is Engineering Ideas, in this task, the lecturer and students discuss and determine the scope of ideas that can be engineered. The fifth task is Mini Research. This task is done by the way students and lecturers discuss and determine relevant research topics. The sixth task of students must be able to make Project that produces a model or product that has ethical, aesthetic, social, cultural, and economic values.

The course in research methodology for physics education is specifically designed for undergraduate students in the fifth semester to aim at equipping students to have the knowledge and experience in preparing a thesis in physic education proposals that are in accordance with the rules of scientific proposal preparation. In its implementation, students learn various methods of educational research, techniques of learning observation to identify the problems of learning physics at school so that they are expected to develop their ideas into thesis themes.

After completing this course, students are expected to be able to understand; (a) scientific philosophy, nature and method; (b) how to conduct research; (c) choosing a problem; (d) preliminary study; (e) formulating problems, basic assumptions, and hypotheses; (f) population, sample, and sampling method, (g) determine and compile instruments and their analysis; (h) how to analyze data; and (i) making and compiling a thesis proposal on physical education at school.

The implementation of the physics education research methodology course was carried out with a cooperative learning model with student activities in groups discussing learning all lecture materials, composing papers, making power points and presenting them to other groups. This activity takes place from the beginning to the end of the lecture. In the KKNI curriculum, the grades obtained by students in this activity are categorized as routine tasks. For other assignments, CBR, CJR, MR, P and RI are assigned to students and collected at the agreed time. Very minimal guidance is given to students in carrying out all these tasks. The learning process can obtain good learning outcomes if the contents and procedures of learning are organized into meaningful sequences (Kabba, 2009). For this purpose, the procedures for implementing the six tasks in the IQF need to be carefully monitored and optimized, not just giving assignments without being properly feedbacked.

Besides that, the ideas and ideas of students cannot develop because some are identified as copying other people’s thesis proposals in the form of a thesis. The introduction of various research methods in the learning process and observations to schools to identify the problems of physics learning, it turns out that it has not had a positive impact on the ability of students in preparing feasible proposals, then proceed to thesis guidance. The main problem lies in the ability of students to study various aspects related to research, such as studies of curriculum, learning strategies, articles and scientific writing is lacking so that the courage to independently prepare research designs most students do not appear. Indeed, the ability of students in preparing proposals can be optimized by strengthening the implementation of 6 tasks.

On the other hand, the presence of e-learning provides new innovations in the world of education with the widespread use of electronic communication media. (Miarso, 2015). The use of e-learning as a technology needs to be done in order to carry out effective learning and improve student learning outcomes. Seeing the needs of students and the demands of the times, a good learning strategy is to combine face-to-face learning in class and E-learning (Galang, et al, 2016). The choice of using a blended learning model is felt appropriate in the physics education methodology course. Blended learning does not mean replacing face-to-face learning activities in the classroom but strengthening the learning model (Fatwa, 2016).
Edmodo learning is a form of e-learning learning, e-learning is defined as a form of information technology that is applied in the field of education in the form of virtual schools in either an independent or networked form (Purbo, 2001) and a school environment-based social network (Epinur, 2013). Edmodo is designed to create interaction between lecturers and students which emphasizes fast communication, polling, assignment, sharing ideas, and many more things. As a lecturer, Edmodo provides features for sharing files, links, tasks, values and warnings directly to students (Solihin, et al, 2015). In addition, Edmodo can also be accessed by parents.

2 Method

We strongly encourage authors to use this document for the preparation of the camera-ready. Please follow the instructions closely in order to make the volume look as uniform as possible (Moore and Lopes, 1999).

The Research subjects involved in this action research were Grade A Physics Education Study Program 2016 students who took the Educational Research Methodology course on the odd semester of the 2018/2019 academic year in July-December 2018. The study was designed with classroom action research methods to overcome problems student learning, because of the difficulty in compiling thesis proposals by applying a blended learning model (combining face-to-face cooperative learning models in classes with Edmodo-based online learning) applying 6 tasks namely routine assignments, Critical Book Report, Critical Journal Review, Mini Research, Idea Engineering and Project. Blended learning based on 6 tasks.

Classroom action research carried out in each cycle includes four stages: (1) planning, (2) acting, (3) observing, (4) reflecting. The activity process which includes four stages is referred to as one cycle (Susilo, 2009).

The steps taken in each cycle in more detail can be explained as follows. The steps taken in planning include:
1. Revise the lecture contract.
2. Designing a worksheet for its 6 assignments and assessment rubrics
3. Arranging instruments for evaluating student proposals to judge it feasible or not to continue as a thesis proposal.

In the implementation phase, learning is done with a model of blended learning based on 6 tasks. The tasks done by students in study groups differed at each meeting adjusted to 6 types of tasks carried out systematically ranging from routine assignments, CBR, CJR, Mini Research, Project and Idea Engineering.

Reflection is carried out based on the results of observations and data analysis of learning outcomes achieved by students in each assignment given, as well as describing the progress achieved, the obstacles faced and efforts to overcome them. The results of further reflection will be used as a basis for determining the improvement of actions in the next cycle and task.

3 Result

The data obtained from the study consisted of learning outcomes data obtained from 3 task product assessments consisting of RT values, CBR values and values CJR. The increase in RT, values CBR and CJR from cycle I to cycle II is presented in Table 1.
Table 1. Description of Improved Student Learning

<table>
<thead>
<tr>
<th>No.</th>
<th>Average</th>
<th>First Cycle</th>
<th>Second Cycle</th>
<th>N-gain (%)</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>RT</td>
<td>63</td>
<td>75</td>
<td>32,4</td>
<td>Medium</td>
</tr>
<tr>
<td>2.</td>
<td>CBR</td>
<td>53</td>
<td>72</td>
<td>40,4</td>
<td>Medium</td>
</tr>
<tr>
<td>3.</td>
<td>CJR</td>
<td>56</td>
<td>76</td>
<td>45,5</td>
<td>Medium</td>
</tr>
</tbody>
</table>

Observation results on the process of implementing 6 tasks in terms of student learning activities.

The activeness of students in cycles I and II during the learning process is presented in Table 2.

Table 2. Description of Improved Student Learning

<table>
<thead>
<tr>
<th>Students Activity</th>
<th>Percentage Activity</th>
<th>1st Cycle</th>
<th>Category</th>
<th>2nd Cycle</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>76</td>
<td>Active</td>
<td>84</td>
<td>Very Active</td>
<td></td>
</tr>
<tr>
<td>Noting</td>
<td>68</td>
<td>Less Active</td>
<td>72</td>
<td>Active</td>
<td></td>
</tr>
<tr>
<td>Discussion</td>
<td>70</td>
<td>Active</td>
<td>84</td>
<td>Very Active</td>
<td></td>
</tr>
<tr>
<td>Asking / answers questions</td>
<td>62</td>
<td>Less Active</td>
<td>76</td>
<td>Active</td>
<td></td>
</tr>
<tr>
<td>Giving ideas</td>
<td>60</td>
<td>Less Active</td>
<td>76</td>
<td>Active</td>
<td></td>
</tr>
<tr>
<td>Irrelevant activity</td>
<td>70</td>
<td>Active</td>
<td>48</td>
<td>Less Active</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>68</td>
<td>Less Active</td>
<td>73</td>
<td>Active</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Description of Improved Student Learning

<table>
<thead>
<tr>
<th>No.</th>
<th>Observed aspect</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Research methodology courses become more interesting</td>
<td>19</td>
</tr>
<tr>
<td>2.</td>
<td>Develop hard work and independence</td>
<td>17</td>
</tr>
<tr>
<td>3.</td>
<td>Develop thinking skills to find the latest references</td>
<td>20</td>
</tr>
<tr>
<td>4.</td>
<td>Develop students’ insight and curiosity</td>
<td>21</td>
</tr>
<tr>
<td>5.</td>
<td>Increase student activity</td>
<td>20</td>
</tr>
<tr>
<td>6.</td>
<td>A real experience critiquing books articles simplify the preparation of proposals Thesis</td>
<td>25</td>
</tr>
</tbody>
</table>

Blended learning, combining face-to-face learning with learning online using Edmodo. In this study face-to-face learning is done with cooperative learning models. In the introductory activity the lecturer conveyed all the learning objectives to be achieved and motivated students, followed by presenting information, group collaboration and presentations. In learning Online lecturers use Edmodo facilities such as; quizzes, assignments, and chat. Lecturers Upload assignments a week before face to face in class. The supporting factors are learning with Edmodo, namely the availability of supporting facilities on campus namely projectors, laptops, and wireless internet networks (Wi-Fi). Besides that, there is an application that can be downloaded with a smartphone, so that it can be accessed anywhere
and anywhere using a smartphone. This learning can maximize learning time can be done anywhere and anytime and is not boring. This learning is also able to save costs because there is no need for hard copy of material, and teach students to study independently.

The factor that inhibits blended learning -based Edmodo is that there are some students who do not have a data plan to access and internet networks that are again disrupted.

There are several suggestions from students who experience learning to use blended learning, among others: learning needs to be carefully prepared so that the impact of learning is effective, improving internet connection because e-learning will be implemented if it is supported by a good internet connection, improving interaction between lecturers and students in e-learning, so we need a place in e-learning that is able to become a discussion forum for students and lecturers.

Some obstacles experienced by researchers in conducting blended learning, among others: Lecturers still do not fully understand how to use e-learning in learning, there is no e-learning readiness so there is no discussion place for students and lecturers, internet connection is not smooth so the implementation of learning tends to require a relatively long time. The same thing was discovered by Islamiyah and Lilis (2016).

The implementation of the 6 assignments in this lecture was carried out in an integrated manner, namely students seeking information and learning about lecture material as routine tasks by conducting CBR and CJR. To understand the meaning of each component in the thesis proposal chapter 1, chapters 2 and 3, students do CBR and CJR. Furthermore, so that students can write a thesis proposal, students are given the task of MR, RI and Project. On MR students are trained to make backgrounds, problem formulation, hypothesis formulation, research title, theoretical framework handout, and research methods through CBR and CJR.

Students carry out several activities, namely: reviewing books, downloading national-scale journals and international, describing the background of the available books and journals, describing the problem formulation based on the background, describing the hypothesis formulation, describing the research title, describing the hand out of the theoretical framework and describing the research method.

Obstacles contained in writing a thesis proposal According to JJ. Siang (2009) can come from internal and external factors. Internal factors include lack of motivation in students and low academic ability, external factors that are difficult to find ideas / problems that will be used as a thesis title, difficulty in searching literature, and problems with supervisors during consultation. Motivation is a power or strength that arises in itself to provide readiness so that the goals set have been achieved by Riduwan (2010).

The results of reflection on learning activities have identified several problems that show that the ability of students to understand the basic concepts of research and the ability to compile a thesis proposal is still low, various problems are found namely; students do not understand the basic concepts of research, do not understand the meaning and definition of each component of the thesis proposal, the thesis title is mostly not the result of identification of learning problems in school but rather reading the previous thesis, the literature review used is not factual because it does not originate from the latest references, and minimal references that are sourced from the research journal.

The enthusiasm of the students working on 6 tasks in order to be able to write a thesis proposal that is suitable for use as a final project is very high. But at the beginning of the activities in the first cycle, most of them were still unable to provide ideas or ideas when discussing through class discussions. After reflection with observers, information was obtained that most students were busy with reading and compiling the results of their
individual articles, and had not been given more opportunities to share information on the results of their studies.

Reading Literature tends to be disliked by students so that it becomes an obstacle in preparing proposals. With the task of CJR and CBR requiring students to criticize and take the essence of reading material inevitably it forces students to read books and journals that are relevant to the topic they choose. It is strange that students can write proposals well without ever reading journals and references related to the journal. For example, how can students be able to write conceptual frameworks well without understanding the meaning of the conceptual framework and without ever reading the conceptual framework created by other authors. Reading the literature to improve the ability of students to get the latest research problems is not just copying the problems of their senior high school thesis. Besides that, with the task, CJR students get a comparison of the thoughts of several writers, reviewing thoughts by reading their works and entering into the proposals that are being made are important requirements in writing a thesis proposal.

Based on the observations of activities CJR, most students have meaningful experience in choosing journals that are relevant to the topic of the problem, factual and sourced from journals that are ISSN online or printed. This condition is according to Parmin (2012) because students if given the opportunity and the trust to trace learning resources in the form of journals or articles are able to get the right article according to their field of study. Provision of motivation that stimulates curiosity to be able to choose thesis problems that are factual is proven to be able to trigger the activity of reading, recording, and compiling the results of the study in accordance with the established systematics.

The task of MR, RI at first was very difficult for students difficult to describe, explain the ideas in their minds in writing in sequence. As well as sometimes when there is a new idea or a more interesting one than before, it will try to think of a new topic before the topic is finished. To overcome this difficulty, students are guided to choose only one focus of the problem / problem and complete it to completion, trying to formulate the problem in the topic, outlining the creative ideas that will be conveyed and determining and making goals and benefits.

Idea engineering is a vehicle for students to practice writing creative ideas as an intellectual response to the actual problems faced by society. Engineering ideas to make students think creatively and objectively because students are given the opportunity to give creative ideas that offer solutions to problems that develop in society. Subjective, writings are supported by reliable data and / or information, and are genuine (not plagiarized) and avoid duplication. Engineering ideas develop the ability to think logically and systematically because each step of writing is designed systematically and in harmony.

4 Conclusions

There is an increase in student learning outcomes and activities through the application of a learning model blended by strengthening six assignments in Research Methodology for Physics Education course.

Acknowledgements. Thank you very much to the Chancellor, the Dean of FMIPA, the Head of the Research Institute and all the facilitating parties so that this research can be carried out.
References


Study of Thermodynamic and Structure of Cu(II) 1,2,4 H-Triazole Complex using The ab Initio Method

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Abstract. The complex of Cu(II) 1,2,4 H-triazole is one complex compound having a polymeric structure. The objective of this study determines the difference in energy formation and structure data of Cu(II) 1,2,4 H-triazole complex. The computational study used the Hartree-Fock method and the basis set 3-21G and 6-31G(d). The complex was studied of [Cu2(Htrz)4(trz)2]2+ and [Cu2(Htrz)6]4+. The result of a computational study with function/ basis set UHF/ 6-31G(d) shows the distance between Cu(II) ions for complexes with deprotonated ligands of 3,433Å, while complexes with undeprotonated ligands are 3,551Å. Bond length of Cu-N in the complex with deprotonated ligands are 1.953Å - 2.167Å, whereas for the complex with undeprotonated ligands are 2.063Å - 2,123Å. The difference of energy from a computational study using the function/ basis set UHF/ 6-31G(d) for the [Cu2(Htrz)6]4+ complex is -3693.43 KJ/ Mol and the [Cu2(Htrz)4(trz)2]2+ complex is -1666.01 KJ/ Mol.

Keywords: Cu(II) 1,2,4 H-triazole, the computational study, the structure data, and difference of energy

1 Introduction

The ion of Cu(II) has nine electrons in orbitals of d (d^9) formed the octahedral structure in the complex compounds. The Cu(II) 1,2,4 H-triazole complex was formed the covalent coordination bonds with the octahedral structure. The ligand of 1,2,4 H-triazole (Htrz) is an intermediate field ligand. The atom of H, which is bonded the N4 atom from the Htrz ligand can be released to form a trz^-1 ion. The structure of the Htrz and trz^-1 ligand rings are presented in Figure 1.

Fig 1. The structure of the ligand rings of (a) Htrz and (b) trz^-1.

The Cu(II) ions with Htrz ligand have a polymeric structure in which between the Cu(II) ions is connected with the Htrz ligand bridge. The structure of the Cu(II) 1,2,4 H-triazole
The (Cu(II)-Htrz) complex is similar to Fe(II) 1,2,4 H-triazole. The structure of the Cu(II) 1,2,4 H-triazole complex is shown in Figure 2.

Experimental studies of Cu(II)-Htrz complexes or derivatives have been carried out by various methods. Analysis of the single crystal structure of the complex [Cu(hyetrz)3]ClO43H2O (hyetrz) - 4-(2-hydroxyethyl)-1,2,4-triazole was carried out using Enraf-Nonius CAD4 diffractometer and EXAFS spectrometer. The final coordinate data and isotropic thermal parameters are visualized by CRYSTAL MAKER to get the crystal structure of the complex. The crystal structure obtained shows between Cu(II) ions are connected by three bridges N1, N2-Htrz with a distance between Cu1-Cu2 of 3.8530(8)Å and Cu2-Cu3 of 3.8293(2)Å. Complex forms a chain with an angle between pairs of Cu(II) ions between Cu1-Cu2 and Cu2-Cu3 at 175.18(2)°. The data show the complex forms a chain that only slightly deviates from the linearly shaped chain (Garcia et al, 1997). The structural characteristics of [Fe(NH2trz)3][NO3]2 (1) and [Cu(NH2trz)3]2(NO3)2.H2O (2) complexes have been observed using SEM and XRPD. A single crystal complex (2) has been observed using XRD, lead to the complex structural parameter data is obtained (Dirtu et al., 2010). Both complex crystal form shows similarities based on SEM images with greater magnification.

An experimental study of the Cu(II)-Htrz complex was carried out by several previous researchers. The computational chemistry methods could predict the crystal structure of Cu(II)-Htrz complex. The data are compared with structural data has been obtained experimentally. The study determined differences energy data of Cu(II)-Htrz complex too. This study was used in the ab initio method with UHF functions and basis sets of 3-21G and 6-31G(d).

Determination of energy with the completion of the Schrödinger equation is carried out using analytic and semi-empirical methods (Hückel method) for a set of molecular orbitals obtained in the form the variations of energy. This energy can be integrated as an orbital for each of these energies (one electron formalism). The wave functions for many electrons are a result of the Hartree (Hartree Product) wave function as stated in equation 1.

\[ H = \sum_{i=1}^{N} h_i \]  

where \( h_i \) is a wave function for each electron. An interaction between nuclei is considered zero because the core is considered motionless (Born Oppenheimer Approximation).

\[ h_{i=-1/2} \nabla^2 + \sum_{k=1}^{M} \frac{Z_k}{r_{ik}} \]  

where M represents the total number of cores

Fock proposed the addition of the Hartree SCF with Slater Determinant of the wave function. The Fock operator for one electron defined for each electron i is:
\[
f_t = -\frac{1}{2} \nabla_i^2 - \sum_k^{\text{int}} \frac{Z_k}{r_{ik}} + V_i^{HF}(f) \tag{3}
\]

The Hartree-Fock assumption states that each electron is in a fixed field produced by the other electron densities (Cramer, 2004).

Determination of structure, vibration frequency, relative energy, and dipole moments are calculated using basis sets 3-21G almost the same compared to the results using a basis set 6-21G (Binkley et al., 1980). Comparison of geometry parameters, normal vibration frequency modes, and dipole moments from computational using basis sets 3-21G and 3-21G* according to the experimental data (Pietro et al., 1982). Determination of bond length using a basis set 6-21G is more in line with experimental results than using a basis set 3-21G (Gordon et al., 1982). The determination of energy using 6-31G* is closer to the experimental results than the determination of energy using 3-21G* (Schleyer et al., 1984). The calculated activation energy with MP4 (SDTQ)/ 6-31G* / MP2/ 6-31G* is in accordance with experimental data. One point calculation at MP2/ 6-31G* level with geometry optimization at 3-21G gives an energy value that is in accordance with the experimental data (Spellmeyer et al., 1987).

The geometry optimization at Hartree-Fock (RHF) level with basis set of 3-21G and 6-31+G* for the complex compounds with alkali metals. The results of this study obtained that the calculation results using a basis set 6-31+G* are more suitable with experimental data than basis set 3-21G (Glendening et al., 1994). Results of a study of various compounds using a Local density functional (LDF) theory with a basis set of STO-3G and 3-21G obtained suitability with experimental data with an average deviation of 0.026Å. Specifically for the compound Fe(CO)5 basis set 3-21G more in line with the experimental results compared to the STO-3G basis set. Determination of frequency the LDF results are better than the results of Hartree-Fock (Sosa et al., 1992). The results of the geometry optimization show that the basis set 6-31G(d) is in accordance with the experiment compared to STO-3G, 6-31G, 6-31+G, and 6-31+G(d) (Foresman et al., 1991). Based on comparisons of computational results with experimental data show that the basis set 3-21G and 6-31G(d) is quite good to be used in the determination of structure and energy. Prediction of the structure and the difference of energy \([\text{Fe}_4(\text{Htrz})_8(\text{trz})_4]^{4+}\) and \([\text{Fe}_4(\text{Htrz})_{12}]^{8+}\) complexes used the function/basis set TPSSh/ TZVP. The results showed that the energy difference in the formation of the \([\text{Fe}_4(\text{Htrz})_8(\text{trz})_4]^{4+}\) was -9285.974 KJ/ Mol and \([\text{Fe}_4(\text{Htrz})_{12}]^{8+}\) of -3501.534 KJ/ Mol (Nugraha et al., 2015).

2 Computational Method

The computational calculations to determine the structure and the difference of energy using the UHF function and the basis set of 3-21G and 6-31G(d). The software used is NWChem 6.6 (Valiev et al., 2010) for computational chemistry calculations, Jmol (http://www.jmol.org/) and Avogadro (Hanwell et al., 2012) for visualization structure complexes. The data obtained from computational calculations are used to determine the difference in energy complexes (Ochterski, 2000).

2.1 Determination of complex structured data.

Based on the structured from the geometry optimization results obtained the bond length and bond angle data for the Cu(II)-Htrz complex.

2.2 Determination of complex energy difference.
The difference in energy complex is obtained energy data from computational chemistry calculations.

3 Results and Discussion

3.1 Determination of Complex Structure

The result of geometry optimization with function/ basis set UHF/ 6-31G(d) shows that the Cu(II)-Htrz complex has a polymeric structure and between Cu(II) ions connected by three Htrz ligand rings. Structural visualization of the results of geometry optimization of the complexes [Cu$_2$(Htrz)$_4$(trz)$_2$]$^{2+}$ and [Cu$_2$(Htrz)$_6$]$^{4+}$ are shown in Figure 3.

![Fig. 3](image)

**Fig. 3.** Structure from geometry optimization results of the (a) [Cu$_2$(Htrz)$_4$(trz)$_2$]$^{2+}$ and (b) [Cu$_2$(Htrz)$_6$]$^{4+}$ complexes.

The parameter’s structure of the Cu(II)-Htrz complex were studied data on the distance between Cu(II) ions and the bond length of Cu-N. The distance between Cu(II) ions as a result of geometry optimization with functions/basis set UHF/ 3-21G for the complex with deprotonated ligands is 3.635Å, while complex with undeprtonated ligands of 3.194Å. The distance between Cu(II) ions as a result of geometry optimization with function /basis set UHF/ 6-31G(d) for the complex with deprotonated ligands is 3.433Å, while complex with undeprtonated ligands is 3.551Å. The data of distance between Cu(II) ions of [Cu$_2$(Htrz)$_4$(trz)$_2$]$^{2+}$ and [Cu$_2$(Htrz)$_6$]$^{4+}$ complexes results of computational calculations with UHF functions and 3-21G and 6-31G(d) basis sets stated in Table 1.

<table>
<thead>
<tr>
<th>Functions/ basis sets</th>
<th>The distance between Cu(II) ions (Å)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UHF/ 3-21G</td>
<td>3.635</td>
</tr>
</tbody>
</table>

Table 1 The distance between Cu(II) ions result in geometry optimization
The bond length of Cu-N on deprotonated complexes are shorter than undepr.

... shorter than the undepr.

... basis set UHF/ 3-21G shows that the bond length of Cu-N in the complexes with the deprotonated ligand are 1.953Å - 2.087Å, while the undepr.

... show that the bond length of Cu-N in the complexes with a deprotonated ligand is 1.953Å - 2.167Å, while the undepr.

... complexes result of the computational calculations with UHF functions and the basis sets 3-21G and 6-31G(d) presented in Table 2.

Table 2 The bond length of Cu-N as a result of geometry optimization

<table>
<thead>
<tr>
<th>Functions/ basis sets</th>
<th>[Cu₂(Htrz)₄(trz)₂]²⁺</th>
<th>[Cu₂(Htrz)₆]⁴⁺</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The deprotonated ring</td>
<td>The undepr. ring</td>
</tr>
<tr>
<td>UHF/ 3-21G</td>
<td>1.953 – 1.967</td>
<td>2.035 - 2.087</td>
</tr>
<tr>
<td>UHF/ 6-31G(d)</td>
<td>1.953 – 2.002</td>
<td>2.077 – 2.167</td>
</tr>
</tbody>
</table>

3.2 Determination of complex energy

Determination energy of Cu(II)-Htrz complex was carried out on complexes with one deprotonated ligand and undepr.

... complexes result of computational calculations on UHF functions and 3-21G and 6-31G(d) basis sets are presented in Table 3.

Table 3 The difference energy of [Cu₂(Htrz)₄(trz)₂]²⁺ and [Cu₂(Htrz)₆]⁴⁺ complexes with the UHF function and 3-21G and 6-31G(d) basis sets.

<table>
<thead>
<tr>
<th>The complexes</th>
<th>Functions / Basis Sets</th>
<th>The amount of Energy (Ht)</th>
<th>The Energy Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Cu</td>
<td>Htrz</td>
</tr>
<tr>
<td>[Cu₂(Htrz)₄(trz)₂]²⁺</td>
<td>UHF/ 3-21G</td>
<td>-1630.11</td>
<td>-239.36</td>
</tr>
<tr>
<td></td>
<td>UHF/ 6-31G(d)</td>
<td>-1637.79</td>
<td>-240.73</td>
</tr>
<tr>
<td>[Cu₂(Htrz)₆]⁴⁺</td>
<td>UHF/ 3-21G</td>
<td>-1630.11</td>
<td>-239.36</td>
</tr>
<tr>
<td></td>
<td>UHF/ 6-31G(d)</td>
<td>-1637.79</td>
<td>-240.73</td>
</tr>
</tbody>
</table>
4 Conclusion

The computational calculation to function/ basis set UHF/ 6-31G(d) shows the distance between Cu(II) ions for the complexes with deprotonated ligands of 3.433Å, while undeprotonated ligand is 3.551Å. The bond length of the Cu-N in the complexes with a deprotonated ligand is 1.953Å – 2.167 Å, whereas for the complexes with undeprotonated ligand are 2.063Å - 2.123Å. The difference energy from computational chemistry calculations for [Cu₂(Htrz)₄(trz)₂]²⁺ and [Cu₂(Htrz)₆]⁴⁺ complexes are -3693.43 KJ/ Mol; and -1666.01 KJ/ Mol. [Cu₂(Htrz)₄(trz)₂]²⁺ complex is more stable than the [Cu₂(Htrz)₆]⁴⁺ complex.

Acknowledgements

This work was supported by State University of Medan, The Ministry of Research, Technology and Higher Education the Republic of Indonesia by the KDBK Research Grant (Project No. 282/UN33.8/PL/2018).

References


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Abstract. This study aims to determine the effect of variations in composition and size of red sand grains on the quality of concrete. Concrete is made in the form of cubes 15 x 15 x 15 cm with the standard SNI K-175 with a composition of 1: 2: 3 cement mixture with FAS 0.5. In this study, variations in the composition of red sand (fine aggregate) were made by 0%, 5%, 10%, 15%, 20% of the weight of the fine aggregate used and the variation of red sand grain size of 80 mesh, 100 mesh, 120 mesh. After the concrete is 24 hours old, the mold is opened and given the code number as desired and treated in a water bath. After going through the immersion period 28 days later the pressure strength was tested and the XRD test. From the results of the study obtained the mechanical properties of the maximum concrete pressure strength test at a composition of 5% along with a decrease in the size of the red sand grain size (80 mesh, 100 mesh, 120 mesh) with pressure forces of 31.9 MPa, 35.4 MPa, and 35.5 MPa, respectively. This goes beyond the force of pressure set by the Indonesian National Standard Agency. XRD testing on concrete after smoothing, from the results of the XRD test obtained elements such as SiO2, Ca (OH) 2, CaO and Ta2O5 show that the graph shows a high silicon intensity value. Addition of red sand fine aggregate has an impact on improving the quality of concrete (the strength of pressure from SNI k-175 becomes K-400).

Keywords: 80 mesh red sand, 100 mesh red sand, 120 mesh red sand, compressive strength, water absorption, XRD

1 Introduction

Red sand is excavated sand from Padang Bulan village, Kota Pinang Subdistrict, LabuhanBatu Selatan District, which has very fine grains and lighter weight than ordinary galan sand. This red sand is often used by the community as a road agency. In 1972 PT. AIR BAH uses this red sand as a road body by dumping this red sand and compacting it with cylindrical trucks. Until now the road is still strong and only eroded little by little every year. LabuhanBatu Selatan red sand is used as an ingredient in making concrete because it has ingredients such as SiO2 (Silicon Oxide), TaO2 (Tantalium Oxide), FeNi (Iron Nickel), Fe2C (Iron Carbide) and high red sand silicon intensity values [1]. In previous studies with X-ray diffraction and thermal characterization showing evolution in all time systems, in systems A and B no small SiO was present and sulfate had reacted fully to the amount revised almost 73% had been deposited into the hydration phase [2]. SiO2 is one of the chemical elements contained in Portland cement, so this element makes it possible to obtain a stronger concrete mixture [3].
Research (Agustina, 2012) about the effect of adding red sand volume to rock celltan harbor to density, water absorption, and concrete compressive strength with variations used 50% red sand and 50% ordinary sand produced a compressive strength of 32 MPa. Research (Harahap, 2013) on the effect of red sand characterization on rock port on mechanical properties (SEM test, X-ray diffraction, impact test) of concrete, with 20%, 50% red sand variations, 70% of the fine aggregate used resulted in bending at 20% 16.4 MPa, at 50% at 18.6 MPa, and at 75% by 16.2%. Research (Nasution, 2017) about the effect of red sand grain variations on the southern port to increase the strength of concrete, obtained that the minimum compressive strength at the addition of 120 mesh is an average of 13.36 MPa, and from the test the absorption of water occurs a decrease in concrete with the addition of red sand on the size 80 mesh and 120 mesh which is 50%. It can be concluded that variations in sand grain size are more effective in reducing water absorption.

Based on the description above, the problem is that the aggregate bonds are not strong. To improve aggregate bonds there are several methods that can be done, including the method of the Indonesian National Standard (SNI), the American Society for Testing and Materials (ASTM), the American Association of State Highway and Transportation Official (AASHTO). The most appropriate method used in this study is SNI 03-2834-2000 which refers to the making of K-175 concrete. Variations that affect the strength of the concrete pressure in terms of aspects of the size of the red sand grain size and composition of red sand, while other factors such as the way of compaction and maintenance during the hardening process are used in the ways of the Indonesian National Standard (SNI). The SNI used in this study are SNI 15-2049-2004 (Portland Cement) [4], SNI 03-2834-2000 (Procedures for making and maintaining concrete) [5], SNI 03-1974-1990 (Testing compressive strength) [6]. In this study the implementation is divided into several stages. The first stage of preparation, the stage of testing the material, the testing phase of the test object, the stage of data processing.

Based on the background description above, the researchers were interested in conducting research using LabuhanBatu Selatan red sand which varied 0%, 5%, 10%, 15% and 20% and ordinary sand 100%, 95%, 90%, 85% and 80% then the red sand is also varied the size of the granules with a variation of 80 mesh, 100 mesh, 120 mesh is expected to be smaller the size of the sand grains, the sand will be stronger with cement and water so as to improve the quality and strength of concrete.

2 Experimental.

2.1 Material

The materials used in this study are Portland type I cement from PT. MuliaSakti Perkasa, fine aggregates (red sand and ordinary sand), coarse aggregates, water. This red sand was obtained from PadangBulan Village in Kota Pinang sub-district, South Labuhan district.

2.2 Instrumentation

The equipment used includes an analytical balance sheet, bucket, measuring cup, cement spoon, compactor stick, screen sieve (80, 100, 120 mesh), concrete mold, molen. Pressure strength analysis was carried out with the Compress Testing Machine with a capacity of 2000
K Newton. Phase analysis and structure were carried out with XRD Shimadzu type with My Cu wavelength of 1.540600 Å with a speed (Scan speed) of 2.0000 deg / min.

2.3 Sample testing

1. Pressure strength testing

The well-printed concrete and the concrete top surface are made with a shovel so that the flat top surface after 24 hours is opened from the mold and put into the water for the wiring process (water absorption). This specimen is tested by a compression test machine after 7 days or 28 days of treatment and drying based on the strength level to be determined. The load must be applied gradually and in the right interval until the specimen has cracked. The strength of the concrete is obtained from the load by cracking the specimen divided by the surface area of the specimen [7].

2. X-Ray Diffraction

X-ray diffraction is used to characterize crystalline material in determining lattice parameters and crystal structures. The principle of this X-ray diffraction method is the interaction of electromagnetic waves to effect the intermediary effect by comparing the structure size and wavelength of radiation. The above conditions are met if:

$$2d \sin \theta = n\lambda$$

Where:
- $d$ = distance between two lattice fields
- $\theta$ = the angle between the rays comes with the normal plane
- $n$ = number which is called the refraction order
- $\lambda$ = X-ray wavelength used.

The equation $2d \sin \theta = n\lambda$, is called the Bragg condition and the angle $\theta$ is called the Bragg angle for X-ray irradiation in the atomic plane separated at a distance of "d" and "n" = 1, 2, 3, 4 [8].

3 Result and discussion

3.1 Strength of concrete pressure

Concrete pressure testing is carried out after 28 days from casting and soaking. The amount of concrete pressure is influenced by the composition of the constituent material and the attachment of the cement paste to the aggregate. The form of the test sample in this study is cube shaped 15 cm x 15 cm x 15 cm. The results of concrete pressure strength testing with variations in the composition of red sand 0%, 5%, 10%, 15%, 20% and variations in size of 80 mesh red sand grains, 100 Mesh and 20%.

From the table above it can be seen that the composition of 5% red sand is more optimal compared to other compositions, with the pressure strength rising linearly along with the decrease in the size of the red sand grains (80, 100, 120 mesh). For more details can be seen in the graphic below:
### Table 1: Test results of the strength of concrete pressure 80, 100 and 120 mesh.

<table>
<thead>
<tr>
<th>Red Sand (Mesh)</th>
<th>Sample Code</th>
<th>Average Surface Area (m²)</th>
<th>Load Press average (KN)</th>
<th>Pressure Power average (Mpa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>A₁₁, A₁₂, A₁₃</td>
<td>0.0225</td>
<td>556.9</td>
<td>24.75</td>
</tr>
<tr>
<td></td>
<td>B₁₁, B₁₂, B₁₃</td>
<td>0.0225</td>
<td>717.9</td>
<td>31.90</td>
</tr>
<tr>
<td></td>
<td>C₁₁, C₁₂, C₁₃</td>
<td>0.0225</td>
<td>777.9</td>
<td>34.57</td>
</tr>
<tr>
<td></td>
<td>D₁₁, D₁₂, D₁₃</td>
<td>0.0225</td>
<td>621.4</td>
<td>27.62</td>
</tr>
<tr>
<td></td>
<td>E₁₁, E₁₂, E₁₃</td>
<td>0.0225</td>
<td>522.7</td>
<td>23.23</td>
</tr>
<tr>
<td></td>
<td>A₂₁, A₂₂, A₂₃</td>
<td>0.0225</td>
<td>546.3</td>
<td>24.28</td>
</tr>
<tr>
<td></td>
<td>B₂₁, B₂₂, B₂₃</td>
<td>0.0225</td>
<td>796.6</td>
<td>35.40</td>
</tr>
<tr>
<td>100</td>
<td>C₂₁, C₂₂, C₂₃</td>
<td>0.0225</td>
<td>878.0</td>
<td>34.97</td>
</tr>
<tr>
<td></td>
<td>D₂₁, D₂₂, D₂₃</td>
<td>0.0225</td>
<td>614.3</td>
<td>27.29</td>
</tr>
<tr>
<td></td>
<td>E₂₁, E₂₂, E₂₃</td>
<td>0.0225</td>
<td>596.9</td>
<td>26.52</td>
</tr>
<tr>
<td></td>
<td>A₃₁, A₃₂, A₃₃</td>
<td>0.0225</td>
<td>504.0</td>
<td>22.4</td>
</tr>
<tr>
<td></td>
<td>B₃₁, B₃₂, B₃₃</td>
<td>0.0225</td>
<td>798.6</td>
<td>35.49</td>
</tr>
<tr>
<td></td>
<td>C₃₁, C₃₂, C₃₃</td>
<td>0.0225</td>
<td>751.8</td>
<td>33.41</td>
</tr>
<tr>
<td>120</td>
<td>D₃₁, D₃₂, D₃₃</td>
<td>0.0225</td>
<td>613.4</td>
<td>27.26</td>
</tr>
<tr>
<td></td>
<td>E₃₁, E₃₂, E₃₃</td>
<td>0.0225</td>
<td>453.4</td>
<td>20.15</td>
</tr>
</tbody>
</table>

![Graph of overall strength of concrete pressure on variations in composition and variation of red sand grains.](image)

Figure 1 above shows that variations in composition and variations in butian size of red sand affect the value of the strength of the concrete pressure. 80 mesh red sand granules have maximum average pressure strength at 10% red sand composition which is 34.6 MPa while 100 mesh red sand granules have maximum average pressure strength at 5% red sand composition which is equal to 35.4 MPa and on concrete with a size of red sand granules 120 mesh has the maximum average pressure strength in the composition of 5% red sand which is 35.5 Mpa. This means that the composition of 5% red sand is a concrete mixture that is more optimal than the composition of 10% red sand, this can be seen from the results of testing the strength of concrete pressure which shows that the composition of 5% red sand has a linear increase in pressure strength along with the decrease in grain size. red (80 mesh, 100 mesh,
120 mesh) respectively: 31.9 Mpa, 35.4 Mpa and 35.5 Mpa. This is caused by the composition of 5% red sand can cover the cavities in the concrete so that the water trapped in the concrete is only a little which means it can shrink the porosity of the concrete so that it will increase the strength value of the concrete. While the addition of 10% red sand composition does not always experience an increase in the strength of the concrete pressure due to uneven mixing so that the mixture is not mutually binding.

Based on PBI 1971 it was found that K-175 - K <250 quality concrete had an average pressure strength of 15 - 20 MPa, while the concrete quality of K-250 - K <400 had an average pressure strength of 20 - 35 MPa. The data obtained in the study has a pressure strength of 18 <40 MPa using the concrete composition K-175 produced with medium quality concrete. This goes beyond the force of pressure set by the Indonesian National Standard Agency.

3.2 X-Ray diffraction

The data obtained were analyzed using the Match v1.10 software. The following are the results of diffraction patterns of concrete samples without red sand mixture (A22), with a size of 80 mesh red sand grains (C13), red sand granules with a size of 100 mesh (B23), concrete with a size of 120 mesh of red sand (B33)

In the pattern of action Figure 2. (a) shows the formation of SiO2, Ca (OH) 2 phase, CaO. The optimum SiO2 phase is at an angle of 2θ = 26.65 ° with an intensity of 935.8 count second (cts) (which is given an asterisk) while the Ca (OH) 2 phase is at three angles, namely 2θ = 17.98 °, 2θ = 34.03 °, 2θ = 50.84 ° Ca (OH) 2 phase is an element that can have a negative impact on concrete [9]. At an angle of 2θ = 32.40 ° the CaO phase is formed. In the diffraction pattern of images 4.10 (b) the phases formed are SiO2, Ca (OH) 2, CaO, Ta2O5. The SiO2 phase experienced a peak shift of 0.21 to the left and the optimum at an angle of 2θ = 26.44 ° with an intensity of 994.1 the same thing also happened a peak shift in concrete B23, B33 respectively 2θ = 26.68 ° and 2θ = 26.65 ° and the intensity increases and the detected phase is SiO2 phase. The optimum Ca (OH) 2 phase at an angle of 2θ = 17.85 ° and
experiencing a shift in concrete B23, B33 respectively $2\theta = 18.00^\circ$ and $2\theta = 17.98^\circ$, while the optimum CaO phase is at an angle of $2\theta = 32.04^\circ$ and also experiences a peak shift on concrete B23, B33 are $2\theta = 32.19^\circ$ and $2\theta = 29.35^\circ$ respectively. At an angle of $2\theta = 29.28^\circ$ the Ta2O5 phase is formed and in concrete B23, B33 also occurs the buds of the shoots become $2\theta = 36.58^\circ$ and $2\theta = 47.08^\circ$. Based on Figure 4.10 it can be concluded that SiO2 has the greatest intensity compared to other elements contained in concrete. The effect of damage on concrete can be improved by adding 35-40% of SiO2-rich material [10]. In one study, it was confirmed that without the addition of SiO2 at the first high temperature the value of the strength of the concrete pressure decreases. And at the second critical temperature after the sample was evaluated with 35% -40% SiO2 achieved the best pressure strength results. [11]

The crystal structure formed in the samples A22, C13, B23, B33 is the same, namely in the SiO2 phase the crystal structure formed is hexagonal, in the phase of Ca (OH) 2 the structure of the crystal formed is hexagonal, and in the CaO phase the crystal structure formed is cubic , as for the Ta2O5 phase the crystal structure formed is orthorombic. To determine the volume fraction of SiO2, Ca (OH) 2, CaO, Ta2O5, the samples can be used below.

\[
\text{SiO}_2(\%) = \frac{\sum \text{SiO}_2}{\sum \text{SiO}_2 + \sum \text{Ca(OH)}_2 + \sum \text{CaO} + \sum \text{Ta}_2\text{O}_5}
\]

\[
\text{Ca(OH)}_2(\%) = \frac{\sum \text{Ca(OH)}_2}{\sum \text{Ca(OH)}_2 + \sum \text{CaO} + \sum \text{Ta}_2\text{O}_5}
\]

\[
\text{CaO}(\%) = \frac{\sum \text{CaO}}{\sum \text{SiO}_2 + \sum \text{Ca(OH)}_2 + \sum \text{CaO} + \sum \text{Ta}_2\text{O}_5}
\]

\[
\text{Ta}_2\text{O}_5(\%) = \frac{\sum \text{Ta}_2\text{O}_5}{\sum \text{SiO}_2 + \sum \text{Ca(OH)}_2 + \sum \text{CaO} + \sum \text{Ta}_2\text{O}_5}
\]

This is presented in the comparison of the sample volume fraction of A22, C13, B23, B33.

Table 2. comparison of volume fractions in samples A22, C13, B23, B33.

<table>
<thead>
<tr>
<th>No</th>
<th>Sample</th>
<th>Fraksi Volume (%)</th>
<th>SiO2</th>
<th>Ca(OH)2</th>
<th>CaO</th>
<th>Ta2O5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sample 1 (A22)</td>
<td>50.29</td>
<td>44.73</td>
<td>4.98</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sample 2 (C13)</td>
<td>67.42</td>
<td>23.56</td>
<td>1.94</td>
<td>7.08</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Sample 3 (B23)</td>
<td>69.12</td>
<td>24.96</td>
<td>2.54</td>
<td>3.36</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Sample 4 (B33)</td>
<td>83.38</td>
<td>11.38</td>
<td>3.37</td>
<td>1.96</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 shows that the volume fraction of SiO2 increases with the addition of red sand and decreases the size of sand grains on red sand. SiO2 is one of the largest chemical elements contained in cement and red sand, so that this element can make a stronger concrete mixture.
4 Conclusion

1. From the results of testing the strength of the pressure on the concrete with variations in composition and variations in the size of the red sand grains increase the pressure strength of the concrete. Optimal pressure strength and increase linearly in the composition of 5% along with a decrease in the size of the red sand grain size (80 mesh, 100 mesh and 120 mesh) with the strength of pressure in a row that is equal to 31.9 Mpa, 35.4 Mpa and 35.5 Mpa. This goes beyond the force of pressure set by the Indonesian National Standard Agency.

2. From the results of the test, obtained the XRD test results there are elements of SiO2 (Silicon Oxide), Ca (OH) 2 (Calcium Hydroxide), CaO (Calcium Oxide), Ta2O5 (Tantalium Pentaoxide) graphs showing that silicon has the greatest intensity compared to other elements contained in concrete. The crystal structure formed is the same as in SiO2 phase and Ca (OH) phase 2, the crystal structure formed is hexagonal, in the CaO phase the crystal structure formed is cubic, and in the Ta2O5 phase the structure formed is orthorombic. Table 1. Table title. Table captions should always be positioned above the tables.

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Assessment of Understanding the Concept of Motion Mechanics Using Multi Representation

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Abstract. Assessment of understanding the concept of physics is done using a three-level multiple choice test. The aim is to measure understanding of the concept, the reasons underlying the determination of the measured concept and the confidence in confirming the relationship between the truth of concept knowledge and reason for answering. The construct of the item involves multi representations (verbal, formal, graphic, and numeric) by connecting two representations in one item. The development of the problem considers three validities, namely content, construct and user validity. Test reliability uses the Cronbach alpha formula. The results showed that the content validity considered by the validator had fulfilled the validity requirements according to the proposed method. Content validity reviews the correlation between the concept content of one representation and other relevant or interrelated concept representations. Validity from the user considers the empirical understanding between the representation of concept components assessed and the representation of reasons relevant to improvements in terms of language and content correlation understanding. Data from each item can be used to trace whether there is a misunderstanding concept or the presence of alternative concepts.

Keywords: assessment, concept of motion, multi representation.

1 Introduction

Critical Book Review (CBR), one of the mandatory tasks that will be very supportive of graduates' competencies seen in terms of cognitive mastery in the scientific field and the biggest contributor in the assessment rubric in the form of cognitive tests weighing 65% of the overall assessment. CBR has its own assessment rubric that has been developed in a holistic scale, as a more detailed complementary need to develop a Conceptual Assessment Tool (CAT) which aims to look more deeply at the mastery of concepts learned in a course as a complement of CBR.

The depth of CAT as a test instrument that will be developed can be described briefly as an indication of the consensus of the achievement of learning goals and research on the difficulties faced by students, and can be used as a measure of the effectiveness of pedagogical transformation and as an indication of students' ability to think in content material content taught (Baily et al. 2017). The CAT development will refer to the learning objectives and achievements that have been set in the college contract, and the instructional learning of the basic courses and examine the difficulties commonly found in students towards the conceptual mastery of the material being taught. The CAT test was developed based on 5 types of representations.
(mathematical, formal, pictorial, graphic, and verbal) for each research study topic (Klein et al, 2017), this was done to describe comprehensively the understanding of concepts assessed.

The purpose of developing a multi-representation test for general physics is to determine the mastery of the concepts of test participants, trace the presence of alternative concepts or the existence of conceptual errors, and find the reasons underlying the understanding of a concept. Efforts to improve learning can be found from the reasoning for each item that deviates from the answers given based on the high and low value of the answer. Representative competence can be interpreted as the ability to understand a concept and the relationship between verbal, formal, graphical and numerical representations that interact with each other to interpret and reconstruct concepts (Ainsworth, 1999).

This paper presents three stages of developing assessment instruments. The first stage presents the role of Lecturer Field of Study (LFS) and the development plan for the items to measure mastery of the concept, the reason behind the answer statement and the level of confidence provides answers in accordance with the learning objectives. The second stage determines theoretical validity (content validity, construct validity and user validity) and test reliability. The third stage determines the detection of misconceptions based on the analysis of the results of the items or the existence of misconceptions, and finds the reasons underlying the understanding of an understanding. Efforts to improve learning can be found from the reasoning for each item that deviates from the answers given based on the high and low value of the answer. Study participants were undergraduate students who took general physics courses at Faculty Mathematic and Natural Science of State University of Medan in the early years of lectures.

2 Method and development

2.1 Role of lecturer field of study and objective of learning

The success of mastering the scientific field of physics education starts from the most basic is the mastery of a concept by involving connectivity between one representation with another representation in one concept that is studied. Physics learning should be done by involving an analysis of the difficulties commonly encountered in learning physics. Development of the Concept Assessment Tool for motion material exploring concept understanding includes verbal analysis of velocity, acceleration, and particle position, formal mathematical analysis, graphical analysis, and numerical applied to regular straight motion with constant velocity, straight motion changes regularly constant velocity, bullet motion (trajectory), and Newton's law.

One of the roles of LFS assessment and evaluation examines information on cognitive abilities in mastering basic concepts through information that can be collected using assessment instruments in the form of ability tests. This field of study can be carried out through the LFS research funded by the State University of Medan. Information obtained through interpretation of test data is used to provide input on the implementation of the lecture process in the future.

The aim of general physics learning is to provide basic scientific studies of physics to review concepts or verify the existence of a physics concept through discovery, inquiry and scientific and problem solving approaches. The existence of a conceptual knowledge test provides information that is able to link learning outcomes that have been achieved with the
successful use of a learning model or approach that is carried out and provide improvement suggestions.

2.2 Design of development validity and reliability of test

Development of CAT involves content, construct and user validity. Construct validity is intended to develop instruments based on theory of objective of learning which states that conceptual knowledge can be divided into verbal representations (rv), formal (rf), graphic (rg), and numeric (rn) and the connectivity between these representations (rv ↔ rf ↔ rg ↔ rn). Content validity examines development of CAT in terms of the linkage of content based on scientific studies in physics. User validity discusses the use of CAT from the side of the user or test participant to review the logic of physics and the logic of the presentation language of the item (Sadaghiani & Pollock, 2015).

Reliability of CAT concentrates whether the information produced will be the same when developed with the future, in other words whether the CAT test provides the same information reliability based on the time of use. The empirical formula to determine internal reliability is used by Cronbach alpha, a statistical technique to determine internal consistency which is formulated as:

\[ \alpha = \left( \frac{k}{k-1} \right) \left( 1 - \frac{\sum_{k=1}^{K} \sigma_k^2}{\sigma_t^2} \right) \]  

(1)

Where k is the number of items, \( \sigma_t^2 \) is the total variance of the test and, \( \sigma_k^2 \) is the variance of item k. The \( \alpha \) value interval is from 0 to 1, the greater the alpha value, the higher the consistency of internal reliability.

2.3 Detection of misconception based on item analyze

The appearance of the three-tier multiple-choice test items can be seen in Figure 1. Each item will measure the mastery of a concept from the content of the material assessed, then followed by a follow-up question to check understanding which aims to find an explanation of the concept assessed, then the students are asked to measure individually to the correctness of the answers given.
3 Result and discussion

3.1 Result

3.1.1 Validity of test

The source of information validity in developing a test can be traced from 5 sources related to the purpose of the test (Sireci, 2013). The method of tracking sources of validity of CAT test can be explained based on the test objectives.

The purpose of the CAT test is to measure cognitive learning outcomes; the sources of evidence of validity must meet the feasibility of the content, constructs, user responses, consequences of tests and relationships with other variables such as summative tests.

The purpose of the CAT test is to provide information to improve the learning process so that the sources of validity must fulfill the feasibility of the content, constructs, user responses, consequences of tests and relationships with other variables such as formative tests (Waldrip et al., 2010).

The purpose of the test is to be able to detect difficulties in mastering a concept so that the sources of validity must fulfill the feasibility of the content, constructs, user responses, consequences of tests and relationships with other variables such as tests for metacognition knowledge (Arslan et al., 2012). Based on the three objectives of test development, the CAT test has met the tracking of sources of validity in the development of the intended test.

Empirical evidence of CAT test validity based on the purpose of test development is analyzed and decided based on the consideration of the peer validator. Qualitative analysis is done to improve the quality of the editorial item, the relationship between one representation and another and the function of the choice of answers in the same item.

The peer validators requested gave scientific considerations. They are asked to give consideration by giving a check mark on indicators of sources of validity with a scale of 1-5 (not appropriate; less precise, precise, quite precise, very appropriate). Empirical validity between validators is stated with correlation index ($r_{1,2} = 0.81; r_{1,3} = 0.85; r_{2,3} = 0.82$).

3.1.2 Reliability of test

The reliability of the CAT test to produce information between one time and the next is expressed by two methods, namely internal reliability with the Cronbach alpha method and repeated tests. Internal reliability is done to give an empirical picture for a limited scale using the Cronbach alpha formula, the test value gives a value of 0.75. Repetition test method produces a reliability value of 0.80 using statistical correlation method.

3.1.3 Characteristic of item test

Information that can be obtained from a test can be traced from item characteristics. The characteristics of the items observed to provide information as an illustration of the achievement of a test goal. It can be found from the level of difficulty and differentiation of the item. The next information is the function of distractor (not the answer key) which shows the presence of alternative concepts or the existence of misconceptions.

The difficulty level of CAT test items is between the interval values $0.2 - 0.7$. The lowest interval value states that the achievement of the test participants in understanding a concept that was asked or confirmed in the item was only able to be answered by 20% of the test participants.
participants. The concept in the question is categorized as a concept that is difficult to understand by the test participants. Referring to this learning process gives an indication that the learning process needs to get attention to improving the quality of the learning process. Based on the perspective of detecting the possibility of misconceptions it provides a great opportunity for possible difficulties in mastering the concept and its relationship with other representations.

The difficulty index 0.7 provides an illustration that the mastery of concepts achieved by CAT test participants 70% has mastered the concept in question. This provides an illustration that the learning process has achieved its objectives and can be declared successful, although there are still misconceptions of the test participants. For the purpose of improving this learning process it still requires an effort to improve the quality of learning.

### 3.2 Discussion

The CAT test developed for the concept of motion is 10 questions with the category of conceptual knowledge involving the process of thinking dimensions of application, analysis and synthesis between one representation associated with other representations. Figure 2 shows one of the items from the conceptual test that links graph representation with numerical or mathematical representation.

In the first part of the test, participants are required to determine the average velocity owned by a car that passes BAD trajectory. In the picture can be seen the position of the car’s function of time, and can also determine the instantaneous velocity in the intended chart in accordance with the position of BAD. If the test participants were able to determine the difference between the concept of average velocity and instantaneous velocity, it would be able to determine the average velocity based on the graph position function of the time.

The second level is checking whether the answers given are based on the right analysis or just guesses. If the test participants were able to determine the reasons correctly, it was said that the test participants were able to master the concept of average velocity from the graph position function of the time. If between the first level and the second level there is one that is answered incorrectly, there is a misconception.

At the third level the test participants are expected to be able to assess their abilities. Confidence determines understanding of the concept and underlying reasons. If at the first and second levels the response is correct and the belief about answers it at a sure level, it is said to understand the concept as a comprehensively. This item has a difficulty level index of 0.5 and a differential of 0.3. It is said that 50% of participants master the concept and the rest have not mastered the concept of position graphs with time. The difference between high score groups and low scores that can answer correctly reaches 30% of the total number of these two groups.
4 Conclusion

A three-level multiple choice test tool has been produced to measure the conceptual knowledge of mechanical motion of 30 items. Test information is collected and analyzed to determine the ability to master concepts, detect learning difficulties and conceptual errors, and improve the quality of learning. Analysis is applied to grain characteristics which have a low difficulty index value (difficult category) and have a low discriminating power index.

Acknowledgments. This work has been supported by a grant from the State University of Medan

References

Modification of Species-Based Differential Evolution for Finding All Solutions of Systems of Nonlinear Equations

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Abstract. Nowadays the root finding problem for nonlinear system equations is still one of the difficult problems in computational sciences. Many attempts using deterministic and meta-heuristic methods have been done with their advantages and disadvantages, but many of them have fail to converge to all possible roots. Differential Evolution (DE), a random search techniques using vector as an alternative solution in the search for finding all of the real roots from the system of nonlinear equations. Species-based is one of the methods niching the building sub-populations or species in the area with species-seed functions as its center. This study will describe the modification of existing species-based previously to reduce the computational complexity and run more efficiently. The results of the test function shows species-based modifications can localize all potential roots with one running the program.

Keywords: Differential Evolution, Species-Based, Nonlinear Equations.

1 Introduction

At this time optimization and the root finding problem for nonlinear system equations has an important role in various fields of operational research, industry, finance and management. Optimization problem is a problem of maximizing or minimizing a function of one variable or multiple variables, functions examined included unimodal and multimodal function. In searching for the optimum solution can be done by calculus, numerical and random value (random search). Search the optimum solution by using basic calculus and numerical methods must meet certain requirements. A search solution by using basic calculus method requires an objective function that is continuous or differentiable and has a solution or initial guesses. Numerical methods can not be used directly to search for the optimum solution of an objective function. However the optimum solution can be obtained by finding the roots of the first derivative of the objective function numerically. This means that the use of numerical methods to find the optimum solution also requires the presence of the first derivative of the objective function. Yet in reality often encountered problems with the optimization objective function is discrete and not continuous, not differentiable, has a gradient which fluctuate very quickly, and does not have the guesses/early solution⁸.

Nowadays the root finding problem for nonlinear system equations is still one of the difficult problems in computational sciences. the root finding problem a function of one
variable or multiple variables, functions examined included one or more root in a function. In searching for the root finding problem can be done by calculus, numerical and random value (random search). Search the root solution by using basic calculus and numerical methods must meet certain requirements. A search solution by using basic calculus method requires an objective function that is continuous or differentiable and has a solution or initial guesses.

In this discussion we utilize Differential Evolution (DE), the method is to run a random search techniques using vector as an alternative solution in the search for the root solution. DE is one of the evolutionary algorithm has a performance as good as that of other evolutionary algorithms such as genetic algorithm (GA) [2,3,4]. DE was first introduced by Ken Price's and Rainer storn in 1994 [4], excess DE is the evolution experienced by each individual in a population where differentiation and crossovers occur sequentially in each individual randomly selected from the population at any time. Crossover parameters modified to determine the effect on the computing process. Results of the testing showed crossover parameters which are both used in the differential evolution for optimization problems [3]. In one population vector values to which every individual is distributed randomly will turn into a vector value towards the best value that ultimately becomes the maximum and minimum solution to the function. Although it may seem simple DE to localize the global optimum very fast and accurate [2,8].

2 Research method

2.1 Differential Evolution

Differential Evolution (DE) is a method developed by Kennethrice and published in October 1994 in the magazine Dr.Dobb's Journal (Priceetal., 2005). This method is a mathematical function of multi dimensional optimization method and included in the group of evolutionary algorithm. The emergence of DE method originates from the business Che by chev polynomial fitting solving problems and generating ideas of using the difference vector to randomize the vector population. Then along with the development, in ICEO (International Contest on Evolutionary Optimization) first, DE becomes one of the best and genetic algorithm can find the global optimum multi dimensional (ie showing more than one optimum value) with a good probability[3,4].
The initial step of this method is the initialization vector generated randomly in area functions.

\[ x_{i,j} = x_{i,\text{low}} + \text{rand}(0,1)(x_{i,\text{high}} - x_{i,\text{low}}) \]  

where \( j=1,2,...,D \) (dimensional vector) and \( i=1,2,...,NP \) (the number of vectors in the population), \( D \) is the dimension of a vector, \( NP \) is a lot of vectors in a population. Area boundary function of each component of the vector can be written \( \text{min} < x_j < \text{max} \), where \( j=1,2,...,D \). Once initialized, DE will mutate and undergo recombination to produce a new population.

\[ \bar{v}_{i,g} = \bar{x}_{r0,g} + F(\bar{x}_{r1,g} - \bar{x}_{r2,g}) \]  

where \( \bar{v}_{i,g} \) is the mutant vector, \( g \) is the vector generation in the process of mutation. The scale factor, \( F \in (0,1) \) is a positive real number that controls the development of population changes generated by two vectors selected randomly from the population. \( r0, r2 \text{and} r3 \) is the index number to generate a random vector of the population. To complete the search strategy differential mutation, DE also employs crossover.

\[ \bar{u}_{i,g} = \begin{cases} \bar{v}_{i,g} & \text{if} \quad (\text{rand} (0,1) \leq CR) \\ \bar{x}_{i} & \text{otherwise} \end{cases} \]  

From the equation above, \( \text{rand} (0,1) \) is a random number. CR is a constant crossover models specified by the manufacturer. If the random value that appears smaller than CR parameters it will be a new vector will appear from the results of the mutation, otherwise it will use a long vector, then in this optimization process prior to the transfer must meet the
requirements of crossover parameters. Results of the crossover will be tested with the results of the selection function.

2.2 Species-based differential evolution

Species-based is one of the methods niching used in multimodal optimization. This method of forming a lot of population in the area function by maintaining the distance (euclidean distance) in the placement of its center point \([2,4,5,6]\). Each population has a radius \(r\) between the vectors and the population center point. The central point is also called the seed species. Here is the algorithm of formation of species in a population:

1. Spread a random vector in the function area.
2. Sorting each function value of all existing vector, the value of the vector function at its best it is the focal point of the first population.
3. If \(r\) is the radius of each population, each located within a radius vector \(r\) will be the first population of the population.
4. The rest of the vector that is then in sorting like (step 2), Having obtained the best value performed (step 3). It will get the second population. And so on.
5. The process will stop if there is no more vectors to be in sorting, or all vectors have entered into one of the populations.
6. Calculate the number of vectors in the population, if all ideal minimal amount for poses DE (ideal minimal amount adjusted for optimization functions), if not ideal vector generation is carried out randomly in a radius populsi.
7. All the population will make the process of DE, until every population converges.
8. Stop if it is found that the criteria chill.

![Fig2. Illustration for Species-Based](image)

In this illustration explained that \(s_1, s_2\) and \(s_3\) is a vector that is the center of population. Being \(p\) are vectors in the population. The number of vertices in the population can be sure there will be the same as the spread randomly and the proximity of each vector to the center point. Then it could be one of the vectors will get less than ideal vector to make the process of differential evolution[3]

2.3 Modification species - based differential evolution

Development is done in aspecies-based so that each population has a step formation processes more efficient, while its purpose is:
1. To avoid sorting repeatedly to seek seed species in optimization.

2. In order to have the number of seeds in the population have the same ideal amount for differential evolution.

3. In order to more evenly spread seeds species to reach all solutions of linear functions.

Fundamental changes in the algorithm is in the formation of seed species. Furthermore, I call these seed species featured vectors which the vector that will be the center of change, steps are:

1. Establish a featured vector first. Formation featured vector is to be raised for the first time, in contrast with the first algorithm that was formed from the best sorting vectors that have been generated at random. Vector seeded first at the center of an interval function,

$$
\vec{x}_{f=1} = \frac{(x_{j_{\text{min}}} - x_{j_{\text{max}}})}{2}
$$

2. Establish a featured vector of the 2nd, 3rd and so on. In this algorithm we set the minimum distance between vectors featured in accordance with the interests and shape of the optimization function. Vector seeded become a reference for superior vector-2 randomly generated, vector seeded 1 and 2 become a reference for vector-3 seed. This process continues until certain criteria. If the minimum
distance is not met, then the vector randomly generated vectors not be featured. If we generate 100 random vectors could be a featured vectors which occurred less than 100.

\[ x_p^* = rand(0,1).(x_{j,n} - x_{j,m}) + x_{j,m} \]  \hspace{1cm} (5)

\[ p = 1,2,\ldots,n \text{ (number of trials)} \]  \hspace{1cm} (6)

\[ \text{dist}(\vec{x}_i, \vec{x}_j) = \sqrt{\sum_{i=1}^{n} (x_{i,j} - x_{i,j})^2} \]  \hspace{1cm} (7)

if \( \text{dist}(\vec{x}_i, \vec{x}_j) \geq dr \) then \( \vec{x}_i \) \( \vec{x}_j \) (8)

Where, \( dr \) is the amount of distance between vectors \( x^* \) is randomly generated vectors, \( i=1,2,\ldots,NP_{seed} \) (the amount of seed vectors), \( j=1,2,\ldots,D \) (dimensional vector), \( \text{dist} \) is the distance between two vectors featured,

3 Result and Discussion

Consider system of nonlinear equations of the form

\[ f_1(x_1,x_2,\ldots,x_n) = 0, \]
\[ f_2(x_1,x_2,\ldots,x_n) = 0, \]
\[ f_n(x_1,x_2,\ldots,x_n) = 0, \]  \hspace{1cm} (9)

where \( (x_1,x_2,\ldots,x_n) \in D = [a_1,b_1] \times [a_2,b_2] \times \cdots \times [a_n,b_n] \mathbb{R}^n \) and \( f_i : D \rightarrow \mathbb{R} \quad i=1,2,\ldots,n \) being continuous functions with at least one of them is nonlinear. The above system can be written vector form \( f(x) = 0 \) where \( f = (f_1,f_2,\ldots,f_n)^T \) and \( x = (x_1,x_2,\ldots,x_n)^T \). A vector \( x^*=(x^*_1,x^*_2,\ldots,x^*_n)^T \in D \) is called a solution or root of the system if \( f(x^*)=0 \).

There relationship between the optimization problem of a function from \( \mathbb{R}^n \) to \( \mathbb{R} \) and the problem of solving system of nonlinear equations is as follows.

System \( f(x)=0 \) has a solution \( x=(x_1,x_2,\ldots,x_n)^T \). If the objective function \( F \) of the optimization problem, which is defined by

\[ F(x) = F(x_1,x_2,\ldots,x_n) \]

\[ F(x) = \frac{1}{1 + \sum_{i=1}^{n} |f_i(x_1,x_2,\ldots,x_n)|} \]  \hspace{1cm} (10)

Has the maximum value of \( f \). This would suggest the possible use of global optimization methods for discovering the solution of nonlinear system Eq.(1). If there exist \( x^* \) such that \( F(x^*)=1 \) then \( x^* \) is a global optimum of methods for discovering the solution of nonlinear system. If there exist \( x^* \) such that \( F(x^*)=1 \), then \( x^* \) is the root of the system equations. The determination of formula \( F(x) \) is motivated by the formula for fitness \( F(x) = \frac{1}{1 + abs(f(x))} \) for solving transcendental equations \( f(x) = 0 \) using the genetic algorithm.

Many optimization problems are of highly nonlinear involving many variables under some constraints. Such nonlinearity often result in the multimodal objective function. Hence, Local search algorithm such as hill climbing or steepest descent methods are not suitable.
Only global search algorithms are suitable for obtaining optimal solutions. Recently several metaheuristic methods have been developed to perform global search.

2.1 Numerical experiments

Differential Evolution (DE) is a method developed by Kennethrice and published in October 1994 in the magazine Dr.Dobb's Journal (Price et al., 2005). This method is a mathematical function of multi dimensional optimization method and included in the group of evolutionary

2.1 Differential evolution

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In order to assess the efficacy of the proposed technique, a set of problems from various benchmark problems have been examined. In this study, all the numerical experiments were performed on a Notebook equipped with processor Intel CoreTMi5 with 4 GB ram and 1.6 GHz CPU running Ubuntu Linux 12.04. The code

\[ f(x) = \exp((-x)^2 \sin(3\pi x)) \]

(11)

Where \(0 \leq x \leq 2,3\), the radius of the species \( r = 0.25 \), in five attempts, the amount of the distribution of 500 vectors, result:

<table>
<thead>
<tr>
<th>No</th>
<th>( x )</th>
<th>( f(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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</tr>
<tr>
<td>2</td>
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<tr>
<td>7</td>
<td>1.33401</td>
<td>4.74E-08</td>
</tr>
</tbody>
</table>

Table1. the real roots from the system of nonlinear equations

![Fig4](image)

Fig4. the real roots from the system of nonlinear equations 1

Test Function 2, the system of equations and our chosen domain are as follows:
With $D = \{(x_1, x_2) | -10 \leq x_1 \leq 10, -10 \leq x_2 \leq 10\}$ the radius of the species $r=0.25$, in five attempts, the amount of the distribution of 500 vectors, result:

$$f_1(x_1, x_2) = e^{x_1-x_2} - \sin(x_1 + x_2) = 0$$
$$f_2(x_1, x_2) = x_1^2x_2^3 - \cos(x_1 + x_2) = 0$$

Table 2. the real roots from the system of nonlinear equations

<table>
<thead>
<tr>
<th>$x_1$</th>
<th>$x_2$</th>
<th>$F(x)$</th>
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<tbody>
<tr>
<td>0.673301</td>
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<td>-0.157688</td>
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<td>0.015597</td>
</tr>
</tbody>
</table>

Fig 5. the real roots from the system of nonlinear equations

4 Conclusions

From this research, the following conclusions can be drawn:
1. The differential evolution method utilizes vectors in a population to find the root value of a function by always having a convergent value, so that it can be used to solve root problems in non-linear functions.
2. After being tested on several benchmark functions, this method managed to get results with quite high accuracy.
3. Modification of Species-based differential evolution manages to localize all root values in the function of running a program.
4. Species-based modification in this study makes computing more efficient.
References


Utilisation of Biopolymer Combination as a Material for Making Gel Peel Off Mask

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Abstract. Utilisation of biopolymers combination as a material for making gel peel off masks has been carried out. The purpose of this research to determine the combination of biopolymers. It can be formulated in dosage form Gel peel off mask and find out that single and combination biopolymers have different viscosity effects in the preparation of gel peel off masks. Tests on the preparation of peel off gel masks include homogeneity test, organoleptic observation, pH measurement, determination of viscosity, time testing of the preparation dried up, stability observation and statistical analysis test with SPSS 16.0 software which includes viscosity stability test using ANOVA parametric analysis method (Analysis of Variance) and continued with Duncan's test. The results showed that each formula of peel off gel mask combined with a single biopolymer and a combination of biopolymers had a pH of 5.4 - 5.8, viscosity 31790 cp - 38240 cp, and the time needed to dry up 21-27 minutes in storage for 12 weeks. The results of the statistical analysis of the viscosity stability test of the six formulas of peel off gel mask using ANOVA method showed a significant difference between each formula (P value <0.05). The combination of biopolymer in formula 5 (Chitosan 0.0625% + Xanthan gum 0.0625%) in the preparation of peel-off gel mask gave a higher viscosity effect compared to other formulas.

Keywords: Biopolymer, Chitosan, Gelling agent, gel peel off mask

1 Introduction

The skin is a cover’s layer of the body and as a body protector from various kinds of dangers that come from outside. For women, the skin is a part of the body that needs special attention in terms of beauty, especially on the facial skin. This causes a lot of women who will always try to beautify themselves by using cosmetics (Wibowo, 2008).

Facial cosmetics which are commonly used are available in various dosage forms, one of which is in the form of a mask. Facial masks are cosmetic beauty treatments that are very popular for improving skin quality (Yeom et al., 2011). Mask products are practical in their use, one of which is wearing a peel off mask.

Peel off mask is a cosmetic form of gel-shaped facial skin care that is applied to the skin at a certain time. It will form a layer of elastic transparent film, after drying the mask can be directly lifted or released without rinsing (Hary, 1973). Physical quality gel facial mask peel off is influenced by the composition of the ingredients used, especially the composition of polyvinyl alcohol (PVA). PVA plays a role in giving the peeloff effect because it has adhesive properties so it can form a layer of film that is easily peeled off after drying (Birk et al., 2014).
In this study, biopolymers were used as gelling agents. Biopolymer as a polymer that is formed naturally produced by living things such as plants, animals or microorganisms and is found in nature. Natural polymers have many advantages over artificial polymers. One of the advantages of natural polymers compared to synthetic polymers is their abundance. For example, cellulose is the most abundant natural polymer in nature, while chitin and chitosan are second only to cellulose (Yang, et al., 2008).

The biopolymers used in this study were Chitosan, Xanthan gum and Carboxymethyl cellulose (CMC). Chitosan is a polymer of saccharides (polysaccharides) obtained from the deacetylation process of chitin compounds contained in the outer skin of animals of the Crustacean class, for example shrimp, crabs, and others (Tiyaboonchai, 2003). Chitosan has the ability to form gel, film and fiber, because of its high molecular weight and solubility in dilute acidic solutions (Suhardi, 1992). Xanthan gum is a natural polysaccharide and an important industrial biopolymer. Xanthan gum has three superior properties, which are a high viscosity at low concentrations, pseudoplastic, it is not sensitive to temperature, pH and electrolyte concentration. These three superior qualities make xanthan gum very important in the food, cosmetics, pharmaceutical, paper, paint, textile and adhesive industries (Jeeva, et al., 2011).

Carboxymethyl Cellulose (CMC) is a natural polymer derivative that is most widely used in various industries, such as food, pharmaceuticals, detergents, textiles and cosmetic products. This is because CMC has certain functions as a thickener, stabilizer, gelling agent, binder and emulsifier (Kamal, 2010). Carboxymethylcellulosa is widely used for oral and topical pharmaceutical formulations, mainly because of the level of viscosity it has as a gelling agent (Zath and Kushla, 1996).

Based on the background above, the researcher was interested in conducting research on the formulation of peel off gel mask with a combination of biopolymer namely Chitosan, Xanthan gum and Carboxymethyl cellulose (CMC) as gelling agents.

2  Method

This research method was conducted experimentally. The study included the manufacture of peel-off gel masks, using a single biopolymer namely Chitosan, Carboxymethyl cellulose (CMC), and Xanthan gum with a concentration of 0.125% while the combination of biopolymers with a concentration of 0.0625%: 0.0625%. Examination of the preparation includes physical evaluation of the preparation (homogeneity test, organoleptic observation, pH measurement, determination of viscosity, test time of preparation to dry) and observation of stability of the preparation made. And statistical analysis test with SPSS 16.0 software which includes viscosity stability test using ANOVA parametric analysis method (Analysis of Variance) and followed by Duncan test

2.1 Instruments and materials

2.1.1 Instruments

The instruments used include: analytical scales, water baths, spatulas, shovels, tissues, measuring cups (pyrex), beaker (pyrex), stirring rods, porcelain cups, peel off gel mask
containers, transparent glass, Brookfield Viscometer and pH meters (Hanna) and glass objects.

2.1.2 Materials

Ingredients Materials used include: polyvinyl alco-hol, glycerin, propylene glycol, methyl paraben, propyl paraben, triethanolamine, alcohol 96%, aquadest and biopolymers such as chitosan, xanthan gum, and carboxymethyl cellulose

2.2 Formulation of gel peel off mask

2.2.1 Preparations standard formula for peel off gel mask

The basic formula chosen for the manufacture of gel peel mask preparations is in this study with composition (Rieger, 2000).

<table>
<thead>
<tr>
<th>No</th>
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<th>Formula (g)</th>
</tr>
</thead>
<tbody>
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</tr>
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<td></td>
<td></td>
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<tr>
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<td>F6: ad 100</td>
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</table>

2.2.2 Biopolymer combination formula

The Formula of Biopolymer Combination in table 1

Table 1. The formula design of the gelpeel off mask.
2.2.3 Procedure for making gel peel off mask

In a glass beaker, polyvinyl alcohol (PVA) was added with distilled water and glycerin, then heated on a water bath and stirred constantly to form a gel (Mass 1). Xanthan gum and aquaest were added to the evaporating dish to be stirred and heated (Mass 2). Propylene glycol was added to the beaker glass, methylparaben and propyl paraben were added, stirred until homogeneous (Mass 3). Mass 2 inserted to the mass 1, stirred homogeneously then entered mass 3 stirred homogeneously. The mixture solution was added triethanolamine stirred constantly and homogeneously. After cooling ethanol was added to form a homogeneous mass of peel off gel mask.

2.2.4 Physical preparations evaluation of gel peel off mask

Physical quality checks were carried out on each preparation. Physical quality checks include: homogeneity test, organoleptic observation, pH measurement, determination of viscosity, the preparation dries testing and observations of the stability of the preparation made.

2.2.5 Homogeneity test

A certain number of preparations if applied to a piece of glass or other transparent material that is sufficient. The preparation must show a homogeneous arrangement and there is no visible coarse grain (DG POM, 1979).

2.2.6 Observation of organoleptic

Organoleptic observation was carried out by observing changes in shape, color, and odor from the preparation of gel peel off mask (Septiani, 2011)

2.2.7 pH measurement

Determination of the pH of the preparation was done by using a pH meter. The tool was first calibrated using standard buffer solution (pH 7.01) and acid pH buffer solution (pH 4.01) until the device shows the pH price. Then the electrode was washed with distilled water, then dried with tissue. The sample was made in 1% concentration, ie weigh 1 g of the preparation and dissolved in distilled water to 100 ml. Then the electrode was dipped in the solution. Let the tools showed the pH considered to be constant. The figure shown by pH meter is the pH of the preparation (Rawlins, 2003)

2.2.8 Determination of viscosity

A total of 100 ml of gel inserted into a 250 ml beaker glass then the viscosity is measured with Brookfield Viscometer. Not only the spindle was set but also the speed to be used (Septiani, 2011).
2.2.10 Test time drying preparation

Each mask formula was put into a plastic pot, stored at room temperature and measured stability parameters such as odor, color, pH, time of preparation dried, and viscosity evaluated during 12 weeks storage with observations every 2 weeks (National Health Surveillance Agency, 2005).

2.2.11 Data analysis

The results of the viscosity stability test data were analyzed using statistical package processing for SPSS 16.0. The data input for statistical included normality test, homogeneity test, ANOVA (Analysis of Variance) test and continued with Duncan test.

3 Result

Preparation of gel-off mask is made using a standard gel-off mask mask formula (Rieger, 2000). This standard formula was modified when removed some material. The preparation of peel-off gel masks is made in 6 formulas using different biopolymers. The biopolymers used to make peel-off gel masks were Chitosan, Xanthan gum, and Carboxymethyl Cellulose (CMC). As blanks, peel-off gel masks without biopolymers were used. Each formulation of peel-off gel mask was made with a single biopolymer and a combination of biopolymer. Biopolymer was single with a concentration of 0.125% while in the combination of biopolymers a concentration of 0.0625%: 0.0625% was used. The mask preparations were obtained in the form of peel-off gel mask with clear and cream color.

3.1 Physical quality preparations evaluation of peel off gel mask

3.1. Homogeneity test

Homogeneity test is done by applying the prep-aration on a piece of glass or other transparent material, then leveling. If there are no granules then the preparation can be said to be homogeneous (DG POM, 1979). Test results of the homogeneity of gel peel off mask in Fig 1.

![Fig 1. Test results of the homogeneity of gel peel off mask](image)

The results of homogeneity examination on the preparation of peel off gel mask showed that all preparations did not show any coarse grains. It showed that the preparation had a homogeneous arrangement, as shown in Figure 2.
Table 2. Observation results of homogeneity of GelPeelOff Mask preparations

<table>
<thead>
<tr>
<th>Preparations</th>
<th>Homogeneity</th>
</tr>
</thead>
<tbody>
<tr>
<td>F0</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>F1</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>F2</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>F3</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>F4</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>F5</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>F6</td>
<td>Homogeneous</td>
</tr>
</tbody>
</table>

Information:
F0 = Formula without biopolymers
F1 = Formula Xanthan gum 0.125%
F2 = Formula Carboxymethyl Cellulose 0.125%
F3 = Chitosan Formula 0.125%
F4 = Formula Xanthan gum 0.0625% + Carboxymethyl Cellulose 0.0625%
F5 = Chitosan Formula 0.0625% + Xanthan gum 0.0625%
F6 = Chitosan Formula 0.0625% + Carboxymethyl Cellulose 0.0625%

The results of organoleptic examination on F3 Gel Peel Off mask (Chitosan 0.25%), F5 (Chitosan 0.0625% + Xanthan gum 0.0625%) and F6 (Chitosan 0.0625% + Carboxymethyl Cellulose 0.0625%) gave odor which was a little sour and creamy. This is due to the addition of acetic acid to dissolve chitosan because chitosan is slightly soluble in water and not soluble in ethanol (Rowe, et al., 2009). Chitosan is more soluble in acetic acid (Tang, et al., 2007).

3.1.2 pH measurement

pH preparation was carried out using a pH meter (Hanna instruments). The results can be seen in Table 3 below.

pH stability is an important parameter that determines whether a preparation is stable or not. pH testing aims to determine the safety of the preparation when used. Thus, it did not irritate the skin (Anief, 2004). The pH test results on all peel off gel masks showed a pH of 5.4-5.8. The pH test results on the formula F2 (Carboxymethyl Cellulose 0.125%) gave a more alkaline result of 5.7 while at F3 (chitosan) gave a more acidic result of 5.5. The pH of all formulas for the peel off gel mask is still in the normal pH range of the skin, which is between 4.5 and 7.0 (Wasita atmadja, 1997) (1997).
Table 3. The results of the pH test observations of Peel Off Gel Mask preparations

<table>
<thead>
<tr>
<th>Preparation</th>
<th>pH</th>
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<tbody>
<tr>
<td>F0</td>
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</tr>
<tr>
<td>F1</td>
<td>5.6</td>
</tr>
<tr>
<td>F2</td>
<td>5.7</td>
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<td>F3</td>
<td>5.5</td>
</tr>
<tr>
<td>F4</td>
<td>5.8</td>
</tr>
<tr>
<td>F5</td>
<td>5.7</td>
</tr>
<tr>
<td>F6</td>
<td>5.7</td>
</tr>
</tbody>
</table>

3.1.3 Analysed of viscosity

Viscosity examination was done using a brook field viscometer. The results can be seen in Table 4.

Table 4. The results of the viscosity test observations of Peel Off Gel Mask preparations

<table>
<thead>
<tr>
<th>Preparation</th>
<th>Viskositas (cp)</th>
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<tr>
<td>F5</td>
<td>38240</td>
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<tr>
<td>F6</td>
<td>37060</td>
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</tbody>
</table>

The determination of the viscosity value of the preparation of peel off gel mask using xanthan gum, CMC, and chitosan biopolymers the viscosity of the gel was influenced by the concentration and properties of the gelling agent. An increase in the amount of gelling agent can strengthen the gel matrix which causes an increase in viscosity (Zats and Kushla, 1996).

The viscosity value of the peel off gel mask preparation showed that the different viscosity values in each formula ranged from 31790 Cp - 38240 Cp which can be seen in Table 4.4. The viscosity value at F0 as blank gives a lower yield of 11773 Cp because there was no addition of gelling agent or without biopolymer. The lowest viscosity was found in F2 (Carboxymethyl Cellulose 0.125%) with 31790 Cps while the highest viscosity is found in F5 (Chitosan 0.0625% + Xanthan gum 0.0625%) which is 38240Cp.
3.1.4 Preparation time test results dry

The test of the time the preparation dries was done by observing the time needed for the preparation to dry, i.e., the time from when the peel-off mask is applied to the skin of the arm with a length of 7 cm and width of 7 cm. until a dry layer forms. The results can be seen in Table 5.

The most influential factor on dry time is the concentration of ethanol in the formulation. Increasing ethanol concentration will shorten the dry time of the preparation, this is because ethanol has a higher level of volatility compared to pure water (Beringhs et al., 2013). The formulation of peel off gel mask formulation used 15% ethanol concentration. It based on the formulation contained in Hary’s Cosmeticology book which stated that ethanol concentration can be used up to 30% in the gel peel off mask.

<table>
<thead>
<tr>
<th>Preparation</th>
<th>Time to dry (minutes)</th>
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<td>F0</td>
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<td>F1</td>
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<tr>
<td>F2</td>
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<td>F3</td>
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<td>F5</td>
<td>29</td>
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<tr>
<td>F6</td>
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</tbody>
</table>

3.1.5 Preparation stability check results

The stability evaluation of the preparation was carried out during 12 weeks storage with observation interval every 2, 4, 6, 8, 10, and 12 weeks. The preparation of peel-off gel mask was stored at room temperature and observed changes in odor, color, pH, time of preparation to dry, and viscosity. The test results showed that the preparation of peel-off gel mask experienced changes during storage, where viscosity and preparation time to dry increased. The results of the evaluation of the stability of each test parameter can be seen in Table 6.

**Table 5. Observation results when drying Peel Off Gel Mask preparations**

<table>
<thead>
<tr>
<th>Preparation</th>
<th>Time to dry (minutes)</th>
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<td>F0</td>
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<td>F1</td>
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**Table 6. Observation Results of Stability Test for Peel-off Mask Preparation Formula for Time Parameters (Weeks)**

<table>
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<td>Time dries (minutes)</td>
<td>Viscosity (cp)</td>
</tr>
<tr>
<td>--------</td>
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</tr>
<tr>
<td>F1</td>
<td>21</td>
<td>11773</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>11773</td>
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<tr>
<td></td>
<td>21</td>
<td>11773</td>
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<tr>
<td></td>
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<td>11773</td>
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<td></td>
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<td>11773</td>
</tr>
<tr>
<td>Viscosity (cp)</td>
<td>27540</td>
<td>31240</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>24</td>
</tr>
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<td>Color</td>
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<td>TB</td>
</tr>
<tr>
<td>Smell</td>
<td>TB</td>
<td>TB</td>
</tr>
<tr>
<td>pH</td>
<td>5,7</td>
<td>5,7</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Viscosity (cp)</td>
<td>26490</td>
<td>27230</td>
</tr>
<tr>
<td></td>
<td>23</td>
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<tr>
<td>pH</td>
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<td></td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td>Viscosity (cp)</td>
<td>26720</td>
<td>27640</td>
</tr>
<tr>
<td></td>
<td>25</td>
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<tr>
<td>pH</td>
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<td>5,8</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>26</td>
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<tr>
<td>Viscosity (cp)</td>
<td>28810</td>
<td>29260</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td>Color</td>
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<tr>
<td>Smell</td>
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<tr>
<td>pH</td>
<td>5,7</td>
<td>5,7</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td>Viscosity (cp)</td>
<td>32620</td>
<td>34750</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td>Color</td>
<td>TB</td>
<td>TB</td>
</tr>
<tr>
<td>Smell</td>
<td>TB</td>
<td>TB</td>
</tr>
</tbody>
</table>
The observation results of peel-off gel mask showed that the color and odor of the mask preparation did not change during 12 weeks of storage at room temperature. Observations can be seen in Appendix 1.

The results of the observation of the viscosity of the peel-off gel mask during 12 weeks storage showed that the preparation had increased viscosity. This can be caused by long storage, so that old preparations are affected by the environment such as air (Black, et al., 1997).

The increase in viscosity during storage was also caused by the water in the preparation being ab-sorbed by the gelling component so that the addition of gel volume (Zatz et al., 1994). The test time of the preparation dried was done by observing the time needed for the preparation to dry, ie the time from when the peel-off gel mask was applied to the skin of the arm with a length of 7 cm and a width of 7 cm to form a dry layer. The most influential factor on dry time is the concentration of ethanol in the formulation. Increasing ethanol concentration will shorten the dry time of the preparation. It’s appear because ethanol has a higher level of volatility compared to pure water (Beringhs et al., 2013). The results indicated that the longer storage time, the time preparation of peel-off gel masks to dry up increases. This can be caused by ethanol which evaporates when the packaging was opened too long during testing. Ethanol in the peel off gel mask formula serves to speed up the drying time of the mask, so that when ethanol evaporates it will give effect to the preparation in the form of increased for dry time up for longer. One factor that must be considered that the packaging should be tightly closed in order to maintain the preparation from the effects of environmental changes that can reduce the quality (Beringhs et al., 2013).

4 Discussions

After observing the viscosity stability test of peel off gel mask, the next step was statistical test analysis using SPSS (Statistical Package for the Social Sciences) 16.0 software using parametric one way ANOVA (Analysis of Variance) analysis method at 95% confidence level and continued with the Dun-can test to find out whether the viscosity stability test can change significantly.

The results of the statistical analysis of the viscosity stability test of the six formulas of peel off gel mask using one-way ANOVA method with a 95% confidence level showed a significant difference between each formula (P value <0.05). This shows that there is a difference in the gelling prop-erties of the biopolymer agent which affects the viscosity level.

| Smell | TB | TB | TB | TB | TB
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>5.7</td>
<td>5.7</td>
<td>5.7</td>
<td>5.7</td>
<td>5.7</td>
</tr>
</tbody>
</table>
| Time dries (minutes) | 27 | 27 | 27 | 28 | 28 | 29
| Viscosity (cp) | 31030 | 31860 | 33790 | 34810 | 35730 | 37060

Information:

TB = Not changed
B = Change
of the gel peel off mask. The highest viscosity of F5 (Chitosan: Xanthan gum 38240 cp) and the lowest on F2 (Carboxymethyl Cellulose 31790 cp).

5 Conclusion

1. The combination of biopolymer can be formulated in the dosage form of peeled gel mask. Biopolymers are Chitosan, Xanthan gum and Carboxymethylcellulose.

2. The single and combination biopolymers have different viscosity effects in the preparation of exfoliating gel masks. The single biopolymer has the highest viscosity was Xanthan gum with 33350 cp. The second viscosity result was Chitosan 32440 cp so that the lowest viscosity was Carboxymethylcellulose with 31790 cp. The highest viscosity results of the combination of biopolymer were Chitosan + Xanthan gum which was 38240 cp. The second was Chitosan + Carboxymethyl Cellulose with a yield of 37060 cp, and the lowest viscosity result was xanthan gum + Carboxymethyl Cellulose 33090 cp. Data obtained from one-way ANOVA results with a 95% confidence level showed that each formula showed a significant difference (P <0.05), namely the highest viscosity F5 (Chitosan + Xanthan gum 38240 cp) and the lowest on F2 (Carboxymethylcellulose 31790 cp).

References


Effect of Particle Size on Fresh Turmeric (Curcuma Longa L.) and Simplicia Toward Content of Curcumin Compound

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Abstract. The effect of particle size of fresh turmeric and simplicia toward content of curcumin compounds has been carried out. The purpose of this research is to analyze the content of curcumin compounds based on the particle size of the fresh turmeric and simplicia using ethanol and water solvents. Extraction of curcumin in fresh turmeric and simplicia yield was carried out by maceration method of electrosynthetic coupling in ethanol and water solvent using the infundation method, at particle sizes of 20, 80 and 140 mesh. The content of curcumin compound was analyzed as quantitatively using spectrophotometry visible at 475 nm, the linear regression is \( Y = 6.428x - 4.424 \) and \( R^2 = 0.7594 \). The highest content of curcumin compound was found in the fresh turmeric and simplicia using ethanol solvent at 140 mesh particle size respectively, are 5.6 and 4.2 ppm. In water solvents, the concentration of curcumin from fresh turmeric and simplicia were 1.3 and 0.6 ppm, respectively.

Keywords: Turmeric, Curcumin, Particle Size, Extraction, Maceration of Electrosynthetic coupling

1 Introduction

Turmeric (Curcuma longa L.) is one of the plants the tribe-finding (Zingiberaceae) has many properties and benefits because they contain secondary metabolites that can be used as medicine. This causes turmeric used in a variety of beverage products such as traditional herbal drinks are now widely consumed by the public to improve health and fitness (Supandi, et al., 2016).

Turmeric contains curcuminoid compounds consisting of curcumin, desmetoksikurkumin as much as 10% and 1-5% bisdesmetoksikurkumin and other beneficial substances such as essential oils (Ikrawan, 2017). Some of the biological activity of curcumin, among others as anti-inflammatory, antioxidant, anticancer, antimutagenic, antifungal, antibacterial, antiparasitic, antiviral / anti-HIV, anticoagulant, antidiabetic (Purwaningsih, 2016). The content of curcumin compound can be extracted by extraction. The extraction process can be influenced by several factors, one of which is the size of the particles will be extracted. The particle size affects the amount of extract produced, because the smaller particle size of a substance, induce more broken cells with wider contact area between the sample and the solvent (Anam, 2010). In this study conducted on a sample of fresh turmeric extract and botanicals with the size 20, 80 and 140 mesh.
The concentration of active substances in extract greatly influenced by particle size, time and temperature of extraction. Extraction by maceration takes a long time and solvents required coupling electro-synthesis maceration method in order to enhance the reaction between the solvent and the active compound and it takes a relatively short time and solvent bit. Curcumin concentration analysis was conducted using visible spectrophotometry.

Based on the background described above, it interested in conducting research on the influence of particle size of fresh turmeric rhizome extract and botanicals in ethanol and water to the compound curcumin visible spectrophotometry.

2 Material and method

2.1 Material

The materials needed are turmeric, 96% ethanol, distilled water and raw curcumin standard production E-Merck.

2.2 Sample processing

The samples used are fresh turmeric rhizome and simplisia. Each turmeric is cleaned, washed, drained and then chopped-chopped. Fresh turmeric rhizome after chopped smoothed with wet blender, finely sieved in 20 mesh, 80 mesh, 140 mesh. Once chopped turmeric bulbs are then dried in at 40°C. Samples are considered dry when the easily broken, and blended with a dry blender until a powder sieved using a sieve 20 mesh, 80 mesh, 140 mesh, 200 mesh.

2.3 Using turmeric rhizome extract solvents ethanol

2.3.1 Best maceration time optimization method coupling electro-synthesis

Simplicia turmeric powder weighed 5 g which have been sieved using 80 mesh sieve dissolved in 50 ml of 96% ethanol (1:10) was added to 50 ml glass beaker cover volume up with ethanol until macerated coupling pins limits electro-synthesis (Widodo, et al., 2007). Electro-synthesis coupling maceration was prepared for 6 samples with the same sieve of 80 mesh, each sample was macerated in a variety of time of 0.5, 1, 1.5, 2, and 3 hours. Then the results of maceration were evaporated and extract samples were diluted in 20 mL methanol for analyzed using a visible spectrophotometer.

2.3.2 Coupling maceration elektrosintesis on optimum time

5 g each sample fresh turmeric rhizomes and bulbs weighed was dissolved in 50 ml of 96% ethanol (1:10) then added to each 50 ml glass beaker and cover volume up with 96% ethanol until further macerated coupling pins limits the voltage electro-synthesis 20 volts for 2 hours (Widodo, et al., 2007). Results of maceration evaporated to solvent evaporated. Extraction results obtained sediment was diluted in 20 ml methanol and then analyzed using a visible spectrophotometer.
2.3.3 Using solvent extraction of turmeric rhizome air

Turmeric was prepared with solvent extraction in infusion water. 5 g turmeric bulbs was added to the pot and add 50 mL infusion water, then heated in for 15 minutes, until the temperature inside the pot reaches 90°C, while stirring occasionally, then infusion with a flannel cloth while still hot and the filtrate accommodated. The extraction solvent aerated until reduced water obtained viscous extract and then continued quantitative analysis using visible spectrophotometer (MOH, 1979).

2.4 Quantitative analysis of curcumin content compounds

2.4.1 Preparation of parent solution curcumin

Weighed as much as 20 mg of curcumin and added to the standard raw flask in 100 ml ethanol, then added to the line of the mark in order to obtain a concentration of 200 ppm (Parent Solution I). 2.5 ml of solution I was added to 50 ml flask cover volume up with ethanol as 10 ppm (Parent Raw Solution II / LIB II).

2.4.2 Determination of the maximum wavelength

Determination of the maximum wavelength was prepared with 3 ml of Parent Solution I and dissolved in 50 ml ethanol obtained 12 ppm solution. This solution was measured at a wavelength of 400-800 nm.

2.4.3 Determining straight line equations

1 ml, 2 ml, 3 ml, 4 ml and 5 ml of LIB II (Solution Parent Raw II) was pipetted then added10 ml ethanol (as concentration of 1 ppm, 2 ppm, 3 ppm, 4 ppm, 5 ppm. These solution were measured by visible spectrophotometer at a predetermined wavelength.

2.4.4 Concentration determination of curcumin in samples

Weighed as much as 20 mg extract of curcumin and dissolved in 100 ml ethanol to obtain a concentration of 200 ppm (solution 1). 2.5 ml of curcumin of solution 1 was added to the flask 50 ml and cover volume up to 50 ml with ethanol derived concentration of 10 ppm (solution 2). Absorbance was measured using a visible spectrophotometer at a predetermined wavelength.

3 Results and discussion

3.1 Best maceration time optimization method coupling elektrosintesis

Extraction of Turmeric carried out to obtain compound curcumin by maceration method coupling elekcro-synthesis, with extract time of macerated are 0.5, 1, 1.5, 2, 2.5 and 3 hours at rated voltage 20 volts using elektrosintesis tool, and maceration time optimization of elektrosintesis coupling methods can be seen in Table 1.
Table 1. The maceration time optimization of the best methods of coupling electro-synthetis

<table>
<thead>
<tr>
<th>No</th>
<th>Maceration Time</th>
<th>Concentration (ppm)</th>
<th>Absorbance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.5 hours</td>
<td>0.6</td>
<td>0.775</td>
</tr>
<tr>
<td>2</td>
<td>1 hour</td>
<td>0.8</td>
<td>0.818</td>
</tr>
<tr>
<td>3</td>
<td>1.5 hours</td>
<td>2.0</td>
<td>1,000</td>
</tr>
<tr>
<td>4</td>
<td>2 hours</td>
<td>3.7</td>
<td>1,268</td>
</tr>
<tr>
<td>5</td>
<td>2.5 hours</td>
<td>2.8</td>
<td>1,125</td>
</tr>
<tr>
<td>6</td>
<td>3 hours</td>
<td>2.1</td>
<td>1,009</td>
</tr>
</tbody>
</table>

Based on Table 1 shows that the best time of maceration results elektrosintesis coupling method is obtained at the time of 2 hours with concentration of 3.7 ppm. It indicate the compound curcumin was extracted completely by in 2 hours causes more solvent sum up / pull curcumin compound of samples if compare in 0.5 hours, 1 hour and 1.5 hours. However, in 2.5 hours and 3 hours curcumin concentration were decreased, since the amount of solute in the solvent was saturated and can not be dissolved again (Ramdja, et al., 2009), need 2 hours curcumin for completed extraction and in 2.5 and 3 hours will generate another compound beside the curcumin. It maceration time results obtained was similar with previous studies conducted by Widodo.

3.2 Coupling maceration elektrosintesis on optimum time

Each sample after sieved with 20, 80 and 140 mesh and then dissolved in 96% ethanol subsequently macerated coupling electro-synthesis on voltage optimum is 20 volts for 2 hours, obtained data from the maceration coupling elektrosintetis using ethanol (Table 2)

Table 2. Maceration Elektrosintesis Coupling Using ethanol solvent

<table>
<thead>
<tr>
<th>No</th>
<th>Samples</th>
<th>Ethanol extracts (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>20 mesh</td>
</tr>
<tr>
<td>1</td>
<td>Ethanol extracts (g) Fresh turmeric rhizome</td>
<td>2.23</td>
</tr>
<tr>
<td>2</td>
<td>Turmeric rhizome simplicia</td>
<td>2.12</td>
</tr>
</tbody>
</table>

3.3 Using solvent extraction of turmeric rhizome air

Each sample fresh turmeric rhizomes and bulbs after 20,80,140 and sieved with a 200 mesh sieve were extracted using a solvent of water with infundation method, where the sample is heated at a temperature of 90 C for 15 minutes infundation results obtained using aqueous solvent extract can be seen in Table 3 as follows:
Table 3. Infusion using solvent extract air

<table>
<thead>
<tr>
<th>No</th>
<th>Samples</th>
<th>Ethanol extracts (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>20 mesh</td>
</tr>
<tr>
<td>1.</td>
<td>Fresh turmeric rhizome</td>
<td>2.29</td>
</tr>
<tr>
<td>2.</td>
<td>Turmeric rhizome simplisia</td>
<td>2.19</td>
</tr>
</tbody>
</table>

3.4 Concentration determination of curcumin in samples

Based on the data obtained by visible spectrophotometry curcumin concentration in samples of fresh turmeric rhizome and botanicals that using ethanol and water in a variety of particle size using a sieve 20, 80 and 140 mesh. The data obtained are presented in Table 4 and Table 5.

Concentration of the compound curcumin against fresh turmeric rhizome and botanicals in ethanol and water at a particle size of 20, 80 and 140 mesh on fresh turmeric rhizome is higher than simplisia turmeric, it indicate the bulbs turmeric has undergone a drying process which causes the compound curcumin on the sample was reduced. There was also a reduction in solvent extracted performed by aerated initiate the sample at long time in the air that causes oxidation of curcumin compound so that the concentration of curcumin decreased.

Water and ethanol 96% is used for fresh turmeric rhizome extract and botanicals shows significant different concentrations of curcumin. It is confirm the concentrations of curcumin in turmeric rhizome fresh and botanicals using ethanol 96% higher than using water-soluble matter because curcumin has properties of soluble in ethanol, acetone, glacial acetic acid, and alkali hydroxide compared to the water and diethylether (Kiso, 1985). Based on the polarity of ethanol and curcumin are polar induce the solvent is able to sum up the content of chemical compounds well and provide results of the highest concentrations of curcumin. In the case of ethanol is advantages compared to water and methanol.

Additionally the methods used in extracting turmeric rhizome using ethanol is different with water. Turmeric extraction using ethanol by maceration method with electro-syntesis coupling active substances with electrochemical techniques, while turmeric extraction using water was conducted by infusion that the sample was heated on water bath at 90°C for 15 minutes. Heating at high temperatures cause the concentration of curcumin in aqueous solvent is lowered.

Particle size also affected difference concentrations yield of curcumin in turmeric compound. Known concentrations of curcumin in turmeric which have been sieved using a sieve 20, 80 and 140 mesh obtained the highest concentrations of curcumin on the particle size with a 140 mesh. One of the factors that affect the extraction process is the particle size so that the number of active compounds that are interested also influential. According to Heat & Reinocius (1986). The smaller of particle size, the more cells was broken and expand the surface area of contact between the solvent and sample. Therefore, the particle size of 140 mesh produce a higher concentrations of curcumin compared than the size of 20 mesh and 80 mesh.

The surface of plant cells are more widely also will facilitate the process of absorption (absorption) occurs between the solvent and extracting samples in the compound curcumin, curcumin concentration in order to obtain 140 mesh size is 5.6 ppm is higher than 20 mesh (2.9 curcumin concentration ppm) and 80 mesh (curcumin concentration of 3.1 ppm). It cause the solvents were absorbed perfectly on the sample when the solvent extraction process will
more absorbing / pull active ingredient curcumin on samples with a 140 mesh. However, the smaller (fine) particle size 200 mesh causes the concentration of curcumin decreased the fresh turmeric and botanicals.

Table 4. The concentration of curcumin on turmeric rhizome in ethanol

<table>
<thead>
<tr>
<th>No</th>
<th>Sieve size</th>
<th>Turmeric rhizome</th>
<th>Simplicia Turmeric rhizome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Concentration (ppm)</td>
<td>Absorbance</td>
</tr>
<tr>
<td>1.</td>
<td>mesh 20</td>
<td>2.9</td>
<td>1,137</td>
</tr>
<tr>
<td>2.</td>
<td>mesh 80</td>
<td>3.1</td>
<td>1,167</td>
</tr>
<tr>
<td>3.</td>
<td>mesh 140</td>
<td>5.6</td>
<td>1,553</td>
</tr>
</tbody>
</table>

Table 5. The concentration of Curcumin on turmeric rhizome in Water

<table>
<thead>
<tr>
<th>No</th>
<th>Sieve size</th>
<th>Turmeric rhizome</th>
<th>Simplicia Turmeric rhizome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Concentration (ppm)</td>
<td>Absorbance</td>
</tr>
<tr>
<td>1.</td>
<td>mesh 20</td>
<td>0.5</td>
<td>0.772</td>
</tr>
<tr>
<td>2.</td>
<td>mesh 80</td>
<td>1.1</td>
<td>0.866</td>
</tr>
<tr>
<td>3.</td>
<td>mesh 140</td>
<td>1.3</td>
<td>0.886</td>
</tr>
</tbody>
</table>

4 Introduction

The concentrations of the compound curcumin found in turmeric have the highest fresh with a particle size of 140 mesh and coupling electro-synthesis maceration extraction method is 5.6 ppm. The best solvent used is ethanol and the optimal solvent water is fresh turmeric rhizome with a particle size of 140 mesh, obtained concentration of 1.3 ppm.

References

[5] Ikrawan, Y., Dr. Ir., Achyadi, N., S., Dr. Ir., 2017. Effect of Section Materials and Methods Against Pre flouring levels Turmeric curcuminoid In Flour With UPLC Method. Articles Section Materials and Methods Effect of Pre-flouring Against kurkuminoid In Flour Turmeric levels. Pages: 2-3.

Antibacterial Activity of Endophytic ER-2 Bacterial Isolates from Plant Cotylelobium melanoxylon

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Abstract. Endophytic microbes are microorganisms that colonize the parts of plant organs and interact with host plant without causing any symptoms or diseases in the host plant. Endophytic microbial colonization is found in various types of plant organs, namely: roots, stems, leaves and seeds. This study is focused on endophytic bacteria mostly conducted intensively on wild plants or forests in the tropical ecosystems. Various trees or tropical forest plants have potentials as traditional medicine and in cooperation with the bacteria. The C. melanoxylon has been utilized by local community as antidiarrheal medicine because of the content of active antibacterial compounds. The presence of endophytic bacteria in tissues of the stem of C. melanoxylon was observed the bacteria were directly isolated from the tissues by planting pour plate on Tryptic Soya Agar (TSA) medium. The antibacterial activity of endophytic bacteria isolates was examined using a dual cultural assay against Escherichia coli ATCC 35218 and Staphylococcus aureus ATCC 25923 as a model bacterial. Morphological, physiological, and biochemical characters were identified based on the ability of the isolates to grow. The endophytic bacteria isolate of strain ER-2 was inhibit the growth of E. coli ATCC 35218 and S. aureus ATCC 25923.

Keywords: Cotylelobium melanoxylon, bacteria, endophytes, antibacterial

1 Introduction

The search for secondary metabolites from endophytes in various plants is very important to obtain antimicrobial compounds (Tenguria et al., 2011). During this time, natural secondary metabolites use more plants, especially medicinal plants to extract their active compounds. Most secondary metabolites are taken from parent plants (Radji, 2005). To get the compounds that are expected to require a lot of plant biomass. Plants used sometimes grow in tropical rainforest ecosystems. If this is done continuously it will damage the forest ecosystem without any effort to preserve it. Besides that, the plants used are sometimes very difficult to grow by vegetative propagation and require decades to be harvested. The discovery of secondary metabolites that have the potential to produce antimicrobials from endophytic fungi can reduce dependence on plants. The use of endophytic bacteria as a producer of secondary metabolites which have the potential as raw materials for drugs can be produced in large quantities with a short period of time.

Endophytic microbes (bacteria or fungi) can produce various active compounds which are useful as antimicrobial materials (Verma et al., 2009). Secondary metabolite compounds produced by endophytic microbes include alkaloids, flavonoids, phenols, peptides, quinones,
steroids, terpenoids, poliketone, benzopyranon, xanthon, tetralon and others (Tan & Zou, 2001; Tenguria et al., 2011). These compounds can play a role in producing anticancer, antimicrobial, anti-diabetic, antimalarial, antiviral and antioxidant compounds (Radji, 2005; Pimentel et al., 2010; and Tenguria et al., 2011). The existence of various problems in the health sector such as types of cancer, the presence of bacterial resistance to drugs, the spread of diseases caused by protozoa (Strobel, 2003).

The search for sources of active compounds from natural ingredients needs to be continued to reduce dependence on raw materials for medicines from chemicals. Samples from various sources, including bacteria from different places, are tested for their potential ability to produce antimicrobials. The discovery of endophytic fungi that can produce antimicrobials can be used for natural medicine raw materials. Antimicrobials produced from endophytic fungi are obtained through a series of screening processes.

2 Materials and methods

2.1 Endophytic bacterial activity test

Testing the activity of endophytic bacteria is carried out with disc agar technique. E. coli pure culture aged 18-24 was taken 1 ml then put into a petri dish (Idrampa et al. 2015). Then 10 ml of Nutrient Agar (NA) was poured into a petri dish with pour plate technique and then left to cool. Then the endophytic bacteria were taken by cutting the medium with a diameter of 6 mm containing 48 hours of endophytic bacteria colonies inserted into a petri dish that had been cultured with E. coli bacteria and incubated for 3 days at room temperature. Furthermore, it was observed that the inhibition zone was formed by measuring the diameter of the inhibitory zone using calipers.

2.2 Characterization of endophytic bacteria

Morphological observations of endophytic bacterial colonies aim to recognize the forms of growth, colonies and characteristics of bacterial colonies in various forms of media. The observation of the morphological characters of endophytic bacteria was first cultured in a pure manner which was inoculated aseptically on a medium to be tilted, to stand upright, a liquid nutrient medium and a medium in the cup. The medium is incubated at room temperature for 24 - 48 hours. Pure cultures of endophytic bacteria are tested biochemically based on their ability to grow and their activity on media containing carbohydrates. The characters observed follow characterization according to Holt et al. (1994).

3 Results and discussion

3.1 Endophytic bacterial antagonist test

Based on the results of the selection, ER-2 isolates was selected which showed activity against Gram-positive and Gram-negative. Some endophytic bacteria can inhibit or reduce the growth of other microbes in a medium. The effect of this inhibition is due to the presence of compounds produced in the form of toxins, antimicrobial components, bacteriocins, antibiotics.
and so on. Antibacterial activity test meant that between one bacterium and another bacterium the competition was marked by the formation of a clear zone of images (2). Endophytic bacteria ER-2 strains are able to inhibit the growth of gram-negative E.coli pathogenic bacteria (ATCC 35218) and gram-positive S. aureus bacteria (ATCC 25923).

The difference in diameter of the inhibitory zone is influenced by the difference in the ability of the diffusion of the active compound into the agar and the difference in bacterial sensitivity. Antimicrobials that are effective against a small number of microorganisms or single taxonomic groups have narrow spectrum activity (Black & Black, 2008). The same statement was also stated by Pal & Paul (2013) isolates that showed antibacterial activity against the growth of Gram-positive and Gram-negative test bacteria were said to have a wide spectrum.

Fig 1. Endophytic bacterial antagonist test (a) bacteria patogen E.coli dan (b) S. aureus (B)

3.2 Characterization of endophytic bacteria

Endophytic bacteria colonies grow 4-7 days on TSA media, gram-positive round shape (0.5-3 mm), colorless, non motile, and rough surface. Morphological observations on the colonies, at the beginning of the growth of a single round white colony, then the colony after 7 days of incubation of the colony diameter widened. Colony in the form of a filament, height increases, edges are filamentous. The surface of the colony is not shiny and translucent, non-pigmented and harsh surface texture. The observation results of morphological, physiological and biochemical characters of ER-2 endophytic bacteria isolate in Table 1.

Characterization physiology include acid production (fructose, lactose and sucrose) negative (+), grew at 25-3 temperature range 0°C and optimum growth at a temperature of 25 °C, is growing at a pH range of 5-10, were able to grow on NaCl salinity levels (%) 2.5-15% and optimum growth at salinity levels of 2.5-10%. According to Willey et al. (2008) stated that each bacterium has a pH range to grow and optimum pH growth. In general, the optimum pH of growth of most bacteria is in the range between pH 6.5 and 7.5 (Pelcaar et al., 2009). Based on the test results showed that isolates of endophytic bacteria ER-2 strain can grow tolerant to 15% NaCl levels. The optimum growth was at 2.5-10.0 (w/v).

Table 1. Phenetic characters of bacteria endophytic ER-2

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Results ER-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colony Form</td>
<td>filamentous</td>
</tr>
<tr>
<td>Elevation</td>
<td>raised</td>
</tr>
<tr>
<td>Margin</td>
<td>filamentous</td>
</tr>
<tr>
<td>Appear</td>
<td>dull</td>
</tr>
<tr>
<td>Optical proverty</td>
<td>opaque</td>
</tr>
<tr>
<td>Pigmentation</td>
<td>white</td>
</tr>
</tbody>
</table>
Texture rough

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>25</td>
<td>++</td>
</tr>
<tr>
<td>30</td>
<td>+</td>
</tr>
<tr>
<td>35</td>
<td>-</td>
</tr>
<tr>
<td>40</td>
<td>-</td>
</tr>
<tr>
<td>55</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>pH</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>++</td>
</tr>
<tr>
<td>6</td>
<td>+++</td>
</tr>
<tr>
<td>7</td>
<td>++</td>
</tr>
<tr>
<td>8</td>
<td>++</td>
</tr>
<tr>
<td>9</td>
<td>++</td>
</tr>
<tr>
<td>10</td>
<td>++</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NaCl (%)</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>+++</td>
</tr>
<tr>
<td>5.0</td>
<td>+++</td>
</tr>
<tr>
<td>7.5</td>
<td>+++</td>
</tr>
<tr>
<td>10.0</td>
<td>+++</td>
</tr>
<tr>
<td>12.5</td>
<td>++</td>
</tr>
<tr>
<td>15.0</td>
<td>++</td>
</tr>
<tr>
<td>20.0</td>
<td>-</td>
</tr>
<tr>
<td>22.0</td>
<td>-</td>
</tr>
</tbody>
</table>

4 Conclusions

Based on the results of the study it can be concluded that the isolates of ER-2 endophytic bacteria from plant stems of C. melanoxylon had antibacterial activity against E. coli and S. aureus bacteria with medium resistance categories.

References


Habitat Characteristics Modelling Dendrocygna javanica (Horsfield, 1821) in North Sumatera, Indonesia, using GIS (Geographic Information System)

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Abstract. Dendrocygna javanica (Horsfield, 1821) is a member of the family Anatidae, the order of Anseriformes, class of Aves, phylum Chordata, of kingdom Animalia. This species is commonly called the Lesser Whistling-duck because it flies in a noisy sound. In Indonesia, it is known as Belibis Batu. Dendrocygna javanica is spread in the regions of Asia including Indonesia. In Indonesia, D. javanica is spread on the islands of Sumatra, Kalimantan, Java, East Nusa Tenggara and West Nusa Tenggara. This study aims to create a distribution model of Dendrocygna javanica based on habitat characteristics in North Sumatra, Indonesia, using GIS (Geographic Information System). A total of 35 distribution points of D. javanica in 8 districts in North Sumatra were analyzed using ArcGis 10.3 software to analyze habitat characteristics. The results showed that D. javanica spread on habitat characteristics Rainfall ranged from 1500-3500 mm/year, 5 soil types namely ferric acrisols (4 points), humic acrisols (4 points), dystric cambisols (2 points), orthic ferrasols (5 point), and dystric fluvisols (20 points), 7 types of land cover namely dryland forest (2 points), plantation (5 points), dryland agriculture (10 points), rice fields (2 points), swamp (4 points), plus (4 points), and body of water (8 points), and are at an elevation of 3-1072 meters above sea level. Dendrocygna javanica is spread in a limited area. This research is expected to be an important source of information in the conservation of D. javanica in North Sumatra.

Keywords: Dendrocygna javanica, ArcGis 10.3, Habitat Characteristic, Geographic Information System

1 Introduction

The population growth rate in Indonesia reached 1.49% in 2010 with a population of 237,641,326 people (BPS, 2010). The high frequency and amount of population growth in Indonesia also influence the high level of food needs (Prabowo, 2011). Increasing food needs result in massive exploitation of natural resources to meet primary needs (Sutanto, 2002). Large-scale exploitation of natural resources and not paying attention to conservation aspects will cause environmental damage and scarcity of some types of individuals due to loss to forest functions (Frissell and Bayles, 1996).

Poultry is one of the potential food sources in Indonesia. Poultry is a good producer of animal protein for consumption by the community (Rasyaf, 2012). Domesticated poultry is divided into two types, namely waterfowl and landfowl. The difference can be marked based
on the shape of the claws where in land birds, the claws form separate fingers while in waterfowl has a swimming membrane that connects each of his fingers.

National poultry contribution to meat availability reaches 1,335,143 tons or 64.46% of the total domestic meat availability. The need for meat as a source of protein is increasing along with the increase in population, so a breakthrough in the search for wild animals that has the potential to be an alternative to meat is needed (Baskoro, 2009). Exploration and domestication of wild animals can be used as a source of food, increasing income and the need for animal protein so that it is necessary to preserve and burn certain types of animals (Hardjosubroto, 1994).

The status of the quibble at the IUCN (International Union for Conservation of Nature) is the Least Concern where this species has a large enough number so that it is not close to the susceptible threshold even though it tends to decrease or very fragmented population size (Birdlife International, 2016). Whistling duck is one of the birds that have a habitat closer to water with the ability to swim in the water so that mobility activities in terrestrial areas are very rare, and are only used to find food, avoid opponents, and lay eggs (Ansari, et al., 2017). Whistling duck in Indonesia is spread over the islands of Borneo, Sumatra, and Java (Birdlife International, 2016). People in Kalimantan have long been consuming whistling duck as food. Sale of whistling duck in Kalimantan has begun to be monitored because the community obtained it by hunting unattended. In 2004, around 120,000 - 165,000 whistling duck were captured in the Mahakam Lake of East Kalimantan, and 95% of that amount was marketed in Banjarmasin (Siwi, et al., 2011).

Whistling duck belongs to the genus Dendrocygna, order Anseriformes, and family Anatidae (Hoyo et al., 2014). In Indonesia, there are two types of whistling duck, which are belibis kembang (Dendrocygna acuarta) and belibis batu (Dendrocygna javanica). Anseriformes are orders consisting of 150 species and show very high diversity throughout the world (Olson and Feduccia, 1980).

In Indonesia, data and information about whistling duck are still very limited. This is because the lack of research on the types of whistling duck in Indonesia has become a separate obstacle when it comes to cultivating whistling duck as a food source as well as in determining the whistling duck conservation strategy. The purpose of this study was to analyze the character of whistling duck habitat in North Sumatra using the GIS (Geographic Information System) approach. The results of this study are expected to be important information in the effort to conserve whistling duck in North Sumatra.

2 Materials and methods

The main text should be written using Times New Roman, 10pt, fully justified. Italics can be used for emphasis and bold typeset should be avoided.

2.1 Collecting coordinate points

Collecting sample coordinates is carried out throughout the North Sumatra region which is the Whistling duck distribution site. Coordinate taking is done using the GPS (Global Position System) Garmin Etrex 30 type. The sampling area included 9 locations, namely Central Tapanuli, Mandailing Natal, Medan, Deli Serdang, Langkat, Serdang Bedagai, Asahan and Siantar. The sampling area is presented in Table 1.
2.2 parameters

The parameters analyzed in this study consisted of parameters of soil type, rainfall, altitude, and type of land cover. These parameters are obtained from various geographic data sources (Table 2). The choice of parameters is based on the character of the habitat whistling duck based on the reference.

2.3 analysis data

Data analysis was performed by the scoring method based on the coordinate layout with geographic parameter maps using ArcGis 10.3 application. Scoring results in the form of habitat characters were then analyzed to see the most dominant characters. Visualization of the results of the data is made in the form of habitat maps based on the parameters used.

Table 1. *D. javanica* coordinate region in North Sumatra

<table>
<thead>
<tr>
<th>No</th>
<th>Regency</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Central Tapanuli</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Mandailing Natal</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Medan</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Langkat</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Deli Serdang</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Tebing Tinggi</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Tanjung Balai</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Asahan</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Siantar</td>
<td>6</td>
</tr>
</tbody>
</table>

Tabel 2. Source of parameter data used in the analysis

<table>
<thead>
<tr>
<th>No</th>
<th>Parameter</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Soil Type</td>
<td>FAO UNESCO Soil Map of Southeast Asia, 2003</td>
</tr>
<tr>
<td>2</td>
<td>Rainfall</td>
<td>Indonesian Agency for Meteorological, Climatological and Geophysics (BMKG)</td>
</tr>
<tr>
<td>3</td>
<td>Elevation</td>
<td>DIVA-GIS (Hijmans, et al., 2004)</td>
</tr>
<tr>
<td>4</td>
<td>Land Cover</td>
<td>Directorate General of Forestry Planning, Ministry of Forestry Indonesian Republic of Indonesia</td>
</tr>
</tbody>
</table>

3 Result and discussion

Source of parameter data used in the results showed that *D. javanica* spread in areas with rainfall of 1500-3500 mm/year (Figure 1). According to Ansari et al. (2017), *D. javanica* is more like a land that is wet with fresh air because of guaranteed food rises. *D. javanica* habitat helps in areas that are wet with shrub plants that are high enough to protect it during the daytime during the daytime, *D. javanica* will actively forage (Ali and Ripley, 1983).
According to Renade, et al. (2017), D. javanica is a species commonly found in the lowlands and wetlands in the Southeast Asian region. The results showed that D. javanica was spread in wet areas such as water bodies, ponds, swamps, and rice fields (51.4%), although some were found in dry areas such as dryland forests, plantations, and dryland agriculture (48.6%) (Figure 2). This result is following the results of the study of Rajpar and Zakaria (2011) which stated that D. javanica is a species found mostly in swamps. Some countries with highlands in Southeast Asia are also inhabited by D. javanica, for example, Nepal. In Nepal, a portion of D. javanica lives in the highlands where the land remains wet. This is following the results of research showing that D. javanica is found at an altitude of 2-324 meters above sea level (Figure 3).
Dendrocygna javanica is usually found in territorial waters with small areas and agriculture but is very sensitive to human existence (Baral, 2009). The presence of humans that is quite disturbing can cause these animals to move to a quieter place with adequate food supplies. This result also showed D. javanica to like areas covered by tall bushes.

The results showed that the dominant soil type as the distribution area of D. javanica was Distric Fluvisols (Figure 4). Distric Fluvisols are land that is regularly submerged in water and still in swamp forests, along with the coast, and mangrove vegetation. Distric Fluvisols are generally found in Sumatra, Java, Kalimantan, Irian Jaya, Sulawesi, and Maluku (FAO, 1979).

**4 Conclusions**

Habitat characteristics Dendrocygna javanica is wetland in the lowlands or highlands, rainfall 1500-3500 meters/year, Dystric Fluvisols soil types, height 3-324 meters above sea.
level, and land cover in the form of dryland agriculture, water bodies, ponds, swamps, rice fields, and plantations.

**Acknowledgements.** The author is very grateful to the Indonesian Minister of Research, Technology and Higher Education for his support in the form of research funding in the Higher Education Foundation Basic Research scheme, 2018 funding year

**References**

Differences in Mathematical Problem-Solving Skills Between Students Who Learn By Applying Problem-Based Learning and Project-Based Learning Assisted by Edmodo

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{budihalomoan@unimed.ac.id}

Department of Mathematics Education, Faculty of Mathematics and Natural Science, State University of Medan¹, ², ³, ⁴

Abstract. The purpose of this study was to determine whether there were differences in mathematical problem solving skills between students who learned by applying the problem based learning and project based learning models assisted by edmodo. This type of research is quasi experiment. Furthermore, the sample in this study were students who came from 2 classes consisting of 66 people. Data obtained through observations and tests. Furthermore, to test the hypothesis, inferential statistical analysis method is used. The results of this study show that there are differences in students' mathematical problem solving abilities in the two experimental classes. Where, the problem solving ability of students in the problem based learning class is higher than in the project based learning class.

Keywords: Problem Solving, Problem Based Learning, Project Based Learning.

1 Introduction

Mathematics is a universal science that underlies the development of modern technology and has an important role in solving problems, both theoretically and practically. The importance of developing problem solving abilities has been realized as one of the goals of mathematics education. In order to achieve this goal, it is necessary to apply a learning model that can construct students' knowledge in solving mathematical problems. However, in reality researchers found several problems obtained from observation, interviews, and tests that were given.

The first problem is the students’ ability in solving the problem is still low. It can be seen from the four indicators of problem solving ability, namely understanding the problem, a plan division, carrying out the plan, looking back. Based on the results of observations by giving diagnostic tests to 33 students, it is obtained that 3 students empty the answer sheet, 4 students have a low criteria of problem-solving skills that is 55% -64% meanwhile the other 26 students is categorized as having very low problem solving abilities between 0% - has a very low problem-solving ability that is between 0% -54%.

The next problem is the learning-method used is still direct learning with the question and answer method. In addition, teachers also often use low-order thinking skills. So that an alternative and appropriate action is needed to solve the problem.
Lencher defines mathematical problem solving as "the process of applying mathematical knowledge that has been obtained previously into new, unknown situations". As an implication, problem solving activities can support the development of other mathematical abilities such as communication and mathematical reasoning (Yusuf Hartono, 2013).

To improve students' thinking skills, one of the main programs related to thinking skills is to teach a number of problem solving skills to students. This approach is called the heuristic approach. In the heuristic approach, the aim is to teach certain problem-solving skills which students can use when they have to overcome certain problems. To be able to do it more easily, the problem solving process needs to be deconstructed into composite parts. The following is the sequence that must be done in problem solving, namely understanding the problem, making a problem solving plan (a plan division), implementing the plan (carrying out the plan), checking back (looking back). (Daniel and David, 2008).

Duck (1994) explain that PBL is an instructional method that challenges students to "learn to learn", work together in groups to find solutions for the real problems. This problem is used to link curiosity and the ability of students to analyze and initiative on learning material. PBL prepares students to think critically and analytically, and to search for and use appropriate learning resources.

Project Based Learning (PjBL) is a model that regulates learning through certain projects. The focus of learning lies in the core concepts and principles of a study discipline, involving students in problem-solving investigations and other meaningful task activities, giving students the opportunity to work autonomously constructing their own knowledge, and culminating in producing real outcomes. (Rais, 2010).

Edmodo is a safe online learning environment and is free from advertisements, games and other distractions that can be used to communicate between educators with students both for lessons and homework, and to collaborate with classmates (Anton, 2017). Edmodo can be used as a learning communication platform to support student learning at the individual, group and whole class levels, both inside and outside the classroom. It also can be used throughout formal and informal situation. The learning settings allow students to collaborate, communicate, submit assignments, upload and download files, and educators to share lesson notes with students, connect to websites, upload and download references for students, making online quizzes, news notifications and event agendas (Kong & Song, 2014).

2 Research methods

This study used quasi-experimental method. This research was carried out at Telkom Sandhy Putra Medan Vocational School located at Letjend Djamin Ginting No. 9C, Medan Tuntungan. The population was taken from all students of eleventh grade of Telkom Vocational School Sandhy Putra Medan Academic Year 2018-2019. For the sample of the research, one class was used as experimental class 1, namely the class that used Problem Based Learning (PBL) learning models and one class was used as experimental class 2, namely the class that used Project Based Learning (PjBL) learning models and the two classes were assisted by virtual Edmodo.

The variables in this study are independent variables, dependent variables, and control variables. The independent variable in this study is the Problem Based Learning (PBL) learning model and the Project Based Learning (PjBL) learning model and both classes are
assisted with virtual Edmodo. The dependent variable in this study is the students’ ability to solve mathematical problems.

<table>
<thead>
<tr>
<th>Class</th>
<th>Pre-test</th>
<th>Treatment</th>
<th>Post-test</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eksperiment A</td>
<td>T₁(1)</td>
<td>X₁</td>
<td>T₁(1)</td>
<td>Eksperiment A</td>
</tr>
<tr>
<td>Eksperiment B</td>
<td>T₁(2)</td>
<td>X₂</td>
<td>T₁(2)</td>
<td>Eksperiment B</td>
</tr>
</tbody>
</table>

3 Research finding and discussion

3.1 Research finding

Before given a different treatment, the two experimental classes were first given a pre-test. And after being treated with two learning models, post-test was given. The question used a description form, consisted of 3 questions. In summary, the results of the pre-test and post-test of the two experimental classes are presented in the following table.

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eksp.1</td>
<td>2336.7</td>
<td>1610</td>
<td>1656.7</td>
</tr>
<tr>
<td>Eksp.2</td>
<td>2480</td>
<td>1610</td>
<td>1656.7</td>
</tr>
<tr>
<td>Mean</td>
<td>70.80</td>
<td>48.78</td>
<td>50.20</td>
</tr>
</tbody>
</table>

Based on Table 2 above, it was found that the total and the mean score of pretest and posttest of mathematical problem solving abilities in the experimental class 1 were different from the experimental class 2. Besides being stated differently, the students’ score in experimental class 1 was higher than experimental class 2.

In addition, the difference between pre-test and post-test scores is also necessary to discover whether there was an improvement before and after between pre-test and post-test in the two experimental classes is shown in the following diagram.
Based on Figure 1, it was found that the average deviation of pretest-posttest in experimental class 1 was 29.39, while the deviation of pretest-posttest experimental class 2 was 22.02. The data show that the influence of the learning model in experimental class 1 is higher than the experimental class 2. This is also indicated by the increase of each indicator in both classes as in the following diagram.

Based on the score criteria of problem solving ability, and following data will show the number of students based on the criteria of students' mathematical problem solving ability before and after given a mathematical problem solving ability test.

<table>
<thead>
<tr>
<th>Group, Eksp</th>
<th>Group, Eksp</th>
<th>Descrp</th>
<th>PPS Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post est</td>
<td>pret est</td>
<td>post est</td>
<td>pret est</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>9</td>
<td>2</td>
</tr>
</tbody>
</table>

**Table 3.** Total of based on score criteria of mathematical problem solving ability.
From Table 3 above, it can be seen that the students in the "Very Low" assessment category in both classes experienced a dramatic decrease in the number of students. Whereas for the "Very High" category in both classes at pretest was 0, in the posttest of the experimental class 1 was 6 students and the experimental class 2 was 3 students. Likewise in other categories which show an increase in students' mathematical problem solving abilities before and after treatment.

One of the analytical requirements that must be met in order to use the t-test parametric statistics is the distribution of data must be normally distributed. To test the normality of the data is done by using the Lilliefors test, with normal conditions if $L_{\text{count}} < L_{\text{table}}$ at the level of $\alpha = 0.05$. The results obtained show that experimental data at the experimental class 1 and 2 are from populations that are normally distributed.

The next is a normal homogeneity test for data. Data homogeneity testing is done by using the F test. $F_{\text{count}} < F_{\text{table}}$ means that the population has the same or no different variance.

The data that derived from normal and homogeneous populations, the two-party t-test is used to test the hypothesis. The hypothesis tested is:

$$\mu_1 = \mu_2$$

$$\mu_1 \neq \mu_2$$

Where

- $\mu_1$: Average difference in posttest-pretest population of Experimental class A
- $\mu_2$: Average difference in posttest-pretest population of Experimental class B

Testing this hypothesis, with rejected criteria $H_0$ if $t_{\text{count}} > t_{\text{table}}$ and accepted if $H_0$, if $H_0$ $t_{\text{count}} > t_{\text{table}}$, which is obtained from the list of $t$ distributions with $dk = 64$ at the significant level $\alpha = 0.05$, for the other $t$ $H_0$ is rejected. The average difference between posttest pretest in experimental class 1 was 29.39 and the average posttest-pretest difference in experimental class 2 was 22.02. From the posttest data above obtained $t_{\text{count}} = 1.7727$ and $t_{\text{table}} = 1.6694$ with $\alpha = 0.05$ and $dk = 64$, from testing the hypothesis obtained $t_{\text{count}} > t_{\text{table}}$ that is $1.7727 > 1.6694$ so that $H_0$ is rejected and $H_a$ is accepted. So it can be concluded that there are differences in mathematical problem solving abilities of students who were taught using the Problem Based Learning (PBL) model and the Project Based Learning model with Edmodo's help.

3.2 Discussion

From the results of the pretest, it was obtained that the average score of students in the experimental class 1 is 50.20 and the experimental class 2 is 48.78 and the initial ability of the two classes is not much different. After knowing the students' initial abilities, different learning is given to the two experimental classes. Experimental class 1 was treated with Edmodo-assisted Problem Based Learning and experimental class 2 was treated with Edmodo-assisted Project Based Learning. After the learning process took place for 2 meetings then a post-test was conducted to determine mathematical problem solving abilities in both experimental classes. From the results of the study obtained the average value of the post-test
experimental class 1 is 75.15 and the average value of the post-test experimental class 2 is 70.80.

The difference between the problem based learning model and the project based learning model is that in problem based learning the teacher gives problems to students and students learning through the problems given by the teacher. Which is in learning, the teacher involves students to solve a problem through the stages of making hypotheses, designing experiments, conducting investigations, collecting data, interpreting data, making conclusions, discussing and making reports, so that students can learn knowledge related to the problem. Whereas in learning project based learning the teacher does not directly provide problems to students, however, students are given the opportunity to find their own problems by giving project assignments. Projects compiled by groups that have organized membership and division of tasks to produce a project which in this case is a neatly arranged report. This affects the problem solving indicators of each learning model.

From the calculations that have been made, in addition to obtaining the conclusion that there are differences in problem solving abilities of the two classes, we can also see the results of students' scores so that the differences can be compared. After being applied, the two classes get the sum and average results contained in the following diagram

![Fig. 3. Posttest Average Score of Two Class](image)

4 Conclusion

Based on the results of the study, it can be concluded that there are differences in students' mathematical problem solving abilities taught by Edmodo-assisted Problem Based Learning and Edmodo-assisted Project Based Learning. All indicators of students' mathematical problem solving abilities were improved after the treatments were given in both experimental classes.

References


Bioactivity of Khail-khail (Elaeagnus latifolia) Leaf Extract to Bacteria Staphylococcus saprophyticus and Salmonella enterica

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Abstract. Khail-khail (Elaeagnus latifolia) is one of the plants endemic to Samosir Island in North Sumatra. Nowadays, further research was needed to explore bioactive compounds produced by these plants. This study aimed to assess the antibacterial activity of plant extract against Staphylococcus saprophyticus and Salmonella enterica. The methods of antibacterial activity test were Paper Discs and Microdilution. The Antibacterial activity results used paper disc method against Staphylococcus saprophyticus showed a weak inhibition and Resistant (R). Moreover, the MIC and KBM values with microdilution method were 1250 μg/mL.

Keywords: Elaeagnus latifolia, Isolation, Identification, Secondary Metabolite, Staphylococcus saprophyticus, Salmonella enterica.

1 Introduction

Indonesia has the potential as source of bioactive compounds from many plants. It has more than 38,000 types of plants with 55% are endemic plants (Sahromi, 2016). The use of these plants has been practiced and used in animals and humans albeit with a small amount. Basically, each of these plants contains substances or compounds that can provide a treatment effect or prevention of a particular disease.

Samosir District, North Sumatra province itself has approximately 48 potential plant species, namely timber producers (11 species), fruit producers (11 species), ornamental plants (22 species), traditional medicines (14 species) and herbs (3 species) (Sahromi, 2016). One of these plants is Elaeagnus latifolia which is often called “khail-khail”. The fruit of many members of this genus is a very rich source of vitamins and minerals, especially vitamins A, C, and E (Seal, 2012), flavonoids and other bioactive compounds. Fruit from this plant genus is also a good source of essential fatty acids, which are commonly contained in the fruit. Several studies are being carried out to see the fruit's potential to stop or to reduce cancer growth (Oleaster, 2014).

Some types of bacteria can cause certain diseases. Some of these bacteria include Staphylococcus saprophyticus and Salmonella enterica. Staphylococcus saprophyticus is a bacterium that causes urinary tract infections. This bacterium is the second most common cause of urinary tract infection after Escherichia coli in women aged 17-27 years (Rupp, et al. 1992). Meanwhile, Salmonella enterica is one of the bacteria that causes salmonellosis (Swanson et. al., 2007).
Several studies on the leaves of khail-khail plants have been carried out quite a lot. Phanjom, et. al., (2012) using extracts from these leaves to mediate the synthesis of silver nanoparticles, obtained stable silver nanoparticles with an average size of 30 nm - 50 nm. Arbiastutie, et al., (2016) in a study of several plants in Pangrango Gunung Gede National Park stated that leaf extracts from this plant have IC50 around 389.39 (moderate) to cervical cancer cells. Quattrocchi, (2012) in his book states that the leaves of this plant can be used to treat urinary tract infections.

Previous research conducted by Yanti, (2017) on the leaves of Elaeagnus latifolia plant extracted with ethanol solvent got results in the form of alkaloids in certain fractions and had good antioxidant activity. In addition, the extracted of the leaves, fruits, and seeds of this plant with methanol solventand tested its bioactivity against E. coli, S. dysentiae, and B. subtilis with ampicillin control got the results of antibacterial activity from the extract Marshillong’s research (2017)

Due to the small number of plants Elaeagnus latifolia especially in Indonesia, it is very rare to find research on these plants, so the lack of information about the benefits found in the leaves of this plants. It is expected that with the development of research on Elaeagnus latifolia plants, it will support the cultivation and preservation of this type of medicinal plants in Indonesia. Therefore, researchers are interested in isolating and characterizing secondary metabolites using acetone solvents and testing for antibacterial properties against the bacteria Staphylococcus saprophyticus and Salmonella enterica. owned by plant leaves Elaeagnus latifolia to increase the usefulness of these plants.

2 Materials and methods

This study was conducted at the Research Laboratory and Microbiology Laboratory, Department of Chemistry, Medan State University, Williem Iskandar Pasar V Street, Medan Estate, Deli Serdang, North Sumatra.

2.1 Materials

The materials used in this study is a plant leaf khail-khail (Elaeagnus latifolia), acetone, filter paper, FeCl3 5% and 1%, 2N HCl, distilled water, Dragendorff reagent, acetic anhydride, H2SO4, TLC plate, silica gel merck 60 GF254, silica gel Merck (230-400 mesh), n-hexane, ethyl acetate, and chloroform. For antibacterial test materials were used Mueller-HintonAgar(MHA), Mueller-Hinton Broth (MHB), dimethyl sulfoxide (DMSO), chloroamphenicol, 0.9% NaCl, bacterial cultures of Staphylococcus saprophyticus and Salmonella enterica.

The instruments was used in this research is analytical balance, a set of glasses, TLC chamber, UV lamp (UVP UVGL-55), erlenmeyer flask, vacuum pump, Buchner funnel, column for chromatography, column for vacuum liquid chromatography (VLC), rotary evaporator Heidolph Base HeiVAP HL, incubator, autoclave TOMY ES-315, oven, Petridish, microplate, cotton bud, FT-IR ThermoFisher Scientific Spectrophotometer and 1H-NMR (Nuclear Magnetic Resonance) Spectro-photometer.
2.2 Methods

The Methods used in this research included Extraction, Paper Disc Diffusion, Microdilution, VLC, TLC and GCC. The characterization of compound using FT-IR and 1H-NMR

2.2.1 Leaf extraction of khail-khail plants

Extraction is done by maceration method. A total of 1.3 kg Elaeagnus latifolia leaves that have been mashed, dried, and macerated with acetone 3 x 24 hours. The macerated acetone extract was combined and filtered. The obtained filtrate was evaporated using a rotary evaporator at low pressure, resulting in acetone extract.

2.2.2 Screening of phytochemical compounds secondary metabolites

Analysis flavonoid group compound
The presence of flavonoid group compounds was done by adding two drops of FeCl3 5% solution on five drops of sample on the drop plate. Its happening greenish color changes to black or blue indicate the presence of flavonoids.

Analyses alkaloids group compounds test
The presence of alkaloid group compounds was done by adding 0.5 grams of a sample with 1 ml of 2N HCl and added with 9 ml of distilled water then added with 5 drops of Dragendorff reagent. The presence of red brick deposits indicated the presence of alkaloids.

Analysis Steroid and Terpenoids Group Compound
The presence of steroids and terpenoids compounds made by adding 0.5 gram of extract with 10 drops of acetic anhydride plus 2 drops concentrated sulfuric acid. The mixture were shaken and left a few minutes. The incidence of red and purple color indicates positive triterpenoids. In addition, the emergence of green and blue colors indicate positive steroids.

Tanin group compound test
The test of the presence of tannin class compounds was carried out by adding 0.5 grams of extract with 10 mL of distilled water and added with 3 drops of FeCl 3 1 %, the appearance of a blackish green color shows positive tannin.

2.2.3 Analysis antibacterial activity

Media and sterilization
Bacterial storage media was made using Mueller-Hinton media. MHA powder was weighed 38 grams and mixed with 1 liter of distilled water, while for 21 grams of MHB dissolved in 1 liter of distilled water. The media and all the devices that will be used for analysis are autoclaved 121 °C for 15 minutes (Pelczar, 2005).

Bacterial suspension
The bacteria that will be used first were cultured before being used for test. The bacteria that have been sterile and smeared on MHA media, put into the incubator to be incubated at 37°C for 24 hours. After that the bacteria are suspended into 0.9% NaCl to the McFarland 0.5
standard (0.5 mL BaCl2 0.048 mol/L in 99.5 mL H2SO4 0.18 mol/L). The suspension of bacteria into 0.9% NaCl is the same as bacterial dilution of 10-6 CFU/mL (McFarland Standard 0.5).

Paper disc diffusion method test

In this test, the concentration of test extracts used were 100, 50, 25 and 12.5 µg/µL with DMSO solvents (Natheer, et al. 2012). The 100 µL/µL test extract was prepared by weighing 0.01 g extract and dissolved in 1 mL DMSO. Concentrations of 50, 25 and 12.5 µg/µl are made by performing serial dilution extracts with DMSO. Bacterial suspension was taken with a cotton bud and smeared on MHA media which has been prepared in advance. Each Petri dish was made with a diagram of 6 parts and each section was placed in a disc paper that has been dripped with 20 µg of test extract.

The positive control used was 30 µg of chloramphenicol antibiotic disc while the DMSO solvent used for negative control (Natheer et al. 2012). Positive control disc paper, negative control, and discs that have been dripped with extract solution, placed on each part and then incubated at 37°C for 24 hours (Nufailah, 2008). The clear area around the disc shows no bacterial growth which was measured using a caliper run. The inhibition zone measurement results are classified based on Table 1.

<table>
<thead>
<tr>
<th>Diameters of Inhibition Zone (mm)</th>
<th>Antibacterial Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 10</td>
<td>No Activity</td>
</tr>
<tr>
<td>10 – 15</td>
<td>Weak</td>
</tr>
<tr>
<td>15 – 20</td>
<td>Medium</td>
</tr>
<tr>
<td>&gt;20</td>
<td>Strong</td>
</tr>
</tbody>
</table>

Table 1. Classification of Antibacterial Activities (Greenwood, 1995).


Before the antibacterial test, a test solution (sample) was prepared using a DMSO solvent with a concentration of 1000 µg/mL. MHB liquid media that has been suspended with 100 µL of bacteria is inserted into each microplate hole. In the first hole, 100 µL of the test solution is added. The solution concentration series was carried out by transferring 100 µL of solution from the first hole to the second hole, from the second hole 100 µL was taken and put into the third hole, the same was done to the tenth hole.

The next two holes were used for two control solutions. For the first control the hole was filled with 100 µL of a liquid medium and 100 µL of bacterial suspension (growth control), while for the control of the two holes only filled with 200 µL of liquid medium (sterility control). The microplate is then incubated at 37°C for 24 hours. The antibiotic control used in this study was chloramphenicol. The determination of MIC was carried out based on observations on the concentration that began to appear bacterial growth and MBC was determined by placing 5 µL of samples that were not overgrown with bacteria in the agar medium, then incubated again for 24 hours. The determination of MBC was based on bacteria that did not grow in the media.
2.2.4 Isolation of components of khail-khail plant leaf extract

Separation with VLC and TLC

The acetone extract was fractionated using liquid vacuum chromatography with a column diameter of 10 cm and adsorbent height 5 cm. Fractionation was carried out using 60 GF254 silica gel Merck as a stationary phase and mobile phase in the form of eluent n-hexane, n-hexane, ethyl acetate, ethyl acetate (variation based on polarity level) with various eluent comparisons. The resulting fraction is then monitored by TLC with the n-hexane mobile phase: ethylacetate for eluent test. The same Rf values will be grouped into several combined fractions, which are then tested for phytochemicals again.

Separation by gravity column chromatography

The combined fraction with the same pattern of Rf results from VLC, fractionated further by GCC with a silica gel Merck 60 and motion fraction n-hexane:ethyl acetate. The fractions obtained from the eluent were monitored by TLC with the n-hexane: ethyl acetate mobile phase with a comparison obtained from the previous TLC. The same Rf value was combined and then one of the fractions was selected based on the incorporation of the Rf value in the TLC with the three-eluent test namely n-hexane: ethyl acetate (1:1), n-hexane: chloroform (1:1) and ethyl acetate: chloroform (1:1) samp a i indicates a single spot.

2.2.5 Characterization of component compounds of khail-khail plant leaf extract

Component structure characterization is carried out including analysis by using FT-IR spectroscopy and 1H-NMR spectroscopy. 1H-NMR is useful for determining parts of hydrogen and carbon from a compound. The FT-IR analysis is useful for knowing the functional groups of the isolated compounds by observing the wave numbers produced.

3 Result and discussions

3.1 Phytochemical screening test results of secondary metabolites

Extracts obtained from the maceration process were then tested by phytochemical screening for qualitative analysis of secondary metabolites contained in extracts obtained. The results of phytochemical screening tests for extracts are shown in Table 2.

<table>
<thead>
<tr>
<th>Group</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flavonoid</td>
<td>+</td>
</tr>
<tr>
<td>Saponin</td>
<td>+</td>
</tr>
<tr>
<td>Alkaloid</td>
<td>-</td>
</tr>
<tr>
<td>Terpenoid</td>
<td>-</td>
</tr>
<tr>
<td>Steroid</td>
<td>+</td>
</tr>
<tr>
<td>Tanin</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 2 : Phytochemical screening test result of acetone extract of plant leaves of *Elaeagnus latifolia*.
3.2 Antibacterial test results

3.2.1 Antibacterial test results for paper disc method

Based on the average diameter value of the inhibition zone shown in Table 3. The inhibitory zone value of the extract tested on S. saprophyticus bacteria which was a gram-positive bacteria showed better inhibitory activity compared to S.enterica bacteria.

![Fig. 1. Results of extracted paper discs test on bacteria A) S.enterica and B) S.saprophyticus](image)

Table 3. Diameter of inhibitory zone results in antibacterial test with paper disc method.

<table>
<thead>
<tr>
<th>Concentration Sample (µg/µL)</th>
<th>Zone of Inhibition (mm)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S. enterica</td>
<td>S. saprophyticus</td>
<td></td>
</tr>
<tr>
<td>Control (+)</td>
<td>27.35 ± 2.62</td>
<td>35.75 ± 0.21</td>
<td></td>
</tr>
<tr>
<td>Control (-)</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>9.05 ± 1.06</td>
<td>7.40 ± 0.14</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>8.15 ± 0.35</td>
<td>9.15 ± 0.07</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>7.75 ± 0.78</td>
<td>10.55 ± 0.49</td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>8.25 ± 0.07</td>
<td>10.60 ± 0.42</td>
<td></td>
</tr>
</tbody>
</table>

The inhibition zone value of S. saprophyticus was classified as weak for extract concentrations of 25 µg/µL and 12.5 µg/µL (10-15 mm) based on Greenwood classification (1995) and no inhibitory activity (<10 mm) in S. enterica. Meanwhile, according to the standards set by CLSI M100 (2017), the inhibitory activity of the extracts used in this study was in the R or Resistant (≤ 12 mm) category.

Based on the results, more Gram-negative bacteria can withstand acetone extract Khail-khail plant leaves compared to gram-positive bacteria. The compounds in the extract will bind to peptidoglycan so that it can damage the cell wall and the growth of gram-positive bacteria can be inhibited when the extract works on it. The compounds extracted are more polar as well as peptidoglycan which consisted of polar proteins and carbohydrates because acetone is more likely to be polar. Whereas in Gram negative bacteria, the compounds in the extract cannot directly bind with peptidoglycan but must damage the outer membrane first. Its cause of
Gram-negative bacteria is more difficult to inhibit than gram-positive bacteria (Mulyadi, et al. 2017).

3.2.2 Antibacterial test results for micro-dilution method

Fig. 2. Results of testing the microdilution method antibacterial activity for determination of A) MIC and B) MBC.

<table>
<thead>
<tr>
<th>Concentration of Extract (µg/mL)</th>
<th>MIC</th>
<th>MBC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>Ex</td>
</tr>
<tr>
<td>9.73</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>19.45</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>39.06</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>78.13</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>156.25</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>312.50</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>625.00</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>1250.00</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2500.00</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5000.00</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 4. The value of MIC and MBC test results with the microdilution method.
Test results in Table 4 showed that the MIC values and MBC extracts of khail-khail plant leaves were the same value. Based on the standards set in CLSI M100 (2017), the MIC values in the extracts tested in this study were in the R or Resistant category (≥ 32 µg/mL). In addition, the MIC and MBC extract values also good compared to the MIC and MBC results of plants with the same genus (Elaeagnus) reported by Dehghan, et al (2014) on plants Elaeagnus Angustifolia and Różalska, et al (2018) in the Elaeagnus Rhamnoides plant.

3.3 Isolation of extract component components

Isolation of component compounds contained in the extract of khail-khail plant leaves was carried out by two methods, namely liquid vacuum chromatography and gravity column chromatography. After being separated, the results of the isolates were tested by using TLC. The TLC test results were shown in Figures 3 and 4.

3.4 Characterization of extract compound with FT-IR and 1H-NMR

The isolates fraction tested showed that the isolates had several types of functional groups, namely amines, alkanes, aldehydes, alkenes, alkyl halides, and aromatics based on the IR spectrum data.

3.1 Phytochemical

Extracts obtained from the maceration process were then tested by phytochemical screening for qualitative analysis of secondary metabolites contained in extracts obtained. The results of phytochemical screening tests for extracts are shown in Table 2.

![Fig. 5. Results of isolate faction sample FT-IR spectrograms.](image-url)
The results of the analysis with 1H-NMR spectroscopy isolated compounds which with CDCl3 solvent there were 2 signal peaks at δ 8.5 ppm indicated 1H in the aldehyde group (Sudjadi, 1983), singlet signal δ 9.5 ppm indicating 1H in the amine group (Pavia et al. 2008). δ 5.5-5 ppm it indicates that there is 1H in the pyridine group.

The structure elucidation of the compound cannot be continued with structural reading due to the use of 13C-NMR spectroscopy which was not carried out in this study. The isolation of these compounds produced limited yield so it was not enough to test with 13C-NMR spectroscopy so that the structure of the compound was unpredictable. However, it was found that isolated compounds were alkaloid based on the results of FT-IR and 1H-NMR. This is due to the presence of an amine (NH2) and aromatic groups in the form of pyridine which is known in the 1H-NMR spectrum.

The presence of alkaloid group compounds in the leaves of Elaeagnus latifolia plants was also supported by the study of Minhas, et al (2018) who succeeded in finding alkaloid group compounds namely 2-(1-hydroxy-2-methylpropyl)-3-(2-hydroxyethyl)-1-methyl-1H-indole-4,7-diol which is one of the indole alkaloids. In addition, Aniszewski (2007) also states that the genus Elaeagnus contains at least alkaloids which are derivatives of L-tryptophan namely Elaeagnine derived from amino acids.

4 Conclusions

The isolation and identification of secondary metabolites from Elaeagnus latifolia leaves is an alkaloid group compound based on the results of analysis using spectroscopy FT-IR and 1H-NMR. Antibacterial activity test for Khail-khail plant leaf extract against S. enterica and S. saprophyticus bacteria showed good inhibition on S. saprophyticus bacteria with MIC and MBC values of 1250 µg / ml, respectively.

Fig. 6. Results of 1H-NMR spectra sample isolate fraction.
References


The Effect of Scientific Inquiry Learning Model Using on Student’s Concept Knowledge and Science Process Skills in Senior High School

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Abstract. Study aimed to analyze the effect of scientific inquiry learning model on concept knowledge and science process skills in senior high school students. This research is a quasi experimental research with two group pre-test post-test design. The population of this research is all student of class XI MIA SMAN 1 Delitua (Senior High School), semester I academic year 2018/2019. Selection of sample is done by cluster random sampling that is XI MIA-1 as experiment class applied scientific inquiry learning and XI MIA-2 as control class applied conventional learning. Instrument used in this research is instrument of concept knowledge in essay form as much as 10 problem and instrument of science process skills in essay form as much as 10 problem which have been declared valid by expert team. Form the result of the study concluded that the first hypothesis test obtained t-counted = 2,92 with α = 0,05 obtained t-table= 2,00. By comparing t-counted with t-table turns t-counted>t-table, this means concept knowledge of students applying scientific inquiry model better than the student’s concept knowledge with conventional learning. The second hypothesis obtained t-counted = 3,53 with α = 0,05 obtained t-table = 2,00. By comparing t-counted with t-table turns t-counted>t-table it means the science process skills of students applying scientific inquiry learning model is better than student’s science process skill with conventional learning.

Keywords: Scientific Inquiry Learning Model, Concept Knowledge, Science Process Skills

1 Introduction

Based on the results of a preliminary study conducted by researchers on students and a physics teacher at SMAN 1 Delitua 1, it was found that in starting the lesson the teacher rarely presents conceptual problems. The teaching and learning process prioritizes the completeness of the material and less optimizes students’ learning activities to find their own concepts and use knowledge the concept he has to solve a problem, this shows that aspects of conceptual knowledge that students have is still lacking. The process of teaching and learning in the classroom tends to be analytical by focusing on decreasing physical formulas through mathematical analysis to solve problems, so students find it difficult to learn physics and questions that are trained by the teacher are very far from the real world. Practical activities to train students’ science process skills are rarely implemented in the learning process, instead the teacher performs demonstration activities. Demonstrations are carried out because the teacher has the consideration that the demonstration activities do not spend time. The learning process
is more dominated by conventional learning. In the implementation of the learning process, question and answer activities between teachers and students are also lacking. Students rarely ask questions and answer questions, there are even students who never ask questions or answer questions given by the teacher because students do not understand the subject matter delivered, so students become less active and feel bored following the ongoing learning process.

Based on the description of the preliminary study above, it can be concluded that, in the implementation of the learning process, it is necessary to have a scientific inquiry-based learning model that is able to encourage student activities, so that students are more active in following the learning process which is expected to influence students' conceptual knowledge improvement and learning outcomes such as students' science process skills as well. will increase. Scientific inquiry-based learning model is a scientific inquiry learning model. According to Joyce (2009), "The core of the scientific inquiry learning model is to involve students in investigating the actual problem by exposing them to the investigation, helping them identify methodological or conceptual problems in the investigation and inviting them to design ways to overcome these problems ". Thus, students can find out how knowledge is built in the community of scientists. At the same time, students will also appreciate knowledge as a result of an exhausting research process and may also learn the limitations and advantages of current knowledge.

2 Method

This research was carried out at SMA Delitua 1 which is located at Jln. Education No. 1 Delitua, District of Delitua, Deli Serdang Regency, Indonesia, in class XI in the odd semester of 2018/2019 Academic Year.

The sample was taken randomly (cluster random sampling), which is class XI MIA-1 using the inquiry scientific learning model and class XI MIA-2 using conventional models.

This type of research is quasi-experimental and the research design was carried out with the pre-test post-test control group design.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Pre-test</th>
<th>treatment</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>Y₁</td>
<td>X₁</td>
<td>Y₂</td>
</tr>
<tr>
<td>Control</td>
<td>Y₁</td>
<td>X₁</td>
<td>Y₂</td>
</tr>
</tbody>
</table>

X₁ = Learning by using the Scientific Inquiry learning model; X₂ = Learning by using conventional learning models; Y₁ = The pre-test given before the treatment in the experimental class is the application of the Scientific Inquiry learning model and the control class which is the application of conventional learning; Y₂ = Post-test given after treatment in the experimental class, namely the application of the Scientific Inquiry learning model and the control class by applying conventional learning.

Collecting data in this study using research instruments, namely tests of conceptual knowledge and science process skills of students. Data collection was carried out in two stages, the first stage was collecting students' conceptual knowledge data and the second stage collecting data on students' science process skills. The research instrument was carried out in
the form of a practical test in the form of student worksheets for science process skills and test essays for conceptual knowledge.

The statistic used in the study is the Lilliefors test to see normality, test the variance comparison to see homogeneity and t-test to see the effect.

3 Result and discussion


The cause of students' conceptual knowledge in the experimental class is better than the control class is because the scientific inquiry learning activities will support students to gain knowledge through several steps, namely observation, problem formulation, hypothesis preparation, data collection, and concluding. Students learn themselves in this learning to use investigate, solve and find solutions to problems given by teachers through investigations and discoveries through practical activities. This makes students more active in conducting investigations and discoveries. Practicum practices provide opportunities for students to experience themselves or do it themselves, following a process of observing an object, condition, or process of something. In practicum activities students will search and process research results to be used as knowledge, construct concepts meaningfully by connecting observations with theories that have been previously owned to solve a problem it faces. Joyce et al. (2009) state that the research process uses procedures - scientific procedures are scientific process skills carried out in a scientific activity. As stated by Siswono, et al. (2017) science process skills have a positive influence on the mastery of students' physics concepts which are proven through theoretical and empirical analysis. Science process skills can be demonstrated in a scientific activity and provide opportunities directly to students to be actively involved in learning to gain new knowledge or develop knowledge possessed by students. Suryani et al (2017) stated that the scientific inquiry model is suitable to be used to improve the Skill of the Science Process because essentially scientific inquiry teaches students to process information by using techniques that have been used by researchers, namely students faced with a scientific activity or experimentation through experiments that demand physical intellectual involvement of students. Active students will encourage the development of students' conceptual knowledge.

The second factor that causes conceptual knowledge of students in the experimental class is better than the control class because students are trained to ask and answer questions posed by the teacher. The scientific inquiry learning model is designed to bring students directly into the investigation process. Through the scientific model, students are expected to actively ask questions why something happened and then find and collect and process data to find answers to these questions. Learning that directs students to ask questions and answer questions according to Hersulastuti (2017) will direct students to have the ability to think critically, namely analysis, evaluation, conclusion, explanation, and self-reflection. The scientific learning model requires starting with presenting problems to students. As what was conveyed by Suryanti, et al (2015) Students who have good conceptual knowledge can be seen from the way he answers the question or in solving the given problem.

The third factor that causes conceptual knowledge of students in the experimental class is better than the control class is because through the activities in the scientific inquiry learning
model will encourage students to think critically. Critical thinking is a skill that must be trained to students because the goal of critical thinking is to achieve deep understanding. Safarani suggested learning objectives would be achieved well if students had adequate critical thinking skills. Practicum activities are one of the means to train critical thinking skills. Ngalimun (2016) that critical thinking students are expected to be able to propose various approaches in problem solving. Problem solving involves students in exploring and critically examining problems, ideas and arguments. by applying critical thinking skills in interpreting, analyzing, and evaluating. According to Joyce (2009), "The core of the scientific inquiry learning model is a learning model that involves students in research problems that are truly original by exposing them to the field of investigation, helping them identify conceptual or methodological problems in the field, and inviting them to designing ways to solve problems. From here, they can see how a science is created and built in the community of scientists. At the same time, they will value knowledge as a result of an exhausting research process and may also learn the limitations and advantages of current knowledge. Through practicum activities students will conduct scientific investigations and furthermore are expected to be accustomed to critical thinking, the same thing is conveyed by Syafitri (2016) there are differences in scientific thinking abilities between low and high levels of critical thinking, this is because students who think critically have a sense of wanting know high, get used to questioning everything, and have the ability to argue in terms of submitting a hypothesis. The ability or potential of individuals to think basically has been owned since the individual was born. The potential to think begins with the ability of each individual to guess or guess (hypothesize) of a problem. When an individual can prove his guess, he will arrive at a position that can encourage him to think further. Therefore, the potential to develop the ability to guess on each individual must be fostered. One way the teacher can do to develop the ability to guess (hypothesize) on each child is to ask various questions that can encourage students to be able to formulate answers temporarily or can formulate various estimates of possible answers to a problem being assessed, estimates as hypotheses not just any estimate, but must have a solid foundation of thinking, so that the hypothesis raised is rational and logical. In the scientific inquiry learning model, the above is an activity that arises during learning activities so as to provide meaning and fun for students because they find their own solutions to problems given by the teacher through investigations according to scientific steps. While conventional learning is learning that uses the teacher as the only source of learning, in the sense that the teacher is the holder of control and control in determining content, learning methods and assessing student learning outcomes. One of the weaknesses of this learning model is the success of student learning depends on the skills and abilities of the teacher, students are less involved in the learning process so that students feel bored.

Based on the description above it can be concluded that conventional learning is less able to improve students' conceptual knowledge, and the scientific inquiry learning model is better in improving students' conceptual knowledge.

The science process skills learned by the scientific learning model show better results than students who are taught with conventional learning (Siswono, et al, 2017; Suryani, et al, 2017, Widyawati, et al, 2016).

The cause of science process skills in the experimental class is better than the control class is because the scientific inquiry learning model can provide a real and active experience through practicum activities. Learning activities involve students actively (student centre) to investigate problems presented on student worksheets. Scientific inquiry model learning activities train students to be skilled in obtaining and processing information through thinking activities by following scientific procedures. Angraini (2015) in his research found that there
were differences in science process skills between students who were given a model of scientific inquiry learning and students who were given a direct instruction learning model. The average student process skills given scientific inquiry learning is 70.07, and the average for students with direct instruction is 64.13. Through physics practicum activities will be easier to understand and understand because it is done directly so that they will know the truth there is a theory they get. Through practicum activities students will prove the concepts or theories that already exist and can experience the process or experiment itself then draw conclusions, so as to support students' understanding of the learning material.

The second factor that causes the science process skills of students in the experimental class is better than the control class is because the experiment can also be done to prove the truth. Ardani (2014) states that Experiment activities aim to train students' thinking skills, develop students' scientific attitudes, and can train students to solve problems critically. Learning the model of scientific inquiry learning invites students to criticize starting from problems, temporary answers, collecting and analyzing data and concluding answers to problems. As stated by Safarati (2017) From the results of the study showed there are differences in science process skills between students who are taught with the scientific inquiry inquiry model and direct instruction learning, the average pretest value of the class process skills direct instruction is 43.00 and the average posttest score is 75, 14. While the average value of the pretest of the scientific inquiry class is 44.50 and the average posttest score is 82.93. A good learning structure in the inquiry scientific inquiry model makes students have high thinking skills. It can be concluded that the scientific inquiry model uses the scientific inquiry learning model. can create better student process skills.

4 Conclusions

Knowledge of conceptual students learned by the scientific inquiry learning model is better than students who are taught with conventional learning; the science process skills of students who are taught with the scientific inquiry model are better than students who are taught with conventional learning.

References


The Development of Video Media on Measurement of Basic Quantities Mechanic

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Physics Education Study Program FMIPA Unimed¹,²,³

Abstract. This research is to develop a video media on measuring the basic quantities mechanics as well as valid length, practical and effective. The measuring instruments to be used include: vernier caliper, micrometer screw gauge, digital balance, three arms balance and digital stop watch. The media is expected to help students' skills both independently or with the help of lecturers in measuring the basic quantities mechanics. This research was conducted in the Unimed Physics Department. The type of research is research using the Research and Development (R & D) method. The stages carried out during the research were tool needs analysis, media making design, media expert and media expert, revision, small group try out, revision, large group test, final revision. So the result of video media is found on length, mass of video media measuring length, mass and time measurement. In the teacher try out, small and large group try out, for extensive usage of this media will be uploaded on Line and you tube. The data analysis technique that used here is quantitative descriptive analysis technique that is by analyzing quantitative data obtained from expert test questionnaires and field tests. The results of the research show the basic quantities measuring mechanics video was valid, practical, and effective. (1) Percentage of assessment score from material experts 78.7% and percentage of assessment scores from media experts 81%. So, Video as learning media included to valid criteria. (2) The practicality testing of the Video Learning was retrieved from questionnaire filling by the students. Results from the small group of students obtained 81%. While the large group received 88.3%. (3) The assessment Effectiveness as Learning Device based on the results of cognitive 82%. Based on the results of the assessment and responses obtained from the questionnaire, it can be concluded that the video learning media for measuring the basic quantities Mechanics is suitable for used and developed.

Keywords: Measurement of basic quantities Mechanics, Line, you tube, quantitative data.

1 Introduction

Measurement is one of lecture materials in general physics courses. Many students have difficulty in understanding the material. From the data result of this study at Department of Physics of the State University of Medan is showing that many students obtain the minimum pass namely C. Only a few of students successfully obtain satisfactory grades namely A. This continued each year, just a little change even experienced a decrease. Besides general physics course is given for new students who unfamiliar with the activity of the lecture, it is a challenge for the lecturer to provide the appropriate learning materials and make student learn independently.
General Physics course is 3 semester credit hours (SCH) consist of 2 SCH for theory and 1 SCH for practice. Practical work is carried out in the laboratory of physics but still not able to increase the motivation of students to learn independently and reduce the dependence of the presence of professors and their assistant. Another problem is the learning media which is not up to date. As we know, learning media is one of the factors determining the success of learning. Learning media is one of the devices to help professors delivering the message and the subject matter to students effectively and efficiently. Learning media usage in the process of teaching and learning can generate interest and desire, motivation and stimulation of learning activities, and even psychological influences brought against the student so that will help the effectiveness the learning process in the delivery of the message and the content. In addition to arousing the interest and motivation of students, learning media can also help students improve understanding, presenting data with interesting and condense information.

Video is one of audio visual media. There are many videos about length measuring instrument vernier caliper, mass measuring tool and time measuring tool. Although there is still no media showing the third measuring instrument simultaneously. In order to add students’ interest and improve their understanding, video about this three measurement must be made and then uploaded to the LINE and You Tube. At this time, information technology is developing rapidly. It should be utilized in the process of learning. The utilization of information technology not only as a medium used directly in the classroom, but could also facilitate the students in studying independently. Currently, there are many internet features such as social media, games, blog, you tube and web site can be used as learning devices. According to Burnett & Melisa (2008), You tube is a website in the form of popular video sharing service that allows to load and watch various video clips for free. In this case, the author will discuss about the usage of LINE and You tube as learning media for students.

The topic about media had been examined by a researcher Isma (2015). She concluded that the development of android-based chemistry learning aims to enhance learning motivation and cognitive achievement. And also, I Made, dkk (2014) found that the development of learning material in drawing with the software-aided Autocad application program can improve learning outcomes. According to Ika (2014) audio visual media/video influences the learning outcomes for Grade XI High School students in understanding the concept of elasticity. It can increase the motivation of learning and the cognitive achievement of HIGH SCHOOL students. Based on the the results of the findings above, the authors try to formulate this topic “The Development of video media on Measurement of Basic quantities Mechanic”.

2 Research methods

This research is using Research and Development (R & D) developed by R & D Cycle Borg and Gall (1983). The steps of R & D research according to the Borg and the Hall are:

a. Preliminary Studies by doing:
   ✓ need analysis for length, mass and time measuring instruments;
   ✓ theoretical studies;
   ✓ the study of relevant research results, namely the library studies examine theory and research results that are relevant and the initial survey location research;
   ✓ the initial survey for research location.

b. Research Planning by:
   ✓ Formulating research objectives;
✓ Setting design and research stages.
c. Design development by determining:
✓ Type of design;
✓ Facilities;
✓ Stages of the implementation of field trials;
✓ Specification of Task Description.
d. Field trials early stage involving material experts and media experts participation.
e. Doing revision of testing product, based on the feedback and suggestion from the initial field test results
f. Main field trial. Conduct trials on small scale or limited samples.
g. Test the revision of the product from the main field trials.
h. Operational field test. Test large scale, data collected through questionnaires, interviews, observations and others.
i. Completion of the final product, improvements were made based on the findings in the field implementation trial.
j. Dissemination and implementation, to make the report of products at professional meeting and published in journals, working together between the publishers, monitor distribution to do quality control.

The data analysis techniques were carried out is using quantitative descriptive analysis techniques, namely by analyzing quantitative data in the form of figures obtained from expert test questionnaire and field test questionnaire. According to Suharsimiarikunto (1993: 27), quantitative data in the form of figures resulting from calculations or measurements are processed by adding up and then compared to the expected amount so that to obtain a percentage of feasibility. The formula that used is:

\[
P = \frac{X}{X_i} \times 100\% \]

Where:
P = Percentage of each criteria
X = score of each criteria.
Xi = maximum score of each criteria

The main text should be written using Times New Roman, 10pt, fully justified. Italics can be used for emphasis and bold typeset should be avoided.

**Table 1.** Percentage table scale according to Suharsimiarikunto (1993: 2008).

<table>
<thead>
<tr>
<th>Value</th>
<th>Criteria</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Very good</td>
<td>80%&lt;X&lt;100%</td>
</tr>
<tr>
<td>B</td>
<td>Good</td>
<td>60%&lt;X&lt;80%</td>
</tr>
<tr>
<td>C</td>
<td>Medium</td>
<td>40%&lt;X&lt;60%</td>
</tr>
<tr>
<td>D</td>
<td>Poor</td>
<td>20%&lt;X&lt;40%</td>
</tr>
<tr>
<td>E</td>
<td>Very poor</td>
<td>0%  &lt;X&lt;20%</td>
</tr>
</tbody>
</table>

To test the effectiveness of video media measuring the principal amount of the Mechanics is obtained as follows:
Instrumen of data collection that used in this research is questionnaire evaluation forms. Questionnaire is a technique or method of collecting data indirectly. The instrument that used in this research was aimed to assessing the feasibility of video media measuring the principal amount of mechanics. The data that obtained from this questionnaire is quantitative data. The questionnaire form that used is a multilevel scale that is a question followed by columns that indicates the levels (SuharsimiArikunto, 1993: 125).

### 3 Result of research and explanation

#### 3.1 The result of research

This research produces audio-visual media in form of basic quantities measuring mechanics video learning. This video will be uploaded to LINE application for a small group of students especially the students majoring in physical education who has took participation in General Physics Course and also a large group of students especially the students majoring in physical education class C which are currently taking General Physics Course. As for the widespread use of this video learning, it will be uploaded via You Tube.

This research generates a product that is a valid, practical, effective and appropriate basic quantities measuring mechanics video.

#### 3.1.1 Review of material expert

The material assessment covers two aspects of quality and material expediency. Data validation by the material expert can be seen in paragraph below:

The results of the expert assessment of this matter in terms of aspects (1) quality of material, obtained a score of 181 (78%), and (2) the material expediency gained score 27 (84.3%). Overall, the level of validation of learning material on video measurement magnitudes of principal mechanics earned score 208 (78.7%). So the score of 208 from the material test, with the percentage of attainment of 78.7% are on a scale of 1. The calculation results are presented in the table below:

<table>
<thead>
<tr>
<th>Value</th>
<th>Criteria</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Very good</td>
<td>80%&lt;X&lt;100%</td>
</tr>
<tr>
<td>B</td>
<td>Good</td>
<td>60%&lt;X&lt;80%</td>
</tr>
<tr>
<td>C</td>
<td>Medium</td>
<td>40%&lt;X&lt;60%</td>
</tr>
<tr>
<td>D</td>
<td>Poor</td>
<td>20%&lt;X&lt;40%</td>
</tr>
<tr>
<td>E</td>
<td>Very poor</td>
<td>0% ~X&lt;20%</td>
</tr>
</tbody>
</table>

\[
x = \frac{\text{number of scores obtained}}{\text{ideal number of scores}} \times 100\%
\]
The results of validation from material expert.

<table>
<thead>
<tr>
<th>Validation</th>
<th>Aspects of the Validation</th>
<th>The Results of Validation</th>
<th>Eligibility Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video</td>
<td>Quality</td>
<td>78%</td>
<td>Proper in use “best in predicate”</td>
</tr>
<tr>
<td></td>
<td>Experience</td>
<td>84.3%</td>
<td></td>
</tr>
</tbody>
</table>

So this video media is valid. Based on the results of the analysis and evaluation of the expert, magnitudes measuring mechanic video needs some revisions. Their suggestions are:

- Some images are out of focus;
- In measuring of depth shouldn’t use a glass, it is better to use smaller objects;
- The placement of the objects when measuring outer diameter with caliper is not precise;
- The use of the caliper is less accurate.

3.1.2 Review of media expert

Validation by the media expert covers three aspects, namely the aspects of quality, language usage, the layout. The results of the media expert assessment of this matter in terms of aspects (1) the quality of the media gained a score of 44 (84.6%), (2) use of language got a score of 19 (79.2%), (3) the layout of the media obtained a score of 31 (77.5%). Overall, the level of validation of learning material on tutorial video earned score 94 (81%). So the score of 94 from the media test, with the percentage of attainment of 81% are on a scale of 1. Note the table below:

<table>
<thead>
<tr>
<th>Validation</th>
<th>Aspects of the Validation</th>
<th>The Results of Validation</th>
<th>Eligibility Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video</td>
<td>Quality</td>
<td>84.6%</td>
<td>Proper in use “best in predicate”</td>
</tr>
<tr>
<td></td>
<td>Language</td>
<td>79.2%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Layout</td>
<td>77.5%</td>
<td></td>
</tr>
</tbody>
</table>

In other words, these learning media from media aspect are valid. Based on the results of the analysis and evaluation of the media expert, magnitudes measuring mechanic video needs some revisions. Their advices on the video are:

- We recommend the script (description) does not cover the measuring process;
- We recommend that before shooting process, the cast doing rehearsal so it seems natural;
- The merging of multiple videos must be done precisely in order to produce smooth video.

The signification of measuring results by using caliper and screw micrometers is less visible, this can lead confusion to the audience.
3.1 Headings, tables and figures

Measurement is one of the lecture materials in general physics courses. Many students have difficulty in understanding the material. From the data result of this study at the Department of Physics of the State University of Medan is showing that many students obtain the minimum pass namely C.

3.1.3 Response of student test results in a small group

After getting suggestions from the experts, this video will be tested in a small group consisting of 8 students majoring in Physical Education who have participated in the General Physics course before. Each of them was asked to view the video through LINE application, then they were asked to fill out a questionnaire form. The form consists of 15 questions about three aspects: video display, video content, and its usability. The results of the questionnaire are: (1) the display, obtained the score 228 (85.1%), (2) the content, received the score 84 (81%), (3) the usability, obtained the score 106 (83%). Total overall score was 418 (82%). There are some inputs from the students about this magnitudes measuring mechanics video. Their inputs are:

- To avoid the lost of some video parts, video must be edited delicately;
- The explanation in video content should be delivered more slowly;
- Use a brief note;
- The video volume must be made louder.

3.1.4 Response of student test results in a large group

After a series of validation and revision, the tutorial video was tested to the students of Physical Education Class C. The testing subject consisted of 40 students. The researchers asked the students to open LINE application on their android and watched it. Next, the students are requested to provide a response by filling out the questionnaire form. The form consists of 15 questions about three aspects: video display, video content, and its usability. The results of the questionnaire are: (1) the display, obtained the score 1191 (84.2%), (2) the content, received the score 259 (84%), (3) the usability, obtained the score 558 (88.3%). Total overall score was 2008 (85.4%). There are some inputs from the students about this magnitudes measuring mechanics video. Their inputs are:

- The material description should be made in detailed explanation;
- The video volume must be made louder;
- The video time should be made shortened;
- Use a brief/simple note;
- Use appropriate music background;
- The Note color should be made contrast to the layout;
- The presenter must be exposed in video;
- The video should be uploaded to the other social media such as Whatsapp, BBM, Instagram, etc.

Based on the research that has been done on the development of video media on Measurement of Basic quantities Mechanics, found that the score of student learning outcomes from 40 respondents in the range 10-17. From the calculations show that the lowest
score of 10 and the highest score of 17. The value of the effectiveness of video media is 82% belongs to the very good category.

3.2 Explanation

The results of the research show the basic quantities measuring mechanic video was valid, practical, and effective.

1. Validity of The Video as Learning Media achievement is 81% and 77.8% for media experts assessment. Thus, Video as learning media included to VALID criteria.

2. Practicality of The Video Learning The practicality testing of the Video Learning was retrieved from questionnaire filling by the students. The practicality usage of LINE application is also being asked. Results from the small group of students obtained 80%. While the large group received 88.3%.

3. Effectiveness as Learning Device. The assessment effectiveness as learning device based on the results of cognitive 82%.

4 Conclusions and suggestions

Based on the results of the research can be concluded that magnitudes measuring mechanic video learning are valid, practical, effective and very decent used, with details:

(1) Valid, the assessment of the material and media experts already ensure this criteria;
(2) Practical, the using of LINE application to play the video learning get very good responses from the students in small group and also larger group;
(3) Effective, It is called effective because it supports learning process;

There are also some suggestions for this video learning:

(1) The video duration should be made shortened because it can make students and the audience get bored.

(2) Advanced research needed to be done similar to this research.
References


Utilization of Natural and Synthetic Cytokinins Towards Dragon’s Blood Germination (Daemonorops didymophylla)

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Abstract. Dragon’s blood (Daemonorops didymophylla) is one of local plants in Jambi Province that has commercial value. However, the existence of this plant is rare due to lack of cultivation by local community because of long period of germination of dragon’s blood seeds (8 months - 1 year). This researches aimed to discover the effect of given natural cytokinins (coconut milk) and synthetic (atonic) towards dragon’s blood germination. Results shows that given synthetic cytokinins (atonic) at 1,5% with soaking period for 48 hours and natural cytokinins (coconut milk) at 75% at 48 hours soaking period able to stimulate fastest germination resulting only two days while soaking period towards dragon’ss blood haveno influence towards germination. The highest germination found on 1% atonic concentration and 75% concentration of coconut milk.

Keywords: Atonic, coconut milk, concentration, dragon’s blood, germination and soaking period

1 Introduction

Dragon’s blood (Daemonorops didymophylla) is one of local plants in Jambi Province that has a economy value. Dragon’s blood is one of rattan palms. Generally most frequent part used from rattan is the stem, however, different with dragon’s blood palm, resin is the part used resulted from its fruit. Dragon’s blood resin can be used for medicine for some illness such as diarrhea, bleeding, anti tumor, as well as anti microbe. In addition, its resin also used as natural dyes (Gupta et al., 2007).

Dragon’s blood resin has become source of income of Jambi citizens that live around forest and AnakDalam tribe. Based on survey about dragon’s blood resin at local level at 2009-2012 is Rp. 60.000,-/kg, and since 2014 dragon’s blood resin able to reaches Rp. 100.000.

Dragon’s blood resin were exported into some countries. The demand of dragon’s blood resin in global market were stable with higher consumer involving China, Hongkong dan Singapura. Based on data from RRC that this country requires 400 tons of dragon’s blood resin every year and Indonesia only capable to export less than 27 tons per year (Arifin, 2009). Based on BPS dragon’s blood palm production in Jambi decreased. Last production at 1995 reaches 15 tons after 1995-2010 dragon’s blood palm production were not recorded.

Asra (2013) found four kinds of dragon’s blood in Jambi forest. They were Daemonorops maculata J. Dransf., Daemonorops draconcella Becc., Daemonorops propinqua Becc. and Daemonorops draco (Willd.) Blume. Asra (2014) conduct a genetic diversity to dragon’s
blood palm (D. draco) in Jambi and Riau Province both forest in Bukit Tiga Puluh National Park and forest outside National Park and found that the highest genetic diversity found in Jambi Province therefore dragon’s blood palm in Jambi Province is a potential source of germplasm.

Daemonorops didymophylla is one of dragon’s blood that can produce high quality red resin (Heyne, 1987). In Tebo district (Jambi Province) local name of D. didymophylla is kelukup. According to Sulasme et al. (2012) in Jebak Village (Batanghari District, Jambi), indigenous people (Orang Rimba or Anak Dalam Tribe) called this plant as rotan kelemunting or mengkarung. This species does not depend on the season and always bear fruit throughout the year.

Dragon’s blood population in Jambi province occurs a drastically decline. There are few factors cause this condition such as forest logging both legal and illegal, forest conversion for rubber and oil palm plantation, forest fire as well as lack of interest to cultivate by local community lead to a declining in producing of dragon’s plant resin. This condition caused by long period of dragon’s blood germination (8 months - 1 year) and fruiting at age (5 years).

Another effort to accelerate germination of dragon’s blood by giving cytokinins hormone. Cytokinins hormone able to postpone dormancy period and stimulate embryo growth. As a result, seed will be faster to germinate. Cytokinins hormone including both natural and synthetic. Therefore this research aimed to reach best concentration and soaking period to stimulate dragon’s blood germination.

2 Methods

2.1 Time and location

This research was conducted from July to September 2018. Samples were collected in Secondary forest in Tebo regency, Jambi Province While speed and seeds viability were conducted in Integrity Laboratory, University of Jambi.

2.2 Materials

Dragon’s blood seeds (Daemonorops didymophylla), synthetic sytokinin hormone (atonic) natural cytokinin (coconut milk). While materials used is micro pipette, camera, test tube, wrapper and plastic box.

2.3 Germination test

Peel and pulp as well as dirt were cleaned up, seeds must be soaked using clean water for 1 - 2 hours and then peel off and rinsed for few times until clean. The next following step is stored in shady and dry place.

2.4 Treatment cytokinins hormone

Cytokinins hormone were arranged in varied concentration by adding sterile water. Synthetic cytokinins (atonic) concentration including 0%; 0.5%; 1% and 1.5% while for natural cytokinins (coconut milk) 0%; 25%; 50%; 75% and 100%. The soaking were every 0
hour, 12 hours, 24 hours, and 36 hours. In addition especially for natural cytokinins (coconut milk) after soaked 12 hours have to replaced with new one. Soaked seeds in cytokinins solvents were rinsed using clean water and soaked with fungicide (dithane) solvents for five minutes.

2.5 Seeds germination

Soaked seeds in cytokinins solvents were entered to white plastics and tied using a wrapper and observed to obtain time for seeds to germinate as well as germination potency.

2.6 Data analysis

Data obtained then analyzed using ANOVA.

3 Results and Discussion

3.1 Time of seeds emerged

Germination is a growth and development process of embryo. Dormancy is one of the factors that caused seed to postpone germination. Effort can be done to accelerate germination and seeds growth by facilitating the entry of water and oxygen to the embryo by destructing the impermeability of seeds coat by mechanical treatments towards the seeds. Therefore, before soaking using natural and synthetic cytokinins, seeds of dragon’s blood were scarified first. As a result from scarification process of dragon’s blood coat is increasing the permeability towards gases and water and able to trigger activation of some enzymes in seeds for overhaul process of food reserves (catabolism). According to Child (1984) instead of destructing the impermeability of seeds coat, giving growth regulator able to accelerate germination.

In addition giving cytokinine hormone also able to stop dormancy period from dragon’s blood seeds (Daemonorops didymophylla). Rachmawati et al. (2017) reported that atonic also provide enough phenolic compound and absorbed by seeds to enhance the metabolism. While coconut milk contain high amount of auxcyn to stimulate cells division in seeds.

Based on ANOVA using two factors involving soaking period and cytokinin concentration (atonic and coconut milk) shows that all treatment shows a significant changes ($F > F_{crit}$, $P_{value} < F_{crit}$). Soaking using cytokinins hormone able to penetrate peel seeds and accelerate germination.

Least Significance Different test at 5% shows every treatment shows significant changes towards dragon’s blood germination time (Table 1 and Table 2).
Table 1. Interaction of synthetic cytokins (atonic) concentration and soaking period (days)

<table>
<thead>
<tr>
<th>Synthetic Cytoninins Concentration (%)</th>
<th>Soaking period (hours)</th>
<th>0</th>
<th>24</th>
<th>36</th>
<th>48</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6h</td>
<td>5,67gh</td>
<td>4,67ef</td>
<td>3,67cd</td>
<td></td>
</tr>
<tr>
<td>0,5</td>
<td>6,3h</td>
<td>5fg</td>
<td>4,67de</td>
<td>3bc</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4,3hdef</td>
<td>5,67gh</td>
<td>4,67e</td>
<td>3bc</td>
<td>2,3ab</td>
</tr>
<tr>
<td>1,5</td>
<td>4,3def</td>
<td>3,67cd</td>
<td>2,67ab</td>
<td>2a</td>
<td></td>
</tr>
</tbody>
</table>

Note: rates at column follow by different letter (not same) show significant changes at LSD test significance level 5%

Utilization of synthetic cytokins (atonic) at 1,5% with 48 hours soaking period shows a significant changes towards another treatments (best concentration) because thus concentration able to trigger endogen auxcyn to enhance cells osmosis pressure, protein synthesize, while Farida (2018) reported that soaking using atonic will facilitate milk and oxygen to penetrate the seeds in germination process.

Atonic is growth regulator which contain phenolic compound, natrium, brown, dissolve in milk as well as has a distinctive aroma. Atonic components consisted of natrium 5–nitroguaiicol (C7H6NO4Na), natrium ortonitrofenol (C6H4NO3Na), natrium para-nitrofenol (C6H4NO3Na) and natrium 2.4 - dinitrofenol (C6H3N2O5Na). Those components affecting germination time to broke dormancy period. In addition, atonic also enhance protoplasm flow rate, stimulate root and shoot growth, flowering, prevent loss of flowering and fruiting, pollen, enhance fertilization, and improve fruit quality (Asahi, 1979). Saputra et al. (2017) reported that Atonic contain both cytokinin and auxcyn that fasten food reserves degradation in seeds to become milk soluble components. Those components will be transmitted and used to formed new cells at embryo in forming protoplasm for germination. This condition in line with Sunarlim et al. (2012) report that atomic is one of growth regulator from liquid auxcyn group that able to accelerate root formation, enhance the absorption of nutrients and encourage vegetative growth as well as stimulating flowering phase.

In addition, giving synthetic cytokinins also reinforce nutrients transmission into plant cells. The smooth process of transporting food reserves digested by seeds of germinating plants is directly proportional to the speed of seed germination.

Giving higher atonic concentration were affecting germination time to become faster. However, too high atonic concentration cause enzyme activity for cell respiratory were obstructed. As a result, respiration will be reduced and cause declining milk contents in plant tissue. While Suhaila et al. (2013) using atonic for 8 cc/l were inhibit the growth of Cylindroladium sp.

Soaking period also related to amount of water that able to penetrate into seeds (Harto yo 2015). This conditions were related to given atomic concentration (mixing between water and atonic). Water is a crucial factor for germination. Water penetrates into seeds will hydrolyze starch as a source of food reserves and energy in germination. Lack of water will cause metabolism disorder.
### Table 2. Interaction of natural cytokinin (coconut milk) and soaking period (days)

<table>
<thead>
<tr>
<th>Natural Concentration (%)</th>
<th>Soaking period</th>
<th>0 hour</th>
<th>24 hours</th>
<th>36 hours</th>
<th>48 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5,67&lt;sup&gt;gh&lt;/sup&gt;</td>
<td>4,67&lt;sup&gt;ef&lt;/sup&gt;</td>
<td>3,67&lt;sup&gt;cd&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>5,67&lt;sup&gt;th&lt;/sup&gt;</td>
<td>5,3&lt;sup&gt;fg&lt;/sup&gt;</td>
<td>4,3&lt;sup&gt;de&lt;/sup&gt;</td>
<td>3,3&lt;sup&gt;bc&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>5,67&lt;sup&gt;th&lt;/sup&gt;</td>
<td>5&lt;sup&gt;ef&lt;/sup&gt;</td>
<td>3&lt;sup&gt;cd&lt;/sup&gt;</td>
<td>3&lt;sup&gt;bc&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>5&lt;sup&gt;ef&lt;/sup&gt;</td>
<td>4,3&lt;sup&gt;de&lt;/sup&gt;</td>
<td>3&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>2&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>5,67&lt;sup&gt;th&lt;/sup&gt;</td>
<td>4,67&lt;sup&gt;ef&lt;/sup&gt;</td>
<td>3,3&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>2,6&lt;sup&gt;ab&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

Note: rates at column follow by different letter (not same) show significant changes at LSD test significance level 5%

Utilization of natural cytokinins (coconut milk) at 75% with 48 hours soaking period shows a significant changes towards another treatments (best treatment) because those concentration that exist in growth regulator and coconut milk able to stimulate germination. In line with this Fathonah et al. (2011) conduct research about soaking period towards palm seeds for 24 hours using varied coconut milk concentration 0%, 25%, 50%, 75% and 100%. Best result shows at 75%.

Growth regulator and nutrients from coconut milk are extremely required for growth and development process. In addition, coconut milk contain organic compound such as vitamins (B and C), hormones (auxcyn, cytokinis, gibberellic acid, protein, carbohydrates, Ca and P) (Purdyaningsih, 2013).

According to Halimursyadah et al. (2015) coconut milk extract facilitate imbibition process from seeds and stimulate germination. Adding coconut milk (organic compounds) that contain cytokinin and auxcyn to accelerate cells division.

#### 3.2 Seedling viability

Seeding viability shown by amount of normal seed emerged at certain time and condition and ± 30 determine in seedling viability. Based on ANOVA cytokinins concentration (atomic and coconut milk) is significantly different towards dragon’s blood seedling viability (F>F<sub>crit</sub>, Pvalue<F<sub>crit</sub>) while soaking period did not show any significant changes towards seedling viability (F<F<sub>crit</sub>). According to Sunarnilam et al. (2012) shows that soaking period using atomic did not affect seedling viability to Citrullus vulgaris Sumpena (2006) shows that seeds viability of cucumber seeds did not affected by soakingperiod contrary given atomic concentration affecting seeds viability.
Table 3. Interaction of synthetic cytokinins (atonic) concentration and soaking period towards rates of seeds viability of dragon’s blood seeds

<table>
<thead>
<tr>
<th>Atonic Concentration (%)</th>
<th>Soaking Period (hours)</th>
<th>0</th>
<th>24</th>
<th>36</th>
<th>48</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>41.67%&lt;sup&gt;a&lt;/sup&gt;</td>
<td>50%&lt;sup&gt;b&lt;/sup&gt;</td>
<td>58.3%&lt;sup&gt;c&lt;/sup&gt;</td>
<td>66.67%&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>0.5</td>
<td>75%&lt;sup&gt;e&lt;/sup&gt;</td>
<td>83.3%&lt;sup&gt;f&lt;/sup&gt;</td>
<td>83.3%&lt;sup&gt;g&lt;/sup&gt;</td>
<td>91.67%&lt;sup&gt;h&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>83.3%&lt;sup&gt;f&lt;/sup&gt;</td>
<td>91.67%&lt;sup&gt;g&lt;/sup&gt;</td>
<td>91.67%&lt;sup&gt;h&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>66.77%&lt;sup&gt;d&lt;/sup&gt;</td>
<td>75%&lt;sup&gt;e&lt;/sup&gt;</td>
<td>75%&lt;sup&gt;e&lt;/sup&gt;</td>
<td>75%&lt;sup&gt;e&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

Note: rates at column follow by different letter (not same) show significant changes at LSD test significance level 5%

Based on data, it can be seen clearly that the highest rates seeds viability resulted from treatment at atonic 1%. In line with this Hartman et al. (1990) reported that atonic can be effective at certain concentration. Based on data it can be seen that the highest rates seedlings viability found in atonic at 1% concentration. Seedling viability treated using atonic is higher compared to water (control).

Low concentration did not effective in stimulating germination while too high concentration able to obstruct seeds viability. This condition cause dragon’s blood palm viability increase along with given atonic concentration and stopped at 1.5% this concentration did not effective in stimulating germination.

Table 4. Interaction of natural cytokines (coconut milk) concentration and soaking period towards rates of seeds viability of dragon’s blood seeds.

<table>
<thead>
<tr>
<th>Coconut Concentration (%)</th>
<th>Soaking period (hours)</th>
<th>0</th>
<th>24</th>
<th>36</th>
<th>48</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>67&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.3&lt;sup&gt;c&lt;/sup&gt;</td>
<td>.3&lt;sup&gt;g&lt;/sup&gt;</td>
<td>.67&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>67&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.3&lt;sup&gt;e&lt;/sup&gt;</td>
<td>.3&lt;sup&gt;f&lt;/sup&gt;</td>
<td>.67&lt;sup&gt;g&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>.3&lt;sup&gt;e&lt;/sup&gt;</td>
<td>.3&lt;sup&gt;f&lt;/sup&gt;</td>
<td>.3&lt;sup&gt;f&lt;/sup&gt;</td>
<td>.3&lt;sup&gt;f&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>.67&lt;sup&gt;d&lt;/sup&gt;</td>
<td>.3&lt;sup&gt;e&lt;/sup&gt;</td>
<td>.3&lt;sup&gt;f&lt;/sup&gt;</td>
<td>.67&lt;sup&gt;f&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>.67&lt;sup&gt;d&lt;/sup&gt;</td>
<td>.67&lt;sup&gt;d&lt;/sup&gt;</td>
<td>.3&lt;sup&gt;f&lt;/sup&gt;</td>
<td>.3&lt;sup&gt;f&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

Note: rates at column follow by different letter (not same) show significant changes at LSD test significance level 5%

Statistic analysis for soaking period using coconut milk shows that soaking period did not show significant changes towards seeding viability. However, there is a significant changes towards seeds that soaked using coconut milk compared to control. Coconut milk contain some hormones involving cytokinin (5.8 mg/l), auxecyn (0.07 mg/l), gibberelic acid and another components that able stimulating germination and growth in plant (Morel, 1974). Cytokinin and auxecyn play a great role in cell division and differentiation certain tissue in forming root and shoot development while gibberelic acid beneficial in germination acceleration

The highest rates seedling viability shown at concentration 25% and 75% with soaking period 48 hours. This condition in line with Fathonah et al. (2011) using varied concentration (0%, 25%, 50%, 75% and 100%) towards palm seeds and the highest viability is 96.25%. Tampubolon (2016) reported that soaking seeds using coconut milk 100% did not effective
because without combination of coconut milk and milk will cause concentrate solution. As a
consequence, absorption of cytokinin were reduced both in and outside of cells resulting less
active cell division.

Giving coconut milk were based on concentration because the higher given concentration
will cause mortality (lethal) in seeds. While according to Sujarwati et al. (2011) cytokinins
will actively in cells division at concentration 40-80%. Application of coconut milk with
appropriate concentration will affect the germination from dragon’s blood seeds, otherwise
both too high and low concentration of organic hormone or growth regulator will not affected
the growth and development.

The success of growth hormone application such as cytokinin determine by some factors
such as appropriate concentration, methods, growth regulator, appropriate timing, kinds of
growth regulator because each growth regulator has its own specifications towards plant
growth and development (Santosa, 2013).

4 Conclusions

Dragon’s blood seeds (Daemonorops didymophylla) that soaked using atonic at 1,5% for
48 hours using coconut milk at 75% shows the fastest germination time at second day. The
most effecting concentration found in atonic 1% and coconut milk75% towards seeds viability
while soaking period did not show significant changes.

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tanggal 27 Januari 2018).
Ltd.
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Untuk Invigorasi Benih Cabai Merah ( Capsicum annum L.) Kaduluras pada Stadia
Practices. USA: Prentice-Hall International Inc.
Konsentrasi Zat Atonik terhadap Pertumbuhan dan Hasil Tanaman Wortel (Daucus carotte L.). Jurnal


Abstract. Other research aims to obtain data on vegetation analysis of species lichens in Aek Nauli-Forest and TAHURA, Karo North Sumatera. This study transect method, determination of tree stands in purposive sampling with exploratory surveys and inventories, is descriptive. The results showed a high diversity and obtained 22 species of lichens, the 19 species in Aek Nauli and 14 species in TAHURA. Thallus lichens forms encountered on two locations: crustose, foliose and fruticose. Data analysis Relative Density (RD) of Vegetation Relative Frequency (FR) Relative Dominance (RDm) and Importance Value (IV), the highest for Aek Nauli consecutive Pyrhospora quernea the type (25.56%, 15.52%; 25.56% and 68.63%). Data analysis of RD; FR; RDm and IV for the highest consecutive Tahura the type of Pertusaria amara (24.80%, 21.05%, 24.80% and 70.64%). Almost all types of lichens both locations showed clumped distribution pattern and one type which shows a random distribution pattern. Through measurements of physico-chemical factors on the standing tree Styrax sp. Aek Nauli obtained in air temperature, air humidity and light intensity on average (22.90°C, 60%; 827.1 Joules). While in the TAHURA, has a temperature, humidity and light intensity on average (21.20°C; 77.9%, 894.4 Joules).

Keywords: Vegetation, Lichens, Corticolous, Styrax

1 Introduction

Lichens can grow in almost all places such as on rocks, soil and tree stands, one of which is in the stands of incense trees. The incense tree has an upright/straight stem with little branching. The bark is grooved until it cracks in a vertical direction or is smooth notched, grape red skin. The inner skin is soft, brown to red, pink or purplish red. The shape of the thallus lichens found in the frankincense tree stands usually in the form of crustose, foliose, fruticose, and squamulose (Hasairin, et al. 2014).

Based on data from Bogor Herbarium Bogorienis, lichens in Indonesia number 40,000 species, but not many researchers in Indonesia have pursued this research, so the opportunity to research lichens in Indonesia is still wide open and potentially (Pratiwi, 2006). The fact that is known and displayed in biology books shows that only a few species are known, even though the number reaches 40,000 species. In addition to the types, the benefits of Lichens have also not been widely reviewed (Pratiwi, 2006). Furthermore Darma et al. (1998) found several types of lichens, in pine stands, among others: Parmelia reticulata, Crusta sp. and Staurothele sp., whereas in rubber stands found Parmelia sp., Parmelia reticulata, Verrucaria sp. and one species belonging to Lichens imperfecti. Thallus Parmelia reticulata is found to develop in pine and rubber trees.

Forest area is very potential for habitat growth of the lichens. One of them is the Aek Nauli-Parapat Protection Forest and the Bukit Barisan Grand Forest Park (TAHURA), Tongkoh. This forest is located in North Sumatra which is a tropical rain forest ecosystem which is the habitat of living things. These forests have not been much researched on flora and fauna, although there are only a few protected forests and nature reserves that specifically examine flora and fauna, but research on the diversity and distribution of lichens is still rare, such as in the Aek Nauli forest area, Parapat, Simalungun Regency and Forest Park (TAHURA) Bukit Barisan, Karo District. Both of these forest areas can be used as research locations. The vegetation type can be divided into three, namely shrub vegetation type, secondary forest and primary forest from lowland to highland reaching a height of ± 2000 m altitude above sea level. The topography is flat to hilly with the slope of clay and
sandy land. This forest area has a wet month (rainfall of 7200 mm/month) for nine consecutive months, a temperature range between 16.8°C-23°C, and high humidity ± 80% (Tjitrosoepomo, 1989); (Sipman, 2003).

Based on the description above, it is necessary to conduct research on "Analysis of Lichens Vegetation in Frankincense Tree Stands (Styrax sp.) In the Aek Nauli Forest Area - Parapat in Simalungun District and TAHURA Forest Park Bukit Barisan, Karo District, North Sumatera".

2 Materials and methods

Research done in the area of Aek Nauli-Forest and TAHURA Karo, Sumatera Utara. Sample is the types of lichens that grow on the bark (corticolous) of the Kemenyan (Styrax sp.) tree. Tool used for collections; tool measuring habitat and physical properties of the media grows; microscopic observations tool. Ingredients aquades, alcohol 70%, laktofenol-analin blue, tissue preparations making. The study was descriptive by the exploratory survey and inventory. Types of tree stands are researched is Kemenyan (Styrax sp.) with 10 trees each location. Determination of tree stands with "Purposive sampling". The technique of sampling method "Vertical Transek" upward as high as 4 meters (Hasairin, et al, 2014). For the first two meters created as plots one and two metres to-2 as the two plots. The number of plots of trees stands by as much as 15 x 2 = 30 plots. Any species of lichens collected for purposes of identification and documentation. For identification using the reference "Key to the lichens genera identification using the reference "Key to the lichens genera book "Grasses, Ferns, Mosses & Lichens" (Sipman, 2003). Data analysis calculates the number of thallus, the percentage of attendance, the vegetation, the index of diversity using the formula Shannon–Wiener. The distribution pattern.

3 Results and discussion

3.1 Description of the research location

Aek Nauli has a protected forest area of tropical forest with an area of approximately 2,500 Ha, located in North Sumatra Province, Simalungun Regency, Girsang Sipangan Bolon District, at 20° 41' to 20° 44' LU and 98° 57' to 98° 58' BT with a height of approximately 1,200-1,400 m altitude is above sea level. Tofigraphy is flat, bumpy and hilly and has a complete spread of forest vegetation. The total area is ± 2,500 Ha and the research forest is around 300 Ha while the rest is asylum forest.

Tahura Bukit Barisan is the third Tahura in Indonesia determined by the President with a Presidential Decree R.I. No. 48 of 1988 on November 19, 1988. Tahura Bukit Barisan is a management unit that has core areas of protected forests and conservation areas with a total area of 51,600 Hektar. Place height ± 1400 - 2000 meter altitude above sea level.

Fig. 1. Location Research a) TAHURA Bukit Barisan; b) Aek Nauli Forest Area
### 3.2 Lichens found in both study location

Based on the results of the research conducted at the two study sites there were 22 species from 11 genera. For the Aek Nauli forest area as many as 19 species and in the TAHURA region as many as 14 species. Lichens identified according to Misra and Agrawal refer to "Key to the lichens genera of Bogor, Cibodas and Singapore" (Sipman, 2003), "Key to the Lichen Genera of the Pacific Northwest (McCune, 2010)" and with reference ooks "Grasses, Ferns, Mosses & Lichens" (Phillips, 1990). The genus is divided into genus Cladonia, Graphis, Lecanora, Lepraria, Parmelia, Peltigere, Pertusaria, Pyrenula, Rimelia, Usnea and Verrucaria. Of the 22 species of lichens found in the two study locations in the frankincense tree stand, there was a diversity that was so varied from one another. Comparison types of lichens, number of colonies and diversity index are shown in Table 1.

<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>Aek Nauli (Parapat)</th>
<th>Tahura (Karo)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>∑ (%)</td>
<td>Pl</td>
</tr>
<tr>
<td>1</td>
<td>Cladonia coniocrae</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Graphis scripta</td>
<td>2</td>
<td>0.11</td>
</tr>
<tr>
<td>3</td>
<td>Graphis elegans</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Lecanora conizoides</td>
<td>80</td>
<td>4.53</td>
</tr>
<tr>
<td></td>
<td>Lecanora thysanophora</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Lepraria incana</td>
<td>14</td>
<td>8.15</td>
</tr>
<tr>
<td>7</td>
<td>Lepraria vouauxii</td>
<td>9</td>
<td>0.51</td>
</tr>
<tr>
<td></td>
<td>Lepraria sp.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Lepraria umbricola</td>
<td>78</td>
<td>4.42</td>
</tr>
<tr>
<td>10</td>
<td>Parmelia saxatilis</td>
<td>46</td>
<td>2.60</td>
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<tr>
<td>11</td>
<td>Parmelia plumbea</td>
<td>59</td>
<td>3.34</td>
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<td>12</td>
<td>Parmelia caperata</td>
<td>42</td>
<td>2.38</td>
</tr>
<tr>
<td>13</td>
<td>Peltigere sp.</td>
<td>36</td>
<td>2.04</td>
</tr>
<tr>
<td>14</td>
<td>Pertusaria amara</td>
<td>23</td>
<td>13.0</td>
</tr>
<tr>
<td>15</td>
<td>Pyrenula nitida</td>
<td>21</td>
<td>1.19</td>
</tr>
<tr>
<td>16</td>
<td>Pyrenula sp.</td>
<td>84</td>
<td>4.76</td>
</tr>
</tbody>
</table>

**Table 1. Comparison and lichens diversity index in research sites**
Based on Table 1 the highest percentage of lichens found in Aek Nauli, Parapat, Simalungun Regency is Pyrhospora quernea with a value of 26.56%. The highest percentage of lichens in TAHURA Bukit Barisan Karo Regency is Pertussaria amara with a value of 24.80%. While the lowest percentage of lichens found in Aek Nauli forest is Graphis scripta with a value of 0.11%. The lowest percentage of lichens in TAHURA Karo Regency is Graphis scripta with a value of 0.41%.

By looking at the highest percentage of lichens in the two study locations there were differences in species. This is most likely influenced by the ecological conditions of the environment where the lichens grow. According to Pratiwi (2006) the growth of lichens is influenced by several environmental factors including air temperature, air humidity, and air quality (Pratiwi, 2006).

The diversity value in Aek Nauli - Parapat, Simalungun Regency is $H' = 2.52$, while in TAHURA Bukit Barisan Tongkoh - Karo Regency is $H' = 2.05$ which according to Odum (1993) is in good condition (high) because of the value $H' > 2$ (Odum, 1993). This situation is acceptable given the location of the study is relatively fertile and has physical chemical factors that are very supportive for the growth and development of lichens. Species diversity is influenced by the distribution of individuals in each type, because a community even though there are many species, but if the distribution of individuals is not evenly distributed, species diversity is low.

The high diversity seen shows the stability of the community in it. This is because the two research locations are classified as primary forests with relatively high heterogeneity. Barbour said that a community is said to have high species diversity if the community is composed by many species with an abundance of the same or almost the same species (Barbour, et al. 1987). Next (Odum, 1993) states that the more the number of species, the more diversity. In this study, diversity ($H'$) is higher in the location of the Aek Nauli forest area - Parapat compared to TAHURA, Tongkoh - Karo Regency.

Lichens in the frankincense tree stands generally have different characteristics in terms of shape, color and also their lushness. The shape of the thallus lichens found in both locations varies, consisting of elongated, rounded and irregular shapes. The shape of the lichens in the incense stand for the crustose type lichens tends to be elongated and irregular. This situation can be found in the genus Phyrospora and Pertussaria. According Pratiwi states the shape of the thallus, especially for the crustose type, will be found dam forms that are not fixed and
some types of lichens have a thallus shape which tends to resemble a circle but can also be found in irregular conditions (Pratiwi, 2006); (Hasairin, et al. 2014).

3.3 Analysis of the vegetation lichens research location

The vegetation in the forest area of the lichens Aek Nauli – Parapat and TAHURA, Bukit Barisan, Kabupaten Karo very in detail are presented in Table 2.

In Table 2 the highest vegetation analysis data is in the form of Relative Density (KR); Relative Frequency (FR); Relative Dominance (DR) and Important Value (NP); the highest was for Aek Nauli, respectively, namely Pyrhospora quernea (25.56%; 15.52%; 25.56% and 68.63%) and the lowest in Graphis scripta. While KR analysis data; FR, The highest DR and NP for Tahura were Pertusaria amara (24.80%; 21.05%; 24.80% and 70.64%) respectively.

The highest Important Value Index (INP) found in the Aek Nauli forest - Parapat Simalungun Regency is Pyrhospora quernea with a value of 68.63%. The highest important value found in TAHURA - Karo District is Pertusaria amara with a value of 70.64%. This means that Pyrhospora quernea and Pertusaria amara species are the most dominant types of lichens along the study area, can be seen in the sampling table of lichens in both study locations

<table>
<thead>
<tr>
<th>No</th>
<th>Species</th>
<th>Aek Nauli</th>
<th>Tahura</th>
<th>IVI Aek Nauli</th>
<th>Tahura</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cladonia coniocraea</td>
<td>-</td>
<td>-</td>
<td>0.82</td>
<td>1.05</td>
</tr>
<tr>
<td>2</td>
<td>Graphis scripta</td>
<td>0.11</td>
<td>0.86</td>
<td>0.11</td>
<td>0.41</td>
</tr>
<tr>
<td>3</td>
<td>Graphis elegans</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.61</td>
</tr>
<tr>
<td>4</td>
<td>Lecanora conizoides</td>
<td>4.53</td>
<td>1.72</td>
<td>4.53</td>
<td>12.81</td>
</tr>
<tr>
<td>5</td>
<td>Lecanora thysanophora</td>
<td>4.42</td>
<td>2.59</td>
<td>4.42</td>
<td>2.05</td>
</tr>
<tr>
<td>6</td>
<td>Lepraria incana</td>
<td>5.32</td>
<td>8.62</td>
<td>5.32</td>
<td>17.32</td>
</tr>
<tr>
<td>7</td>
<td>Lepraria umbricola</td>
<td>0.11</td>
<td>0.86</td>
<td>0.11</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Lepraria vouauxii</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2.36</td>
</tr>
<tr>
<td>9</td>
<td>Lepraria sp.</td>
<td>4.42</td>
<td>3.45</td>
<td>4.42</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>Parmelia saxatilis</td>
<td>2.60</td>
<td>4.31</td>
<td>2.60</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>Parmelia plumbea</td>
<td>3.34</td>
<td>6.90</td>
<td>3.34</td>
<td>0.41</td>
</tr>
<tr>
<td>12</td>
<td>Parmelia caperata</td>
<td>2.38</td>
<td>3.45</td>
<td>2.38</td>
<td>0.61</td>
</tr>
<tr>
<td>13</td>
<td>Peltigere sp.</td>
<td>2.04</td>
<td>3.45</td>
<td>2.04</td>
<td>0.92</td>
</tr>
<tr>
<td>14</td>
<td>Pertusaria amara</td>
<td>13.08</td>
<td>9.48</td>
<td>8</td>
<td>24.80</td>
</tr>
</tbody>
</table>
3.4 Physical properties of environmental chemistry

Observation of ecological characteristics carried out by measuring physical chemical factors, namely; air temperature, air humidity, and light intensity. This measurement was carried out only once for each plot as primary data and secondary data was obtained from the Sampali Meteorology and Geophysics Agency in Medan.

Table 3. Characteristics of ecology in two research sites

<table>
<thead>
<tr>
<th>Tree</th>
<th>Environmental Conditions</th>
<th>Temperature (°C)</th>
<th>Humidity</th>
<th>Light Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Aek Nauli</td>
<td>Tahura</td>
<td>Aek Nauli</td>
</tr>
<tr>
<td>Aek Nauli</td>
<td></td>
<td>23</td>
<td>20</td>
<td>57</td>
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<tr>
<td>II</td>
<td></td>
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<td>22</td>
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<tr>
<td>III</td>
<td></td>
<td>19</td>
<td>23</td>
<td>82</td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td>24</td>
<td>21</td>
<td>43</td>
</tr>
<tr>
<td>V</td>
<td></td>
<td>22</td>
<td>23</td>
<td>67</td>
</tr>
<tr>
<td>VI</td>
<td></td>
<td>23</td>
<td>20</td>
<td>53</td>
</tr>
<tr>
<td>VII</td>
<td></td>
<td>23</td>
<td>21</td>
<td>56</td>
</tr>
<tr>
<td>VIII</td>
<td></td>
<td>23</td>
<td>21</td>
<td>58</td>
</tr>
<tr>
<td>IX</td>
<td></td>
<td>24</td>
<td>21</td>
<td>62</td>
</tr>
<tr>
<td>X</td>
<td></td>
<td>24</td>
<td>20</td>
<td>52</td>
</tr>
<tr>
<td>Rata-rata</td>
<td></td>
<td>22.9</td>
<td>21.2</td>
<td>60</td>
</tr>
</tbody>
</table>

Based on table 3, the results of measurements of air humidity on average at the two study locations were 58.29% and 77.41%, this supports the opinion Pratiwi (2006) which states that...
lichens like dry places with humidity of 40% to 69% (Pratiwi, 2006). The average air humidity in aek nauli is in the range of 40% - 69%, so there are more types of lichens in that location. where as the average humidity in tahura is above that range, so there are fewer types of lichens in tahura. nevertheless the growth and development of lichens in an area is not only determined by the humidity factor of the air, growth and development of lichens in frankincense trees in the two study sites were also influenced by the content of pollutants in the air, because the area contained a trans-sumatra road.

The measurement of air temperature at the aek nauli location ranges from 19°c - 24°c and in the tahura region, ranging from 20°c-23°c. according to Pratiwi (2006) high temperatures will increase respiration rate and reduce the rate of photosynthesis. temperature conditions with a range of values at the two study sites support the growth and development of the lichens because they are in normal plant threshold conditions.

3.5 Index of Diversity / Abundance of Lichens

The distribution or distribution pattern of each type of lich is determined using the ratio ratio formula with the middle value. the following is a graph of the distribution pattern of a type of lichens found in the two study locations. according to krebs if the distribution index is 1 (\( v/m = 1 \)) then the distribution of the species is random, if the distribution index is> 1 then the distribution is clustered, and if the distribution index is <1 then the distribution is uniform (Pratiwi, 2006). the distribution pattern or level of distribution obtained from the two locations is almost more than 1 (> 1) and there is one type in the aek nauli forest area where the distribution is equal to 1 (= 1), namely verrucaria sp. from these results it is known that the distribution pattern of lichens is more than 1 (> 1) the distribution is grouped and the distribution pattern of lichens is equal to 1 (= 1) the distribution is random. this shows that the type of distribution pattern in the two study locations almost entirely reflects heterogeneous reproductive modes, group behavior, and one type reflects homogeneity and non-selective patterns of behavior. this statement is justified by Kusmana (1995), that there are 3 types of distribution patterns, namely: (1) random or random, this pattern reflects homogeneity and patterns of non-selective behavior, (2) clumped, this pattern reflects heterogeneous habitats, reproductive modes, group behavior, etc., (3) uniform or uniform, reflecting the existence of negative interactions between individuals such as competition for space, nutrients or light.

4 Conclusion

The results showed a high diversity and obtained 22 species of lichens, the 19 species in aek nauli and 14 species in tahura consisting of 11 genera. thallus lichens forms encountered on two locations is crustose, foliose and fruticose, but the squamulose type is not found. data analysis relative density of vegetation (kr) relative frequency (fr) relative dominance (dr) and importance value (np), the highest for aek nauli consecutive pyrhospora quernea the type and the highest consecutive tahura the type of pertusaria amara. physical-chemical condition of the habitat that supports the growth and development of this type of tourist forest lichens tahura, karo is the average temperature (21.20c), humidity (77.9 %) and light intensity (894.4 joule), but at aek nauli is the average temperature (22,90c), humidity (60 %) and light intensity (827,1 joule). almost all types of lichens both locations showed clumped distribution pattern.
the highest dispoersion of lichens is lecanora conizoides and the lower distribution of lichens is usnea filifumdea.

5 SUGGESTIONS

Need further identification at lepraria sp.; peltigere sp.; pyrenula sp.; verrucaria sp. physical chemistry environmental factors need to be added to look at other factors that influence real against the presence of lichens. other factors include the density of the heading, direction and wind speed are thought to affect the pattern of spread of lichens.

Acknowledgments. The authors wish to thanks Prof. Dr. Syawal Gultom, M.Pd rektor State University of Medan for HIBAH KDBK and supporting the research data.

References

Plankton Community in The Water of Babura River, Deli Serdang Regency

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Abstract. Plankton communities in Babura River Deli Serdang are the title of the research that has been conducted to determine the presence of plankton by a place of life. The research was conducted in November 2016. In order to provide the accuracy of data, then each station there are ten sub-stations for sampling samples. The results from this study illustrated of Plankton community in the river Babura, there are 11 species with the number of 26 individuals consisting of 9 species of zooplankton are Closterium cornu, Zygmemopsis circumcarinatum, Synedra acus, Bacillaria spp, Fragilaria capucina, Cyclotella kuzingiana, Melosira ambiguia, Calothrix pariet, and Eremosphaera viridis and two species of phytoplankton are Euglypha tuberculata and Rabdolaimus spp. The condition with physical and chemical parameters at the time of research still support plankton life. This type of research is a de facto expost that only revealing of existence data without any treatment. The data obtained will be used as initial data for further research. From indicated of Plankton communities and also connected with the parameters affecting it in each station can be known the ecological description of each species found.

Keywords: Community, Ecology, Parameters, Plankton.

1 Introduction

Plankton community is a collection of several species of plankton in the water, in this case in the water of the Babura river. Plankton is a food ingredient of organisms that are bigger than them so that the presence of plankton can be an indication of the presence of other organisms in this water. Plankton obtains food from ingredients that enter the river and have a role in nutrient cycles, especially phytoplankton as producers. According to Nybakken (1992), that plankton is invertebrate animals that float in the waters, whose relative movement is affected by currents. According to Melay and Rahalus (2014), found six phyla consisting of 9 genera with ten plankton species in Mangrove Ohoi in Kolser village, Southeast Maluku. According to Sagala (2009), 38 species of plankton were found, consisting of 26 phytoplankton species and 12 zooplankton species in Lebak Jungual, water in Pampangan sub-district, Ogan Komering District. According to Purwanti et al. (2011), that more plankton was found at high tide compared to tidal times in the waters of the Demaan river estuary in Jepara Regency. According to Tindaon et al. (2014), found nine phytoplankton classes and eight zooplankton classes.

The plankton community can be used as biomonitoring of pollutants that enter the water. Much research has been done on plankton, but in the water of the Babura river, it is not.
Babura river is one of the rivers that traverse the city of Medan which is located in the village of Keci-keci, Sibolangit sub-district. This research was carried out in the upper reaches of the river in which water is still natural.

Plankton classified as plants or called phytoplankton are producers in the waters because they have chlorophyll to carry out photosynthesis, which produces starch as a food source for organisms bigger than plankton. Plankton are a food source for people, the food we eat is not directly depend on them (Hutabarat and Evan, 1986). Plankton are organisms that float in water which have almost no movement ability, and even if there are very weak and limited/passive movements (Suin, 2002). The swimming ability possessed by plankton is weak so the movement is strongly influenced by the movement of water (Nybakken, 1992); (Barus, 2004).

According to Basmi (2000), the classification of plankton through the needed nutrients consists of phytoplankton, saproplankton, and zooplankton. Phytoplankton is a vegetable plankton (> 90% consists of algae) which contains chlorophyll which is able to synthesize inorganic nutrients to become organic through photosynthesis with energy derived from sunlight. Saproplankton is a group of plants (bacteria and fungi) that has no photosynthetic pigments, and nutrients and energy from the rest of the other styles that have died, while zooplankton is group that depend on living environments, such as phytoplankton or residual organisms, such as detritus and debris.

According to Brotowidjoyo et al, (1995) that herbivorous zooplankton eat phytoplankton, carnivorous zooplankton and predatory fish eat herbivorous zooplankton. According to Putra et al. (2013), found 5 phytoplankton classes and 3 Zooplankton classes in the Upper Citarum river. Plankton play an important role in influencing primary productivity of river water, especially phytoplankton because of their ability to photosynthesize. Stated that plankton is tolerant and have very different responses to quality. Phytoplankton is a group of plant plankton which size ranges from 2 ± 200 micro meters (1 micro meter = 0.001 mm). Phytoplankton requires supporting factors to help the growth process, including temperature, light intensity and CO2. According to Karuwal (2015), that the plankton community is affected by physical factors.

Water currents are movements of water masses caused by differences in water level, water molecular density, or due to wind. Water movement can occur vertically or horizontally. Vertical currents play a very important role in the distribution of dissolved gases, minerals, turbidity, and planktonic organisms. Current velocity in lotic waters is relatively high, it can even reach 6 m/sec, in general the range is 3 m/sec (Barus, 2004).

Temperatures fluctuate every day, following the pattern of environmental air temperature, sunlight intensity, geographical location, shade, and internal conditions of the water such as turbidity, depth, current velocity, and organic material deposits at the bottom of the waters. The role of temperature is very important to the life of aquatic biota, if the temperature increases by 10°C, the rate of metabolism increases by 2-3 times. Temperatures for the development of aquatic organisms and do not cause dangerous stresses range 240C-270C.

Turbidity is the large number of suspended particles in the water. Turbidity in aquatic ecosystems is also closely related to depth, current velocity, type of substrate base, and water temperature. Ecological influences of turbidity are decreasing the penetration power of sunlight into the waters and will also affect the respiratory mechanism of aquatic organisms. The depth of water has an important role in the life of biota, the deeper of water there are zones which each have certain characteristics, such as temperature, solubility of gases in water, current velocity, penetration of sunlight and hydrostatic pressure. Changes in physical and chemical factors of water due to changes in depth will cause different response to biota in it.

The pH value states the concentration of hydrogen ions (H+) in solution, the ability of water to bind or release hydrogen ions will show the nature of an acid or base solution. Clean water, the concentration of H+ and OH- is in balance or known as pH = 7. Aquatic organisms can live ideally...
in the pH range between weak acid and weak base. According to Situmorang (2007), unpolluted water is on a pH scale of 6.0 to 8.0.

Dissolved Oxygen (DO) is the amount of O2 gas that is bound by water molecules. The solubility of O2 is strongly influenced by temperature and minerals dissolved in water. The maximum solubility of oxygen in water is at a temperature of 0 °C, which is equal to 14.16 mg/l. DO comes from the process of photosynthesis of plants and direct binding of free air. DO is an indicator of water quality because the level of oxygen contained in water is needed by aquatic organisms in its survival (Situmorang, 2007).

Biological Oxygen Demand (BOD) shows the amount of oxygen needed by aerobic organisms for their life activities. BOD measurements were carried out for 5 days at 20°C, where within five days the activity of aerobic microorganisms was almost unchanged, therefore it was known as BOD5. BOD values indicate the content of organic matter in the waters, the higher the BOD value, it indicates that the waters contain a lot of organic material, (Barus, 2004). BOD is the amount of oxygen needed by aerobic microorganisms to degrade organic compounds in water (Situmorang, 2007). Phosphate content will affect eutrophication so that it can cause algae bloom. The color of the water becomes greenish, smells bad, and the water is cloudy.

Based on the description above, hence the title of the research carried out "Plankton Community in the Babura River, Deli Serdang Regency". The formulation of the problem in this study is "How is the community of plankton found from the water of the Babura River at Deli Serdang Regency". Research objective: to determine the plankton community in the waters of the Babura River, Deli Serdang Regency.

2 Methods

The study was conducted in the Babura river, Deli Serdang Regency, which is located on two stations, namely: (1) in Keci-Keci Village, Sibolangit Subdistrict, which is an upstream area, the source of the water comes from the seepage of cliffs on the riverbanks, shaded by trees, and is an area natural and (2) in Durin Pitu village, Pancurbatu subdistrict, it is also covered with trees and crossed by natural plantations that are still in existence, there are wild plants that are cultivated, such as acid scale, mangosteen, areca nut, etc., each station has 10 substations as replications. When the research or sampling took place on November 26, 2016, at the station one of the Keci-keci villages in Sibolangit starting at 10.00 and at station two in Durin Pitu Pancurbatu village starting at 14:00 am. At the time of sampling the weather at the research station in bright conditions. This research is exose the facto, meaning that only reveals the data obtained and as it is in the field (field research). The results of the study were then identified with the book Hutabarat and Evans, (1986).

2.1 Procedure

Plankton samples were taken using a net plankton no. 25 tool, which was done by sampling water 10 times using a bucket of 5 liters filtered with net plankton. Water with plankton collected is put into a film bottle and dripped with 4% formalin up to 4 drops. Then plankton was calculated with the aid of a microscope, identified using Hutabarat and Evans (1986), Edmonsond (1959), and Hynes (1976).
Water samples were taken with a dark sample bottle and 1 liter in size. The sample bottle is inserted into the body of the water, with the sloping position, the mouth of the bottle leads to the coming of the current after it is fully upheld and closed in water, then analyzed to BTKL. Measurement of parameters and units can be seen in Table 1. Sample of Plankton on the Babura River were taken on the same day at two research stations, the weather was very bright at the time of research in the waters of the Babura river but the previous night it was estimated that it was raining, marked by slippery and humid roads leading to the research location. Sampling was conducted on 26 Nepember 2016, at the station one of Keci-keci village, Sibolangit sub-district starting at 10:00 am and at station two in Durin Pitu village, Pancurbatu sub-district, starting at 14:00 am. At the time of sampling the weather at the research station in bright conditions. Plankton samples were taken using 10 times net plankton at each research station. The plankton found in the Babura river at the time of the studyare as shown in Table 2.

Table 1. Parameters measured by units

<table>
<thead>
<tr>
<th>No</th>
<th>Parameter</th>
<th>Measuring Tool</th>
<th>units</th>
<th>Measured</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Plankton (Community)</td>
<td>Plankton net</td>
<td>Ind/litr</td>
<td>In situ and in laboratory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Identification book</td>
<td>Ind</td>
<td>Biology Laboratory</td>
</tr>
<tr>
<td>2</td>
<td>Strong Current</td>
<td>Stop Watch</td>
<td>m/sec</td>
<td>In situ</td>
</tr>
<tr>
<td>3</td>
<td>Temperature</td>
<td>Thermometer</td>
<td>°C</td>
<td>In situ</td>
</tr>
<tr>
<td>4</td>
<td>Turbidity</td>
<td>Turbidymeter</td>
<td>JTU</td>
<td>BTK3L</td>
</tr>
<tr>
<td>5</td>
<td>Light transparency</td>
<td>Sechi-disk</td>
<td>M</td>
<td>In situ</td>
</tr>
<tr>
<td>4</td>
<td>pH</td>
<td>pH meter</td>
<td>-</td>
<td>In situ</td>
</tr>
<tr>
<td>5</td>
<td>DO</td>
<td>DO meter</td>
<td>mg/ltr</td>
<td>In situ</td>
</tr>
<tr>
<td>6</td>
<td>BOD</td>
<td>Spectrophotometer</td>
<td>mg/ltr</td>
<td>BTK3L</td>
</tr>
<tr>
<td>7</td>
<td>Nitrate</td>
<td>Spectrophotometer</td>
<td>mg/ltr</td>
<td>BTK3L</td>
</tr>
<tr>
<td>8</td>
<td>Phosphat</td>
<td>Spectrophotometer</td>
<td>mg/ltr</td>
<td>BTK3L</td>
</tr>
</tbody>
</table>

Table 2. Results of Plankton Observation at two stations

<table>
<thead>
<tr>
<th>No</th>
<th>Species</th>
<th>Station I</th>
<th>Station II</th>
<th>Jumlah</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Closteriumcornu</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Zygnemopsiscircumcarinatum</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Synedraacus</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Bacillaria spp</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Fragilariacapucina</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Cyclotella kutzingiana</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Melosira ambigua</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Calothrix pariet</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Eremosphaera viridis</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Euglyphatuberculata</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>Rabdolaimus spp</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Jumlah 26
3 Result and discussion

The results of this study describe the plankton community in the Babura river there are 11 species with a total of 26 individuals consisting of 9 phytoplankton species namely *Closterium cornu*, *Zygnemopsis circumcarinatum*, *Synedraacus*, *Bacillariaspp*, *Fragilariacapucina*, *Cyclotellakutzingiana*, *Melosiraambigua*, *Calothrixpariet*, dan *Eremosphaeraviridis* and 2 zooplankton species namely *Euglyphatuberculata* dan *Rabdolaimus spp*.

Frequency of presence for *Closterium cornu*, *Zygnemopsis circumcarinatum*, *Synedraacus*, *Bacillariaspp*, *Euglyphatuberculata*, *Fragilariacapucina*, *Cyclotellakutzingiana*, *Rabdolaimus spp*, *Melosiraambigua*, *Calothrixpariet* 100% in each and *Eremosphaeraviridis* 50% because it is found only at station one. Measurement of physical parameters in the Babura river such as temperature, current strength, depth, and light transparency is done in situ, turbidity and chemical parameters are analysis to the BTKL SeiWampu Medan road. The results of measurements of physical parameters and chemical parameters in both research stations still support the life of organisms in the waters of the Babura river such as plankton, can be seen in Table 3.

Sampling at station one starts at 10.00 with very hot weather conditions, the water is clear and discharge is a little because it comes from the surrounding seepage. Sampling at station two starts at 14.00 with very hot weather conditions, the water is slightly cloudy due to erosion from the cliffs that it passes through, many leaves and twigs in the water body. The plankton community in the Babura river consists of *Closterium cornu*, *Zygnemopsis circumcarinatum*, *Synedraacus*, *Bacillariapaxilife*, *Fragilariacapucina*, *Cyclotellakutzingiana*, *Melosiraambigua*, *Calothrixpariet*, *Eremosphaeraviridis*, *Euglyphatuberculata*, dan *Rabdolaimus spp*, *Euglyphatuberculata* dan *Rabdolaimusspp* as food sources for zooplankton. Phytoplankton as a little food source is found because light cannot go directly to the body of water for photosynthesis.

### Table 3. Results of measurements of physical and chemical parameters

<table>
<thead>
<tr>
<th>No</th>
<th>Parameter</th>
<th>Station/research site</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>I</td>
</tr>
<tr>
<td>1</td>
<td>Strong current</td>
<td>1.85</td>
</tr>
<tr>
<td>2</td>
<td>Temperature</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>Turbidity</td>
<td>0.80</td>
</tr>
<tr>
<td>4</td>
<td>Depth</td>
<td>30 cm</td>
</tr>
<tr>
<td>5</td>
<td>Light transparency</td>
<td>get to the bottom of the water</td>
</tr>
<tr>
<td>6</td>
<td>pH</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>DO</td>
<td>8.0</td>
</tr>
<tr>
<td>8</td>
<td>BOD</td>
<td>0.5</td>
</tr>
<tr>
<td>9</td>
<td>Nitrate</td>
<td>0.8</td>
</tr>
<tr>
<td>10</td>
<td>Phosphat</td>
<td>0.27</td>
</tr>
</tbody>
</table>

The current strength at station one is 1.85 which is relatively slow because the water discharge is small, the water body is narrow with much rock, so the water that flows only slightly from the side of the large rock. This also happens because the waters are still very shallow and the bottom is almost flat. At station two the current strength is 3.15 the river body is slightly widened, the bottom of the river is slightly tilted. Water currents in the Babura river waters are still in the general range by Barus's opinion, (2004) that the current velocity in lotic waters is relatively high, even up to 6 m/ sec, in general, the range is 3 m/sec.

The results of measurements of the pH of the Babura river waters are very supportive of the life of aquatic organisms, but the reality is not so because other parameters are more influential as a...
Limiting factor for the presence of plankton in the waters of the Babura river. The results of DO measurements of Babura river waters still support the life of aquatic organisms, but in fact, little plankton is found because other parameters are less supportive. The results of BOD measurements of Babura river waters still support the life of aquatic organisms, but in reality, plankton is found to be small because other parameters are less supportive. Light transparency that reaches the bottom of the water, still strongly supports the life of plankton, especially phytoplankton will be able to photosynthesize, but because it is very shallow causing plankton that can live only a little, even though the current is not very heavy but because the movement of plankton is affected by the current, so the flow of water can wash away plankton in the waters.

The research station is covered with a canopy of trees so that sunlight cannot penetrate directly into the waters. This affects the life of phytoplankton that is in dire need of sunlight for photosynthesis. So that there is no direct light to the waters affecting the presence of plankton. So it can be said that the environmental hue is the limiting factor for the presence of plankton.

4 Conclusion

Plankton community in the waters of the Babura river Deli Serdang Regency was found as many as 11 species with a total of 26 individuals consisting of 9 types of phytoplankton namely: Clustterium corn, Zygnemopsis circumanatum, Synedra acus, Bacilla paxi, Fragilaria capucina, Cyclotellakutzingiana, Melosira ambigua, Calothrix pariet, and Eremosphaer aviridis and 2 types of zooplankton, namely: Euglyphatuberculata and Rabdolaimus spp. Euglyphatuberculata dan Rabdolaimussppare phytoplankton as food sources for zooplankton. Physical parameters in the waters of the Babura River, Deli Serdang Regency, are still supportive except for temperatures that are less than 24°C, but because the sunlight does not reach the water body, it affects the amount of plankton. Chemical parameters in the water of the Babura River in Deli Serdang Regency are all within the supporting limits.

References

Analysis of Communication and Mathematical Abstraction Ability of Junior High School Students’ using Student Activity Sheets Based on Model of Learning Mean – Ends Analysis

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Abstract. Using Student Activity Sheets (SAS) in learning is one of the teacher's efforts to provide scaffolding to students. This paper is a limited trial in using student activity sheets based on Mean-Ends Analysis (MEA) learning models in the context of Malay culture. The purpose of this study is to analyze the communication and mathematical abstractions ability students' which using SAS in mathematics learning. The study was conducted at a junior high school in Perbaungan, North Sumatra. Subjects in the study were 7th graders. Data were analyzed using descriptive analysis obtained from LAS which worked by students in groups. The results showed mathematical communication ability were in good category, while the ability of students' mathematical abstraction still needed improvement. Thus the student activity sheet based on the MEA learning model can be used as an alternative to improve students' mathematical communication skills

Keywords: Communication and mathematical abstraction.

1 Introduction

Communication skills and mathematical abstractions of students are important in mathematics learning. Through communication students can express their mathematical ideas clearly, and also through communication in mathematics learning the teacher can detect what students have and have not understood. Experts argue that mathematical communication is a window to human activity (Dewi, 2009), this is because the activities of human cognition cannot be seen and heard but can be observed through their communication activities.

In addition to communication skills students' mathematical abstraction ability is also needed in mathematics learning. (Gray & Tall, 2007) defines abstraction as the process of describing a situation and also the results of abstraction from the process. Abstraction can then be interpreted in many forms, as processes, traits, or concepts. (Ferarri, 2003) states that abstraction is a basic process in mathematics. Furthermore (Mitchelmore & White, 2012) defines abstraction as a mental representation of a mathematical object, of course abstract mathematical objects only have the meaning of the system in which they are defined. Thus it can be concluded that abstraction in mathematics is seen as a mental representation or description of a situation into a form simpler known as symbols and rules in mathematics.
Errors in reflecting mathematical objects will make it difficult for students to understand mathematics. Seeing the importance of communication skills and mathematical abstractions in learning, the school needs to improve the communication skills and mathematical abstractions of students in learning. But both of these abilities are still low. To improve communication skills and mathematical abstractions of students by entering both of these abilities into the learning objectives to be achieved. There are several things that can affect the achievement of a learning goal, such as the selection of models and methods used by the teacher in learning.

Teacher-centered learning requires learning media that can make students more actively explore their own mathematical abilities. One medium that can be used by teachers to explore communication skills and mathematical abstractions of students is the Student Activity Sheet (SAS). This is because SAS contains a set of basic activities that must be carried out by students to maximize their mathematical understanding. Worksheets are a scaffolding section that serves to guide students in the learning process and encourage students to become independent learners while collaborating with members of their group (Ling, 2011).

The main objectives of using worksheets are: 1) to guide students in developing conceptual frameworks of important topics that are difficult for students, and 2) to direct perseverance in learning difficult concepts. In addition to choosing media, of course the teacher also chooses the right learning model in learning (Barniol & Zavala, 2016). In addition to using SAS the teacher must also choose the learning model that will be used to achieve the learning objectives. The selection of the right learning model is an attempt by the teacher to create a pleasant classroom atmosphere. The ideal teacher is able to choose the right task, encourage students to learn meaningfully, organize discourse to create a learning atmosphere and class situation analysis. In this study the learning model used is Mean Ends Analysis (MEA).

The Means Ends Analysis (MEA) learning model is a learning model of variation between problem solving methods and syntax that presents the material in a heuristic-based problem solving approach that is in the form of a series of questions that are instructions to help students solve their problems. Therefore, the MEA learning model can help students move towards the Vigotsky Proximal Development Zone (ZPD). Furthermore, the MEA learning principle is in accordance with Piaget's cognitive development theory which argues that learning is the process of assimilation and accommodation. The process of assimilation in MEA learning is based on material principles presented by heuristic and reality approaches, while the accommodation process in MEA learning is based on the principles of problem translation, documentary, and sharing of abilities. The purpose of this paper is to find out how mathematical communication skills and also mathematical abstractions of students in learning using student activity sheets that are associated with local cultural wisdom.

### 2 Research methods

This research is a descriptive qualitative study. The place of research was conducted in a junior high school in the town of Perbaungan. The research subjects were class VII students, amounting to 36 students.

To obtain the desired data, subjects were given LAS with integer material using the MEA learning model based on Malay culture. LAS is done in mutual cooperation groups. Furthermore, the results of student group work are analyzed and the teacher confirms the answers by asking students to present in front of the class then conducting interviews. This
activity aimed to get in-depth to gather information about the causes of the difficulties or mistakes made by students. After collecting data from the interview, the data was analyzed descriptively.

3 Research result and discussion

The following is presented the results of data analysis about students' communication skills and mathematical abstractions.

3.1 Students’ mathematical communication abilities

![Problem: Explain how much is the contents of a large barn? Give reasons for your answer.](image)

Answer:
The number of contents of a large barn according to our thinking is 49. Because if each small barn contains 7 pieces, and there are as many as 14 small barns, then the contents of a large barn are $14 \times 7 = 98$. If only 1 large barn is filled, then 1 large barn contains 98. If there are two large barns, then each large barn contains 49 pieces, namely $98 \div 2 = 49$.

Fig. 1. Student answer sheet from group 1

From figure 1 we can see that students have been able to communicate their thoughts clearly and correctly, and the arguments they give are also true. To check the communication skills of
the teacher students ask for group 1 to explain the answers they gave. Students give answers verbally and the results are the same as the answers to the writing they have done. Then the teacher asks "If the doctor prescribes a drug with a dose of $3 \times 1$, what does it mean?" The student answers "means the medicine is taken one drug in the morning, one drug at noon, and one drug at night" The students' answers indicated that they could already explain what they were thinking about the concept of integer multiplication.

Answer sheet from group 2

Fig. 2. Student answer sheet about mathematical communication from group 2

Group 2 answers are very brief. They wrote 1 barn 7 pieces, without explaining whether the barn was a small barn or large barn, even though the researchers understood what they meant was a small barn.

When interviewed with a question: explain how you got the answer 49? The student answers: "there are 7 small barns, each contains 7 stones, so the result is $7 \times 7$". Looking at the writing and verbal answers of group 2, it can be said that what students from group 2 write is also the same as what they say verbally. So the researchers concluded the students' answers were fixed. This means students have understood the concept of multiplication but they are difficult to explain what they think perfectly.

3.2 Students' mathematical communication abilities

Student Answer sheet from Group 1

From figure 3 we can see that even though it has been given a hint that $x$ is a symbol of the number of seeds (barn contents) a small barn is symbolized as $y$ but students still give different symbols from the instructions in the SAS. In this case students view the contents of a large barn with the number of congklak seeds in the form of numbers not in the form of mathematical symbols in general. So students still think concrete yet abstractly. This is what makes students difficult to perform mathematical symbols.
Fig. 3. Student answers about mathematical abstraction of students from group 1

Student Answer sheet from Group

Fig. 4. Student answers about mathematical abstraction from group 2

The answer from group 2 is very short. When the researcher asks what is meant by the symbol \( 1y = 7x \), the student answers "that means in one large barn there are 7 times the congklak seeds". Then the researchers asked again, meaning that the contents of the large stomach contained 7 congklak seeds. Students answer "no, the contents of a large barn are 49 but we cannot write how the relationship \( x \) and \( y \) with a large barn. From the students' answers it can be concluded that students understand the multiplication concept but they have difficulty
symbolizing the problem given in the form of variables. This means students still think concretely in solving mathematical problems.

According to (Dewi, 2018) in learning mathematics, abstraction is a fundamental process and have an important role in forming a concept. Through that process we can measure how far students have understood and built the concepts they have learned. From the two group answers, it can be seen that students have understood the concept of the problem given, but they have difficulty writing the mathematical symbols. This is because to carry out this symbolization process, analysis of concepts and mathematical representation is needed. According to (Husna, Johar, Hajidin, Mailizar, 2018) the main difficulty in learning algebra is how to use symbols of mathematics, because it emphasizes on the aspect of analysis as well as representation of mathematical concepts and ideas.

The importance of this symbolization is that it enforces a logically exact and complete formulation of a mathematical theorem. The symbols used in mathematics are universal languages that can be communicated correctly and clearly. This universal language makes mathematicians able to communicate with each other even though they come from different countries and languages. Likewise in mathematics learning, without using mathematical symbols the teacher cannot communicate their ideas and thoughts to his students precisely and clearly. Likewise students, they will have difficulty understanding mathematics if they do not understand the symbols used by the teacher in learning. Students will find it difficult to represent their mathematical understanding to others. The purpose of symbolization is to help thinkers provide a place to record thoughts and provide a means for thinkers to communicate with other thinkers (Draper, 2018).

4 Conclusion

In mathematics learning the student activity sheet can be used as one of the learning media to help students explore their mathematical abilities. So LAS can also be used to help improve students' communication skills and mathematical abstractions. Communication and abstraction problems are important things to improve because through communication the teacher can find out what the students have known or not.

One of the difficulties students have in communicating their mathematical understanding is because students still always think concretely. When students are asked to solve problems related to the ability of abstraction difficulties they encounter to do the symbolization correctly, even though students understand the mathematical concepts used to solve the problem. Because the ability of abstraction is a fundamental process that can help students build a concept, it is advisable for the teacher to always train students to provide mathematical problems related to abstraction skills.

Acknowledgements

The researchers thanked the Ministry of Research, Technology and Higher Education and Medan State University for providing funding to conduct this research. Furthermore, we also
thank the Faculty of Mathematics and Natural Sciences, especially the 2018 AISTSSE committee, which has helped researchers publish the results of this study.

References


Characterization of Electrodes Membrane PVA-Enzyme Coating PVC-KTPCIPB as Urea Sensors With SEM-EDX, XRD and UV-Vis

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Abstract. Potentiometric characteristics are significantly dependent on the composition of the membrane and the properties of the plasticizer. Characterization of membrane electrodes was carried out using (UV-Vis to see absorbance, SEM-EDX to see the morphology and atomic ratio and XRD to see the intensity ratio of u.a). Characterization of PVA membranes: PVC in the composition of 1: 1 i.e. 0.0350 g PVA and 0.0350 g PVC, plasticizer 0.0100 g KTpCIPB with variation of enzyme coating on PVA on 1x, 2x and 3x electrode membranes, followed by each coating 1x 0.0350 g PVC 0.0100 g KTpCIPB. The electrode membrane selected was PVA E 1X PVC-KTPCIPB 0.0100 g electrode membrane obtained optimum (absorbance, atomic ratio and intensity of u.a).

Keywords: ISE, membrane PVA-enzyme coating PVCKTPCIPB, Characterization of membrane (UV-Vis, SEM-EDX, and XRD).

1 Introduction

Potentiometric sensors are devices that measure the voltage between two indicator electrodes and the reference electrode depending on the concentration of the analyte, without contradicting the electrochemical cell (Wang in. Al, 2008). Analites bind the bioreceptor to the surface of the indicator electrode in a buffer solution, resulting in a potential difference between the two electrodes. Measurement of urea concentration in the blood shows kidney indications and liver function, liver / heart failure, protein input or excessive protein catabolism, malnutrition, pregnancy, shock and pressure. Biological bonding reactions were chosen for urease enzymes with PVA and PVC substrates, their interaction in the form of molecular adsorption to increase detection limits and selectivity of biosensors (Dey and Goswami, 2013). PVA is soluble in water and the enzyme urease dissolves in water, while PVC is not soluble in water. PVA and PVC are polymer matrices that have a C branch as a
functional group. Conductive polymers are the basis of electrochemical sensors and biosensors, useful in improving public and environmental health due to rapid detection, high sensitivity, small size, and affordable for environmental monitoring and clinical diagnostics (Rahman et. Al, 2008) Potentiometric sensors provide attraction and can be achieved for biomedical, environmental and industrial analysis, these sensors are generally easy to use, portable, simple, and inexpensive.

2 Materials and method

2.1 Materials

The material used in the study is a standard urea 56 180 Sigma-Aldrich, the enzyme EC 3.5.1.5 (Urease) U4002, 50-100 ku ix types, tungsten diameter of 1.0 mm 267 562 99.99% Aldrich, PVA [-CH2CHOH]-n, PVC (CH2CHCl)n, KTpClPB (potassium tetrakis 4-chlorophenyl borate), Tetrahydrofuran C4H8O, were from Sigma-Aldrich and the method used is the potentiometric method.

2.2 Tools

The equipment used is SEM-edx (Bruker-129 eV Zeiss), UV-Vis (Ray Leigh UV-1601), XRD-6100(Shimazu), tungsten indicator electrode (W) and other supporting tools.

2.3 Methods

The materials used are membrane composites (W PVA: W PVC-plasticizer = 1: 1) (Niu et. Al, 2013) where the mass of PVA and PVC are the same, according to (Vlascici et. Al, 2006), PVC ratio: plasticizer = 1: 2, researchers use PVC: KTpCIPB with a ratio of 1: 2. The composition of the membrane outside the provisions is 0.0350 g PVA and PVC while KTpCIPB is 0.0100 g as follows. Preparation of enzyme PVA solution comes from a mixture of PVA solution and enzyme solution. 0.0350 g of PVA dissolved in 10 mL of hot water to cold water, after that 1 mg of urease enzyme was dissolved in 0.5 mL consisting of water and alcohol with a ratio of 50% water: 50% alcohol. Whereas PVC-KTpCIPB solution comes from 0.0350 g of PVC and 0.0100 g of KTpCIPB dissolved 10 mL of THF in beaker glass. Thus the PVA enzyme solution and PVC-KTpCIPB solution have been used to form membranes and membrane electrodes. Membranes and electrode membranes were characterized using SEM-edx and XRD, while PVA-enzyme-KTpCIPB membrane solutions were characterized by UV-Vis.

3 Result and discussion

3.1 Membrane 0.0350 g PVA-E PVC 0.0100 g

First, characterization of membrane solution 0.0350 g PVA-E PVC 0.0100 g from enzyme variation of 1.0 mg 1.5 mg and 2.0 mg, the results can be seen in Figure 1. Only a slight
increase in the height of the absorbance peak from UV-Vis analysis of membrane solution 0.0350 g PVA-E PVC 0.0100 g at enzyme variation of 1.0 mg the height of the absorbance peak is 0.4920, 1.5 mg the height of the absorbance peak is 0.5241 and 2.0 mg the height of the absorbance peak is 0.6074 having a wavelength located between 291-292 nm from 280 - 500 nm, the maximum absorbance height obtained at the 2.0 mg enzyme. For the manufacture of membranes and membrane electrodes, 1.0 mg of enzyme was used in 0.0350 g of PVA. According to (Aziz et al, 2018) that the mixed samples showed the highest peak absorbance peak, the absorbance was analyzed by UV-Vis in the range of 180-1000 nm.

Both membranes were analyzed using SEM-EDX to see pores and atomic ratios at 15 kV acceleration stress (Mignardi et al, 2013) results can be seen in Figure 4. The three membrane electrodes were analyzed using X-ray diffraction (XRD) at 40 kV and a current of 30 mA scanned from a diffraction angle of 7 ° to 70 ° at a rate of 2 to 0.02 ° 2θ is used to determine the intensity of the mineral composition of the membrane electrode. Electrode membranes are made in three types, namely (1) the electrode is dipped once at a time of 0.0350 g of PVA enzyme after that wait 30 minutes for coting PVC-KTpClPB is notated el.1 PVA E PVC-KTpClPB 0.0100 g, (2) electrode immersion in 0.0350 g PVA enzyme solution after 30 minutes dipped again in the same solution for the second time, wait 30 minutes for coting PVC-KTpClPB notated el.2 PVA E PVC-KTpClPB 0.0100 g, (3 ) electrode immersion in 0.0350 g PVA enzyme solution after 30 minutes dipped again in the same solution for the second time and continue for the third, wait 30 minutes for coting PVC-KTpClPB notated el.3 PVA E PVC-KTpClPB 0, 0100 g.

In Figure 2 SEM uses an acceleration voltage of 15 kV for PVA-E 1x PVC 0.0100 g analyzing the membrane of (a) SEM obtained by many pores, (b) EDX obtained elements C, O, Cl, K, Si, Ca, Na and Mg on the surface of PVA E1-PVC PVA-E membrane 0.0100 g with carbon C ratio is 11.11, oxygen O is 1.85, chlorine Cl is 0.18, potassium K is 0.07, silicon Si is 0.05, calcium Ca is 0.05, sodium Na is 0.05, and magnesium Mg is 0.05 can be seen in table 1. There are differences in images 2 and 3 of the element elements of the membrane composition 0.0350 g PVA-E 1x PVC 0.0100 g and PVA-E 2x PVC 0.0100 g less pores in Figure 3, and PVA-E elements 2x PVC 0.0100 g from EDX with a carbon C ratio of 10.40, oxygen O is 2.54, chlorine Cl is 0.22, silicon Si is 0.09, calcium Ca is 0.09, potassium K is 0.07, magnesium Mg is 0.04.

![Fig. 1. PVA-E PVC membrane solution of UV-Vis in composition (a) 0.0350 g PVA-E1 PVC-0.0100 g, (b) 0.0350 g PVA-E2 PVC-0.0100 g, (c) 0.0350 g PVA-E3 PVC -0.0100 g.](image)
Based on table 1 membrane composition 0.0350 g PVA-E 1x 0.0100 g and table 2 composition of PVA-E 2x PVC 0.0100 g membrane shows that the carbon C ratio of 1x immersion is 11.11 and 2x dyeing is 10, 40, this is in accordance with the nature of PVA and PVC for a polymer matrix which has a C branch as a functional group.

![Fig. 2. PVA-E 1X PVC 0.0100 g membrane from (a) SEM, (b) EDX](image_url)

**Table 1.** The ratio element of PVA-E 1 x PVC 0.0100 g membrane using SEM-EDX

<table>
<thead>
<tr>
<th>Element</th>
<th>Weight %</th>
<th>Atomic %</th>
<th>Ratio Atomic</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>86.91</td>
<td>91.93</td>
<td>11.11</td>
</tr>
<tr>
<td>O</td>
<td>7.57</td>
<td>6.01</td>
<td>1.85</td>
</tr>
<tr>
<td>Cl</td>
<td>3.78</td>
<td>1.35</td>
<td>0.18</td>
</tr>
<tr>
<td>K</td>
<td>0.66</td>
<td>0.21</td>
<td>0.07</td>
</tr>
<tr>
<td>Si</td>
<td>0.39</td>
<td>0.18</td>
<td>0.05</td>
</tr>
<tr>
<td>Ca</td>
<td>0.26</td>
<td>0.08</td>
<td>0.05</td>
</tr>
<tr>
<td>Na</td>
<td>0.23</td>
<td>0.13</td>
<td>0.05</td>
</tr>
<tr>
<td>Mg</td>
<td>0.20</td>
<td>0.10</td>
<td>0.05</td>
</tr>
</tbody>
</table>
Fig 3. PVA-E 2x PVC 0.0100 g membrane from (a) SEM, (b) EDX

Table 2. The ratio element of PVA-E 2x PVC 0.0100 g membrane using SEM-EDX

<table>
<thead>
<tr>
<th>Element</th>
<th>Weight %</th>
<th>Atomic %</th>
<th>Ratio Atomic</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>79.57</td>
<td>86.84</td>
<td>10.40</td>
</tr>
<tr>
<td>O</td>
<td>12.35</td>
<td>10.12</td>
<td>2.54</td>
</tr>
<tr>
<td>Cl</td>
<td>5.10</td>
<td>1.89</td>
<td>0.22</td>
</tr>
<tr>
<td>Si</td>
<td>1.14</td>
<td>0.53</td>
<td>0.09</td>
</tr>
<tr>
<td>Ca</td>
<td>1.09</td>
<td>0.36</td>
<td>0.09</td>
</tr>
<tr>
<td>K</td>
<td>0.66</td>
<td>0.22</td>
<td>0.07</td>
</tr>
<tr>
<td>Mg</td>
<td>0.09</td>
<td>0.05</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Table 3. Ratio of element C from variations of PVA enzyme layers coating with PVC-KTpClPB only 1 time using SEM-EDX

<table>
<thead>
<tr>
<th>Element</th>
<th>Membrane</th>
<th>Ratio Atomic</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>PVA E 1 layer PVC-KTpClPB 0.0100 g</td>
<td>11.11</td>
</tr>
<tr>
<td></td>
<td>PVA E 2 layer PVC-KTpClPB 0.0100 g</td>
<td>10.40</td>
</tr>
</tbody>
</table>
Fig. 4. PVA-E PVC-KTpClPB membrane layer of XRD on indicator electrode (a) el.1 one layer, (b) el.2 two layer, (c) el.3 three layer

<table>
<thead>
<tr>
<th>Membran Elektroda</th>
<th>2Theta (deg)</th>
<th>Count Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVA E 1X PVC-KTpClPB 0.0100 g</td>
<td>43.92</td>
<td>1428</td>
</tr>
<tr>
<td>PVA E2X PVC-KTpClPB 0.0100 g</td>
<td>43.9</td>
<td>1074</td>
</tr>
<tr>
<td>PVA E3X PVC-KTpClPB 0.0100 g</td>
<td>43.88</td>
<td>742</td>
</tr>
</tbody>
</table>

Based on table 3 and table 4 there is a comparable effect between ratio carbon C and XRD diffraction intensity, ie PVA E 1 layer PVC-KTpClPB 0.0100 g and PVA E 2 layer PVC-KTpClPB 0.0100 g. According to Figure 4 the optimum amount of diffraction intensity was obtained in PVA E 1X PVC-KTpClPB 0.0100 g and there is a change in the height of the absorbance peak through the UV-Vis characterization in Figure 1, followed by a change in the height of the peak diffraction intensity with a diffraction angle of about 43 degree can be seen in Figure 4.

4 Conclusion

Characterization of PVA-enzyme PVC-KTpClPB membrane solution analyzed by UV-Vis and PVA- Enzyme PVC-KTpClPB membrane electrodes were analyzed by SEM-EDX to determine the ratio carbon C and XRD ratios to determine the intensity of the diffraction degree, as follows:

1. Characterization of PVA-enzyme and PVC-KTpClPB solutions for UV-Vis were analyzed in the range 280-500 nm obtained the highest peak absorbance at wavelengths 291 and 292 nm.

2. Characterization of PVA-enzyme PVC- KTpClPB membrane electrodes with SEM-EDX and XRD obtained the best at 0.0350 g PVA 1 mg enzyme one layer and one coating PVC-0.0100 g KTpClPB.
Acknowledgements

Thank you to Faculty of Mathematics and Natural Sciences of Universitas Negeri Medan for holding international conferences in the development of science, education and technology.

References

The Effect of Creativity in Inquiry-Problem Based Learning Base on Multimedia to the Student’s Achievement and Generic Ability on Topic Chemical Bonding

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Abstract. The objectives of this research are: (1) to determine differences in student’s achievement with Inquiry based Learning in Multimedia and Conventional Learning. (2) To determine differences in student’s achievement who have high creativity and low creativity. 3. To determine the interaction between Inquiries based learning in multimedia with the level of creativity in improving student’s achievement. The sample was taken by a cluster random sampling of two classes, which the first class as experimental class using inquiry base on multimedia and second class as control class using conventional method. The instrument consists of 30 items in multiple choice questions that have been validated and reliable. The results of research are: there are differences in physical students learning outcomes are taught by Inquiry based learning in multimedia and Conventional Learning. There is a difference in student’s learning outcomes that have high Creativity and Low Creativity. There is no interaction between the Inquiry based Learning in multimedia with student’s level of Creativity in improving learning outcomes chemistry. The generict ability aspect which be improved from this model implementation are simbolic language, logical frame and logical inference

Keywords: Inquiry –problem Based Learning in Multimedia, Level of Creativity, generic ability.

1 Introduction

Education is a conscious effort to develop concern human maturity, either intellectual maturity, social or moral maturity. Education must also be able to realize the learning condition in which students actively develop their potential for themselves to have the spiritual strength, self-control, personality, intelligence, lofty character, also the necessary skills that is needed in their society, nation and state (Department of national education, 2003). As professional educators, certainly, the problems encountered are not hampered but a challenge to be more creative and innovative. In order that, for that numerous attempts have been made to improve the learning outcomes of students in studying chemistry, including the maximize use of some media. In research of Silaban, R. (2010) with the title the influence of the use of Macromedia Flash, Power point Program and concept map Against the results of a Study On the subject of Chemical Hydrocarbons can be inferred that there is an increase in chemical study results of
students taught using macromedia flash, PowerPoints and media concept map. (Silaban, R. 2010) Other studies that examine the effectiveness of the use of media, namely Sialagan, M (2009) entitled the use of computer-based Media with Microsoft Office Power point On the subject of Hydrocarbons which prove that the student's activities in PBM (teaching and learning) after using media computers increases compared to other media. In addition to exploiting the media learning, other things that are not as important in the learning process is the selection of the learning strategies.

Learning strategies is an art and science to bring learning such that the learning objectives can be achieved efficiently and effectively (t. Raka Joni, 1980). Inquiry learning strategy is a strategy whereby the process of finding by students is the bottom line. In this activity contained activities meaningful to produce findings that students no longer obtained from the results of a given set of facts, but rather results from the fact that it faces (Roestiyah, 2001). Such is the case with research results (Sipayung, d. a. 2011) concluded that the results of the learning of students who are taught using the inquiry learning of web-based media and wheel higher than the results of the student learning using learning expository without media.

2 Method

2.1 Location and time research

The research was conducted in post graduate grade 2nd in academic year 2018/2019. The time of this research was conducted on July 2018 until September 2018.

2.2 Research population and sample

Population of this research was all student of post graduate school in chemical education. The sample was chosen randomly in this research were two class in grade II in regular and executif class. One class as experiment class that have been taught by inquiry learning base on multimedia and another class was taught by conventional method.

2.3 Research variable

There are 3 variables of this research which have been used to reach the goal of the research they are:
1Independent Variable: Inquiry base on multimedia.
2Dependent Variable: student’s Generic skill and student’s creativity.
3Control Variable: Learning material that is used in both of experiment and control class is chemical bonding. The time allocation for experiment and control class is same and also teacher competence is same in both of class.

2.4 Research instrument

Instrument test was used to determine how far the student understands of the material that has been taught by the researcher. The instruments tests in this research are multiple choice consist of 30 items and questionnaire for creativity test consist of 30 items with 4 criteria.

Then the data obtained from the instrument test would be analyzed to determine the improvement of student’s achievement.
2.4.1 Instruments test

The instrument is tested before using to analyze the quality. The test including validity test, reliability test, difficulty level test, different index test and testing by using statistic. Statistic is a tool that very important to use in determining the way to collecting data, presenting, analyzing, and concluding the result of data.

2.4.2 Validation tests

Validity relates to the ability to measure exactly something to be desired. The correlation coefficient, item can be declared invalid matter if $r_{\text{count}} > r_{\text{table}}$, $r_{\text{count}}$ value matched with $r_{\text{table}}$ product moment at 5% significance.

2.4.3 Reliability test

Reliability tests related to the problem of trust. To test the reliability of the test used Kuder Richardson formula 20 or better known as KR-20. To interpret the price of those consulted about the price of the price table to table $r$ criticism Product Moment with $\alpha = 0.05$, the matter stated reliable if $r_{\text{count}} > r_{\text{table}}$.

2.4.4 Level of difficulty problem

Difficulty level of questions addressed by the magnitude of the problem, namely by showing hard numbers simply a matter. Questions are good if the problem is not easy or not too difficult.

2.4.5 Distinguish power problem

Distinguishing matter is something to distinguish between students who are good (highly capable) with the stupid students (low-ability). The analysis aims to assess different power those items in order to know the ability to distinguish students who belong to afford (high performance) with students classified as less (weak performance).

2.5 Research design and research procedure

Research design that is used for this research is experiment with two sample class where the first sample class A experiment class and the second sample class B as control class. The design of this research is as shown in the table below:

For the first treatment both of class is given pre-test. Giving the test intended to measure the cognitive aspects of students before and after action. After doing pre-test, for experiment class is taught by Inquiry based learning in multimedia whereas the control class is taught by conventional model with the same topic of chemical bonding. After teaching treatment, for both of sample is given post-test in order to know the achievement of students after doing teaching treatment as the evaluation of the study. The students creativity was observe during learning process. Then testing the hypothesis to get the conclusion.
Table 1. Research design

<table>
<thead>
<tr>
<th>Class</th>
<th>Pre-Test</th>
<th>Treatment</th>
<th>Post-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>Pre-test</td>
<td>Inquiry based learning in multimedia</td>
<td>Post-test</td>
</tr>
<tr>
<td>Control</td>
<td>Pre-test</td>
<td>Conventional model</td>
<td>Post-test</td>
</tr>
</tbody>
</table>

Preparation Phase

Preparation of learning devices and test tool and learning instrument

Non Sample

Stages of implementation

Sample

Control class

Pre-test

Student’s creativity test

Inquiry multimedia based learning

Experimental Class

Pre-test

Student’s creativity test

Inquiry learning without multimedia

Post-test

The data analysis phase

Report of research results
2.6 Technique of data analysis

Techniques of data analysis that used are normality test, homogeneity test, normalized gain, and hypothesis. Techniques of data analysis in this research by using statistic calculation.

2.6.1 Normality test

Normality test of sample is used to test the normality of data distribution will be analyzed. To test the normality performed by Chi Square test ($X^2$) (Arikunto, S., 2002). Normality test by using Chi Square test ($X^2$). Compare values of calculating with h significant level ($\alpha$) = 0.05. If $X^2_{\text{count}} \leq X^2_{\text{table}}$ so the distribution of data is normal.

2.6.2 Homogeneity test

Homogeneity test conducted to determine the data is homogeneous or not (Silitonga, 2011). $F_{\text{count}}$ is compared with table of frequency distribution $F$ ($\alpha = 0.05$). The sample is homogeneous if $F_{\text{count}} < 0.05$.

2.6.3 Normalized gain

According to Meltzer (in Sipayung, 2014) to calculate the student’s achievement is applied formula gain normalization or $g$ factor (gain score normalized).

2.6.4 Hypothesis Test

Based on table 4 above, then it can be described conclusions related to the research hypothesis, then the hypothesis of statistics are:

a. The first hypothesis is proposed, i.e. There are accepted $H_a$ difference results study chemistry between students who are taught to use learning strategies inquirimultimedia-based with students who are taught to use learning strategies, since $\alpha = 0.05 > \text{sig 0.0}$ and $F > F$ count table (52,158).

b. The second Hypothesis proposed $H_a$ accepted, that there is a difference of the results between the groups studied chemistry students who have high creativity with students who have low creativity, for $\alpha = 0.05 > \text{sig 0.01}$ and count (119.218) $F > F$ table.

c. The third Hypothesis put forward $H_0$ accepted ($H_a$ denied) that there was no interaction between the learning strategies and the level of creativity in influencing the result learned Chemistry student on a subject matter for bonds, since $\alpha = 0.05 < \text{sig 0.375}$ and $F$ calculate ($0.80) < F$ interactions between the learning strategies and the level of creativity in influencing the result learned.

The Student creativity can be shown by their chemsketch create:

Complex Compounds of Octahedral Shape in[Cu(CN)$_6$] or Hexacyanocupper (II) Compound

Complex compound is the compound that piled up from a central metal ion with one or more ligands and donate the pair electron to the central metal ion. The donation of ligands pair
to the central metal ion produced coordination covalent bonding so that the complex compound is also stated coordination compound.

So, all of the complex compounds or coordination compounds are the compound that cause of the coordination covalent bonding between transition metal with one or more ligands.

Complex compounds have the relation with Lewis acid and base where Lewis acid is the compound that can be able as the receiver free electron pair and Lewis base is the compound that acted as the donator of electron pair. Complex compound can decompose become complex ion.

Complex compound have been studied and researched through the stages of reaction mechanism using the metal ions and different ligands. Ligands have the ability as the donator of the electron pair so that can be able different among monodentat, bidentate, tridentate, and polidentate.

Theory of crystal medium used to explain color and magnetic properties of hydrate transition metal salts, especially that have the central ion of transition metal with orbital d that not filled yet by the electrons.

3 Discussion

3.1 Complex compounds

Complex compound is the compound that piled up from a central metal ion with one or more ligands and donate the pair electron to the central metal ion. The donation of ligands pair to the central metal ion produced coordination covalent bonding so that the complex compound is also stated coordination compound.

Complex compounds have the relation with Lewis acid and base where Lewis acid is the compound that can be able as the receiver free electron pair and Lewis base is the compound that acted as the donator of electron pair. Complex compound can decompose become complex ion.

Complex compound have been studied and researched through the stages of reaction mechanism using the metal ions and different ligands. Ligands have the ability as the donator of the electron pair so that can be able different among monodentat, bidentate, tridentate, and polidentate.

3.2 Octahedral compound

The octahedral compounds suitable in a cube. Where, the octahedral have 6 ligands and have position in the central of cube’s surface. In the complex octahedral, the central atom have bond with 6 donor atoms. The octahedral complex have the highest symmetry if the ligands that bond is themonodentate and monoatomic, like F-, Cl-, Br-, and I-. In the formation octahedral complex assumed there are 6 ligands monodentate that near with central atom until the certain distance when the bonds between central atom and ligands formed.

Here in this paper we have the octahedral compound that’s [Cu(CN)₆] with the IUPAC name Hexacyanocopprate (II). This compound is octahedral compound because the central atom is Cu and the ligands are CN⁻ (Cyanide) and there are 6 (six) ligands of CN⁻. Because
CN\(^-\) is ligand, so the name is Cyano. The picture of the complex compound of \([\text{Cu(CN)}_6]\) is in the following picture:

![Complex compound of \([\text{Cu(CN)}_6]\)](image)

The configuration:
\[29\text{Cu}^{2+} = [\text{Ar}]^{18} 3d^7 4s^2\]

Electronic configuration:
\[29\text{Cu}^{2+} = [\text{Ar}]^{18} 3d^7\]

\([\text{Cu(CN)}_6]\) = \(3d^7\)

Paramagnetic
\[\downarrow \uparrow \downarrow \uparrow \downarrow \uparrow \downarrow \downarrow \downarrow \downarrow \uparrow \downarrow \uparrow \downarrow \downarrow \downarrow \downarrow \]

![Complex compound of \([\text{Cu(CN)}_6]\) in 3D](image)
Octahedral
✓ 6 pair electrons
✓ 6 ligand CN
✓ High spin because it CN is the weak ligand
✓ Diamagnetic

Magnetic Moment
\[ \mu = \sqrt{n(n + 2)} \]
\[ \mu = \sqrt[3]{3(3 + 2)} = \sqrt[3]{15} BM \text{ (Paramagnetic)} \]

1. Complex compound is the compound that piled up from a central metal ion with one or more ligands and donate the pair electron to the central metal ion. The donation of ligands pair to the central metal ion produced coordination covalent bonding so that the complex compound is also stated coordination compound.
2. The octahedral compounds suitable in a cube. Where, the octahedral have 6 ligands and have position in the central of cube’s surface. In the complex octahedral, the central atom have bond with 6 donor atoms.
3. The octahedral complex have the highest symmetry if the ligands that bond is the monodentate and monoatomic, like F, Cl, Br, and I. In the formation octahedral complex assumed there are 6 ligands monodentate that near with central atom until the certain distance when the bonds between central atom and ligands formed.
4. [Cu(CN)\textsubscript{6}] with the IUPAC name Hexacyanocopperate (II) is the octahedral complex compound because the central atom is Cu and the ligands are CN\textsuperscript{-} (Cyanide) and there are 6 (six) ligands of CN\textsuperscript{-}. Because CN\textsuperscript{-} is ligand, so the name is Cyano.

4 Conclusion and suggestion

4.1 Conclusion
1. There are differences in physical students learning outcomes are taught by Inquiry based learning in multimedia and Conventional Learning with \(\alpha = 0.05 > \text{sig} \ 0.0\) and \(F_{\text{calculate}} > F_{\text{table}}\) (52,158)
2. There is a difference in student’s learning outcomes that have high Creativity and Low Creativity with \(\alpha = 0.05 > \text{sig} \ 0.0\)
3. There is no interaction between the Inquiry based Learning in multimedia with student’s level of Creativity in improving learning outcomes chemistry with \(\alpha = 0.05 < \text{sig} \ 0.375\) and \(F_{\text{calculate}} (0.80) < F_{\text{table}}\)
4. Using chemsketch and multimedia based mention improving student achievement and student generic skill in are simbolic language, logical frame and logical inference.

4.2 Suggestion
The research should be done for further in order to compare the result.
References

Pretreatment and Adsorption Effects on Stability and Morphology Structure of TCNQ-Based Porous Coordination

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Abstract: Porous Coordination Polymers (PCPs) were synthesized using TCNQ and bipyridine anions that serve as connectors to form a 3-dimensional framework. In this study, zinc metal ions (Zn²⁺) and manganese (Mn²⁺) as the center of the complex compound coordination. XRD pattern of Zn (TCNQ-TCNQ) bpy.1.5Benzen 0T and 6T shows no difference, it suggest no magnetic field effect of 6T on the formation of crystal structure. The magnetic field exhibits effect on the morphology of the crystals. The SEM image shows that the 6T crystal surface smoother and the particle size larger than the 0T crystal for both complex compounds. The XRD pattern shows the stability properties of the structure for both types of these complex compounds and the SEM image also shows the stability properties of the compounds after the pretreatment process and after the adsorption process.

Keywords: Magnetic fields, crystal structure, morphology, adsorption.

1 Introduction

Porous coordination polymers (PCPs) compounds have expanded beyond the scope of two other classes of porous material as inorganic material and carbon-based material. The crystal structure of PCPs become a new group of nano-porous crystals. (Noro, 2009 and Kitagawa, 2009). It’s get high attention in porous material research because of their high surface area and large volume of free cages instead their interesting applications including gas purification, gas separation and catalysis (Seo and Matsudsa, 2009).

Porous polymer coordination was built on the self-design of metal ions and organic ligands and formed as crystalline materials which high flexibility obtained from the building of the skeleton through coordination covalent bonds (Ghosh and Kitagawa, 2009). The formation of structures and pore properties is very easy because the components of the preparation are selected. Using these properties, it’s also possible to modify the pore surface with organic ligands that interact with certain molecules (Tanaka, 2008 and Sakamoto, 2009).

In this study, the TCNQ-based PCPs series of [M(TCNQ-TCNQ)bpy].x.Benzene]n was prepared using zinc (Zn) and manganese (Mn) as metal ions which have different magnetic properties as diamagnetic and paramagnetic respectively. TCNQ was used as ligand because it
well known as an active redox ligand that can function as a good acceptor and weak or strong electron donors in valence numbers respectively are 0, -1 or -2 (Shimomura and Kitagawa, 2006). Benzene was used as a solvent and many solvents have been used not only as a intermediate reaction, but also for topology arrangement. In micro-pore polymer coordination compounds, solvent molecules are extensively presence in the microporous, better known as "guest molecules" (Jalbout, 2008). Large diameter spaces are sufficient to accommodate benzene molecules because of the compatibility of cavity size and thickness (Shimomura and Kitagawa, 2007).

Magnetic fields brought a serious influence on their structure and properties. Magnetic field energy can provide the same direction for homogeneous of crystal formation. With the change in the formation of crystals due to magnetic fields could affected the physical properties and chemical properties in interacting with other molecules (Zubir and Ozeki, 2016). Furthermore, we synthesized both of PCPs series under 6T magnetic field and also without applied magnetic field (0T).

2 Material and method

In this research we used 7,7,8,8-tetracyano-p-quinodimetana (TCNQ), 4,4'-Bipiridin (bpy), Lithium Iodide (LI), and Acetonitrile, Diethyl Ether, Benzene and Methanol as solvents. Manganese (II) Nitrate Hexahydrate and Zinc (II) Nitrate Hexahydrate was used as metal ion in PCPs synthesis.

The Superconducting magnet 6T–Oxford Instrument IPS 125-9 with Helium compressor unit-Sumitomo CSW-71, were used for synthesis under 6T magnetic field. Crystal characterization and morphology were analyzed by using X-Ray Difraction (XRD) RigakuMultiflex with Cu-Kα and Scanning Electron Microscopy - SEM JEOL JSM-6000 F.

2.1 PCPs synthesis procedure

2.1.1 LiTCNQ synthesis

A boiling solution of 5.1 g (0.1 mol) TCNQ in 500 ml of acetonitrile was mixed with a boiling solution of 10 g (0.3 mol) Lithium Iodide (LI) in 25 ml of acetonitrile. The mixture stayed in 1 hour at room temperature. Purple crystals will separate from the solution of dark brown and while still warm, the purple crystal was filtered and then washed with acetonitrile until the washing color becomes bright green. Finally, it was washed with a large amount of ether until the washing color becomes clear (Kitagawa and Matsuda, 2007).

2.1.2 [M(TCNQ-TCNQ)bpy]1.5Benzene 0T Synthesis

Gently added LiTCNQ solution (2 mmol, 422 mg) and 4,4'-Bipyridine (1 mmol, 156 mg) in a mixture of methanol and benzene (100 ml, 1: 1) into solution M(NO3)2.6H2O (1 mmol, Zn = 297 mg and Mn = 287 mg) in a mixture of methanol and benzene (100 ml, 1: 1) at 298 K and in the atmosphere of the nitrogen gas. The green crystals formed are collected by filtering.
2.1.3 [M(TCNQ-TCNQ)bpy]1.5Benzene 6T Synthesis

LiTCNQ solution (2 mmol, 422 mg) and 4,4’-Bipyridine (1 mmol, 156 mg) in a mixture of methanol and benzene (100 ml, 1:1) was slowly added into solution M(NO₃)₂·6H₂O (1 mmol, Zn = 297 mg and Mn = 287 mg) in a mixture of methanol and benzene (100 ml, 1:1) at 298 K in the atmosphere of a nitrogen gas and put in 6 Tesla magnetic field centre. The green crystals formed are collected by filtering.

2.2 Crystal characterization

The crystals formed were characterized by X-Ray Diffraction (XRD) Rigaku Multi Flex with Cu-Kα monochromators and morphology of crystals analyzed by Scanning Electron Microscopy (SEM) JEOL JSM-6000 F.

2.3 Structural stability study after pretreatment and adsorption

Before determining the adsorption isotherm, the benzene molecule was removed by heating (pretreatment) at 413 K for 10 hours and under low pressure. XRD and SEM image were determined to see the changes in pretreatment to structural and morphological stability. At the beginning of the adsorption isotherm, 100 mg of the sample was preheated at 383 K, 1 mPa for 2 hours as a pretreatment to remove the remain solvent. The adsorption isotherm of oxygen gas is determined at 77 K and 1 mPa. After Adsorption, also observed changes in stability and morphology of the sample.

3 Result and discussion

XRD patterns of Zn and Mn complexes shows as iso-structure of each other which only one peak at 13.9 degree of Mn(TCNQ-TCNQ)bpy.1.5 Benzene which is not seen in Zn (TCNQ-TCNQ)bpy.1.5 Benzene. Mn[(TCNQ-TCNQ)bpy]1.5 0T and 6T also shows no significant difference of XRD patterns but some intensity changed in the 5 peaks at 13.84, 15.28, 18.48, 22.98 and 22.94 degrees, indicate differences structure formed due to magnetic field influences as shown in figure 1.

This slightly changed of XRD pattern due to the paramagnetic properties of manganese. This difference in intensity was calculated as the intensity ratio where 2 peaks as increase intensity and 3 peaks as decrease intensity. Before determining the adsorption isotherm, benzene was released from the cage by heating 413 K for 10 hours under low pressure. Zn[(TCNQ-TCNQ) bpy]1.5 Benzene of 0T and 6T after pretreatment showed changed of crystals color to be dark green but Mn [(TCNQ-TCNQ) bpy] 1.5. 0T and 6T benzene did not changed the color after pretreatment.

Pretreatment for removing benzene content shows XRD patterns changed for all complex compounds. The four compounds release decomposition and decreased intensity compared to before treatment as shown in figures 1 and 2. This XRD pattern shows that these compounds are stable which are included into third generation compound of PCPs. XRD pattern of Zn [(TCNQ-TCNQ) bpy] 1.5. Benzene 0T and 6T after pretreatment showed no significant difference but in the other hand, Mn [(TCNQ-TCNQ) bpy] 1.5.Benzene 0T and 6T showed slightly differences in intensity of several peaks at 12.78, 17.34 and 17.44 degrees as decrease
intensity while at 15.3 degrees as increase in intensity. The XRD patterns after adsorption for all complexes compounds Zn and Mn as shown similar XRD pattern comparison indicate these complexes compound was quite stable after adsorption process.

Fig.1. XRD Patterns of PCPs Zn[(TCNQ-TCNQ)bpy]1.5.Benzene of 0T (A) and 6T (B) in all treatment.

Fig.2. XRD Patterns of Mn[(TCNQ-TCNQ)bpy]1.5.Benzene of 0T (A) and 6T (B) in all treatment

SEM images were observed that there were no morphological differences between the crystals before and after the treatment as shown in Figures 3 and 4, indicate the pretreatment process to remove benzene from the frameworks were not affected to crystal morphology. SEM images after adsorption was compared with morphology after pretreatment and as synthesis crystal.
There were no significant morphological change after adsorption but the particles after adsorption became irregular due to the absorption of guest molecules but did not change the crystal structure. All morphologies of Zn complex compounds for comparison of all conditions are shown in figure 3 and for complex compounds Mn in figure 4. SEM images observed particle sizes of Mn complexes is bigger than Zn complexes due to magnetic properties induce strong interaction between metal ion and ligand.
The influence of magnetic fields in synthesis of Zn (TCNQ-TCNQ)bpy\(\cdot\)1.5Benzene 0T and 6T crystals did not show differences in XRD patterns. Otherwise, SEM images, it shows that the shape is hexagonal at 0T, while the compound synthesized in the 6T magnetic field is rectangular and the particle size in the Zn 6T compound is greater than that of the Zn 0T compound. Whereas for complex compounds Mn was slight changes to the XRD pattern but did not show significant differences for the morphology. The XRD pattern shows the stability of the structure for both types of complex compounds and SEM images also show the stability of the compound after the pretreatment process and after the adsorption process.

References

Preparation of Sarulla Natural Zeolite as an Adsorbent to Pb(II) and Cd(II) Removal in Aqueous Solution

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Abstract. Sarulla natural zeolite was prepared as an adsorbent to remove heavy metals of Pb (II) and Cd (II) by batch method. Zeolite was activated with 200mL HCl 1.0N and after modification was conducted, the surface was clearer as well as the morphology, the particles were smoothly, therefore the surface area and the adsorption capability were increased. Based on mass variation of adsorbent obtained for both metals, the optimum conditions is 0.4gr, which absorption efficiencies of Pb (II) and Cd (II) were up to 40.51 % and 52.22 %, respectively. Then, Pb and Cd were adsorbed with pH maximum at 4, respectively as 41.78 % and 50.75 %. When beginning the absorption process of Pb ions, it could be immediately be absorbed with a significant amount and continued until the optimum conditions after adsorbed at 50 minutes with adsorption capability of 44.64 %. Cd metal also was absorbed slowly up to 30 minutes and absorbed with a significant amount after 50 minutes contacted time, which the absorption capability is higher than Pb as 56.92 %. The absorption capability of Cd metal was exceeded the Pb metal by using the Sarulla natural zeolite..

Keywords: Natural zeolite, sarulla, adsorption, and heavy metal

1 Introduction

The increase in human population and their needs spurred the development of the industry to grow rapidly. These rapid developments will causes environmental problems or pollution and become the main aspects that need attention, due to the amount of waste produced and disposed of by the industry into environment. Bad waste treatment induce environmental pollution by heavy metals proven to pollute the waters and the environment which impact on the community (Barchan, 1998).The presence of heavy metals in the waters will be difficult to degrade and will be absorbed in the body of the organism. Even though, those heavy metals such as Pb and Cd are classified as dangerous heavy metals and can exposed to the body by the respiratory and digestive tracts. Heavy metal poisoning of Pb and Cd cause acute and chronic poisoning. Acute metal poisoning Pb is characterized by a burning sensation of the mouth, the occurrence of gastrointestinal stimulation accompanied by diarrhea and symptoms of chronic poisoning characterized by nausea, anemia, pain in the abdomen and can cause paralysis (Csuros, 2002).

The adsorption process is one of an effective strategy to remove heavy metals content in waters. The selection of adsorbent is based on capacity, selectivity, absorption rate, does not
contain harmful pollutants and cheap. One of the adsorbents that can be used to removal of Pb\(^{2+}\) and Cd\(^{2+}\) metal waste is zeolite (Ertan, 2005 and Gupta, 2009). The use of zeolite is based on its ability in ion exchange, adsorption and catalyst. Zeolites have very regular crystalline forms with cavities that are interconnected in all directions which causes the zeolite's surface area to be very large with suitable to be used as an adsorbent (Mohan, 2006; Treacy, 2001; Salman, 2017 and Kelly, 2004).

Zeolite is one of mineral which found in Indonesia. Metals from industrial residues that are discharged into nature at levels that exceed the limits of waste can damage the ecosystem. Natural zeolites contained in mineral natural resources have an abundance of around 16.6 million tons which are quite large in Indonesia, especially in locations that are geographically located in the volcanic mountain range. Indonesia has a number of natural zeolite sources found in several regions such as Malang, Wonosari, Bogor and North Sumatra which have an abundance of 3,340 thousand to natural zeolites (Asalil, 2014).

Natural zeolite needs to be activated in advance to get the optimum ability in adsorb the metal waste such as lead and cadmium (Muharrem, 2017; Sabry, 2012; Peric, 2004; Milan, 2015 and Zhang, 2014). In this study, Sarulla natural zeolite was collected from Pahae sub-district, North Tapanuli regency. This zeolite has been activated or modified with hydrochloric acid and was used to adsorb Pb (II) and Cd (II) metals in nature, as a one solution to reduce the environmental pollution.

2 Material and method

2.1 Natural zeolite preparation

Natural zeolite was taken from Sarulla, North Tapanuli area. The natural zeolite was drilled and sieved with a 100 mesh to obtain the homogeneous zeolite grain size. The zeolite was washed with distilled water, then dried in an oven at 110°C for 3 hours and a sample of Sarulla natural zeolite (SZ) would be obtained.

2.2 Natural zeolite activation

The prepared adsorbent sample of Sarulla natural zeolite (SZ) was taken as much as 100gr and activated with 200mL of 1.0N HCl solution. The mixture was stirred for 3 hours, then filtered with Whatman No.42. It was rinsed with distilled water again to neutral pH and dried in an oven at 120°C for 3 hours. Finally, the calcination was proceed at a temperature of 300°C for 2 hours to obtain activated Sarulla natural zeolite (ASZ).

These activated natural zeolite and prepared natural zeolite were characterized with XRD and SEM. The crystals formed were characterized by X-Ray Diffraction (XRD) Rigaku Multi Flex with Cu-Kα monochromators and morphology of crystals analyzed by Scanning Electron Microscopy (SEM) JEOL JSM-6000 F.
2.3 Determination of the optimum conditions of the adsorption process

Determination of optimum conditions was carried out in this study due to each adsorbent had different properties in the adsorption process. It was carried out by measuring three parameters, i.e., the mass of adsorbent, the pH of the solution of metal ion Pb(II) and Cd (II), and the contact time of adsorption.

2.3.1 The effect of adsorbent mass on metal ion adsorption process of Pb and Cd

Activated Sarulla Natural Zeolite with a particle size of 100 mesh was prepare as 0.2; 0.4 and 0.6 g. Then a 50 mL Pb metal ion solution was added with a concentration of 50 ppm with a pH of 4 solution into a 100mL Erlenmeyer. The mixture was stirred using vortex for 30 minutes. After the equilibrium the mixture was achieved, the filtered with Whatman No.42 and the filtrate were analyzed by AAS to analyze the Pb adsorbed concentration.

2.3.2 The effect of metal ion pH on metal adsorption process of Pb and Cd

Activated Sarulla Natural Zeolite was weighed according to the optimum mass of the adsorbent. A 50mL of Pb metal ion solution was added with a concentration of 50 ppm into a 100mL Erlenmeyer with variations in pH 2, 4, and 6 which were arranged with citrate buffer solution. The mixture was stirred using vortex for 30 minutes to achieve the equilibrium. It was then filtered with Whatman No.42 and the metal ions which left in the filtrate were analyzed by AAS.

2.3.3 The effect of contact time on metal adsorption process of Pb and Cd

Activated Sarulla Natural Zeolite was weighed according to the optimum mass of the adsorbent. Then 50 mL of Pb metal ion solution was added with a concentration of 50ppm and the optimum pH into 100mL Erlenmeyer. The mixture was stirred with a variation contact time of 10, 30, 50 and 60 minutes. Once the equilibrium was achieved, the mixture was filtered with Whatman No.42 and the metal ions left in the filtrate were analyzed by AAS.

The same procedure and analysis also prepared for Cd metal ion solution

3 Results and discussion

Figure 1 shows the SEM image of Natural Zeolite Sarulla after prepared and activated. Based on SEM images, the zeolite preparation was looked coarser and there were many small flakes those suspected to be impurities. In addition, the shape not clearly seen because it was like clumping and not maximum open pore yet, which not suitable for adsorption process. After HCl activation, the zeolite was appeared to be cleaner and smoother and the porous was opened (Yousefi, 2018). After activation, the particles were smaller and smoother and the surface area was bigger which possible to increase the adsorption capability.
3.1 The effect of adsorbent mass on Pb(II) and Cd (II) adsorption

Based on the adsorbent mass, the optimum conditions were obtained with the amount of 0.4gr. Whereas, the absorption efficiency of Pb (II) and Cd (II) were found to be 40.51 % and 52.22 %, respectively. Fig. 2 shows that the absorption capacity of metal would be decreased when zeolite was optimal. Although the same adsorbent mass optimum of 4gr, however Cd was more found to be absorbed than Pb. The heavy metal sorption was attributed to different mechanisms of ion exchange processes as well as to the adsorption. During the ion-exchange process, metal ions had to move through the pores of the zeolite mass.

It also moved through channels of the lattice, and they had to replace exchangeable cations. Diffusion was faster through the pores and was retarded when the ions moved through the smaller diameter channels. In this case, the Cd metal ion uptake could mainly be attributed to higher ion-exchange reactions than the Pb metal ion in the micro porous minerals of the zeolite samples (Sabry, 2012). However, at an adsorbent mass of 0.6, the amount of Pb ion was absorbed more than Cd ion, because the nature of Pb metal was harder than Cd, so it has the ability to fit into the larger pores compared to Cd (Mehdi, 2016).
3.2 The effect of pH on Pb(II) and Cd(II) adsorption

One of important parameter that determines the adsorbent’s ability to absorb metal on a solid-liquid surface is pH. Therefore, the pH conditions must be kept stable during the adsorption process. The purpose of determining the optimum pH is to determine the most suitable pH where the absorption of Pb(II) and Cd (II) metal by modified zeolite reaches optimal conditions.

Adsorption of Pb (II) and Cd (II) metal ions onto the surface of the adsorbent is influenced by active sites (species) on the surface of the adsorbent. The charge of species of the adsorbent is normally affixed by the pH of the solution [16]. Fig. 3 shows the effect of pH on Pb(II) and Cd (II) metal adsorption process. It has been found that the adsorption of Pb and Cd were of 41.78 % and 50.75 %, respectively and it was reached at pH 4. The active sites of the adsorbents are protonated by H⁺ ion to yield partially positive charges of the sites which were similar to those of metal ions. And these process induce the number of Cd ions absorbed at pH 4 is more than Pb. The adsorption was not carried out in alkaline conditions or pH above 6 due to metal ions of Pb²⁺ and Cd²⁺ would be formed as Pb(OH)₂ and Cd (OH)₂ under those conditions.

Fig. 2. The effect of adsorbent mass of Pb(II) and Cd (II) in adsorption process

Fig. 3. The Effect of pH of Pb(II) and Cd (II) in adsorption process
3.3 The effect of contact time on Pb(II) and Cd (II) metal adsorption process

The optimum contact time was determined to get the minimum time required by adsorbent to maximum absorb of Pb(II) and Cd (II). Fig. 4 shows the effect of contact time on Pb (II) and Cd (II) adsorption. At the beginning of the adsorption of Pb ions, it could immediately be absorbed at 50 minutes with the significant adsorption capability was of 44.64% as a maximum conditions. In the other hand, Cd ion was adsorbed slightly at the beginning of adsorption and gradually increased to 30 minutes.

![Fig. 4](image)

**Fig. 4.** The effect of contact time of Pb(II) and Cd (II) in adsorption process

However, the optimum was also found at 50 minutes contact time, but the absorption capability was found to be higher than Pb, which was 56.92 percent. It might be due to stronger interaction of Cd metal with the active site on the zeolite framework, which contributed to a greater amount of absorption than Pb metal.

Based on this study, Sarulla natural zeolite has specific properties for the absorption of Pb and Cd metal ions through ion exchange reaction. Many previous studies have shown that the amount of Pb metal ion absorption was more than Cd metal in some types of adsorbent. However, in this study, Sarulla natural zeolite could adsorbed Cd ion higher than Pb with optimum condition for absorption of Cd was 0.4 gr of mass adsorbent in pH 4 and adsorption contact time of 50 minutes. The absorption efficiencies of Cd and Pb were found to be 56.92 and 44.64 percent, respectively at the optimum conditions.

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Non-proportionality and Photon Interaction Study of CLYC Scintillation Material by Compton Scattering Technique

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Abstract. In this research, scintillation properties of Cs2LiYCl6:Ce (CLYC) scintillation material were studied by Compton scattering technique and the samples were irradiated with eight different photon energies using these technique. Photon interactions have been calculated by WinXCom program at 216-662 keV. The mass attenuation coefficient ($\mu_m$) and partial interactions, light yield and non-proportionality were presented. The values of increased toward the decrease of gamma ray energies and are influenced by photon energy and chemical compositions. The partial interactions found that three energy relative to the partial processes first photoelectric absorption, second incoherent (Compton) scattering and third coherent (Rayleigh) scattering. Moreover, the crystal were higher at the low photon energy and decreased with increasing the photon energy. The results of scintillation properties show that slightly increased when increasing the photon energy. The non-proportionality shows demonstrated excellent proportional property in the energy range, the non-proportionality is about 1.5%.

Keywords: scintillation material, non-proportionality, mass attenuation coefficient, light yield.

1 Introduction

In the present, scintillation material are most widely used for the detection of X-rays, gamma rays, and thermal neutrons. Moreover, many type of the scintillation material were among the most popular to applied in nuclear physics laboratories. (Van Eijk, 2001) In 1999, the researchers from Delf University of Technology was first discovered a new inorganic scintillator cerium-doped cesium lithium yttrium chloride (CLYC). The CLYC crystal was the first applied gamma & neutron scintillation detector for use as a replacement for both medium resolution gamma-ray detectors and helium-3 proportional counter tubes for neutron detection. (Qin, 2018) The background of CLYC crystal is very good energy resolution (better than 5% FWHM at 662 keV), the density is 3.31 g/cm3 and peak scintillation wavelength is 370 nm. The ideal scintillation material should convert the kinetic energy of the charged particles or gamma ray into detectable light with high scintillation efficiency. The light yield should be proportional to the deposited energy over a possible wide range. But, still no material meets all
these criteria. (Flakus, 1980, Limkitjaroenporn, 2010) Under these conditions, fundamental properties of scintillation material are very important for example mass attenuation coefficient, decay time, energy resolution, light yield and non-proportionality of light yield. (Moszynski, 2010)

In this study, to investigate scintillation crystal of CLYC for gamma ray spectroscopy. The following properties will be studied the mass attenuation coefficient, light yield and non-proportional of light yield. The $^{137}$Cs have been used in this experiment and using Compton scattering technique for varying gamma ray energies.

2 Experiment

The study of CLYC scintillator with the size of 12.7x12.7x12.7 mm$^3$, the crystal were measured with a photomultiplier tube (PMT) number 9256KB by ET Enterprise electron tubes.

Fig.1. Schematic representation of the experimental setup used to measure photoelectron yield and light yield.
Fig. 2. Block diagram of the Compton scattering technique for the measurement of photoelectron yield and light yield.

Table 1. The scattered gamma rays energies at different angles

<table>
<thead>
<tr>
<th>Θ (deg)</th>
<th>$E_{\gamma(th)}$ (keV)</th>
<th>$E_{\gamma(ex)}$ (keV)</th>
<th>% RD</th>
</tr>
</thead>
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<tr>
<td>30</td>
<td>564.09</td>
<td>573.85±13.75</td>
<td>1.72</td>
</tr>
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<td>45</td>
<td>479.90</td>
<td>486.67±10.25</td>
<td>1.41</td>
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<tr>
<td>60</td>
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<td>399.50±8.16</td>
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<td>75</td>
<td>337.72</td>
<td>346.15±21.17</td>
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<tr>
<td>90</td>
<td>288.39</td>
<td>281.10±22.03</td>
<td>2.52</td>
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<tr>
<td>105</td>
<td>251.63</td>
<td>245.97±28.35</td>
<td>2.25</td>
</tr>
<tr>
<td>120</td>
<td>224.92</td>
<td>216.95±24.32</td>
<td>3.21</td>
</tr>
</tbody>
</table>
A photomultiplier tube coupled the crystals to using silicone grease covered with several layers of white teflon tape and wrapped with black tape, then covered with aluminum housing. The signal output from the PMT anode passed through a Canberra 2007B preamplifier and was sent to Canberra 2022 an amplifier set at 0.5 μs a shaping time constant. The energy spectra analysed with software of Canberra MCA to record data. The measurements were carried out with 30 of CLYC scintillator in the amplifier. The high voltage power supply (HVPS) was used negative 620 V for CLYC scintillators as shown in figure 1.

Figure 1 and figure 2 shows the experimental setup and block diagram used to measure photoelectron yield and light yield using Compton scattering technique for varying gamma ray energies. The $^{137}$Cs obtained from the Office of Atom for Peace (OAP), Thailand, with an activity of 15mCi (555 MBq). The relation of the energy transfer and the scattering angle for any given interaction can be expressed from simultaneous equations for the conservation of energy and momentum (Glenn, 2000). The Compton scattering requires that the light is viewed as a particle and not just a wave because it is the collision of photon with electron and the exchange of energy, which accounts for the shift in energy. The energy imparted to the recoil electron is given by Compton (Tsoulfanidis, 1995) according to the equation:

$$E'_{\gamma} = \frac{E_{\gamma}}{1+(1-\cos \theta)} E_{\gamma}/m_0c^2$$

where $E'_{\gamma}$ is the scattered gamma ray energy, $E_{\gamma}$ is the incident gamma ray energy, $\theta$ is the scattering angle and $m_0c^2$ is the rest-mass-energy of the electron (551 keV).

To measure the mass attenuation coefficient, light yield and non-proportional of light yield, the Compton scattering technique was applied at seven different angles (Ω) from 30°-120°using Compton scattering technique to produce γ-rays of different energies. The validity of the system has been confirmed with an energy calibration of the system. It was found that seven corresponding photon energies were in the range of 216-662 keV as shown in Table 1.

3 Results And Discussion.

3.1 Mass Attenuation Coefficient and Partial Interactions

Theoretically, the mass attenuation coefficient of CLYC crystal compared with BGO single crystal by WinXCom program are shown in Figure 3. It is seen that mass attenuation coefficient are influenced by photon energy and chemical compositions. It was indicates that, at lower energies the total photon interactions with both scintillator is high while at higher energies it decreases. It is clearly to observed that the mass attenuation coefficient of BGO crystal have higher values at lower energies than CLYC crystal. Due to the BGO crystal is very high density (7.11 g/cm³) and effective atomic number.

Figure 4 shows the partial interaction of CLYC crystal, it was found that three energy relative to the partial processes first photoelectric absorption has shown to be a stronger effect at low energy, second incoherent (Compton) scattering is the main interaction in the Compton energy range and third coherent (Rayleigh) scattering it is not significant role in this connection because the value was negligible and decreases almost zero at high energies.
Figure 3. The mass attenuation coefficient of CLYC crystal compared with BGO single crystal at 216-662 keV.

Figure 5 shows the number of photoelectron (Nphe) of CLYC crystal at 216-662 keV, this value is about when the crystal interaction with photon energy and emitted the light per unit area per unit time which directly proportional to the intensity of light used. The results show that these value response linear with the photon energy. The Nphe is very important to transform the number of photoelectron per MeV (Nphe/MeV) into an absolute light yield (Ph/MeV) as shown in figure 6.

Figure 4. The partial interactions of CLYC crystal at 216-662 keV.
Fig. 5. The number of photoelectron of CLYC crystal at 216-662 keV.

From figure 6, the light yield measurement procedure as determined by Bertolaccini method (Bertolaccini, 1968) and the non-proportionality of CLYC crystal in the energy range of 216-662 keV are shown in figure 7. It is seen that the plots of the relationship between the light yield and energy slightly increased when increasing the photon energy. The non-proportionality of CLYC crystal normalized at 662 keV shows demonstrated excellent proportional property in the energy range, the non-proportionality is about 1.5%.

Fig. 6. The light yield of CLYC crystal at 216-662 keV.
4 Conclusions

The scintillation properties of CLYC crystal using Compton scattering technique was finished measurement. It was found that seven corresponding photon energies were in the range of 216-662 keV. Photon interactions have been calculated by WinXCom program at 216-662 keV. The mass attenuation coefficient ($\mu_m$) and partial interactions, light yield and non-proportionality were presented. The values of ($\mu_m$) increased toward the decrease of gamma ray energies and ($\mu_m$) are influenced by photon energy and chemical compositions. The partial interactions found that three energy relative to the partial processes first photoelectric absorption, second incoherent (Compton) scattering and third coherent (Rayleigh) scattering. Moreover, the crystal were higher at the low photon energy and decreased with increasing the photon energy. The results of scintillation properties show that slightly increased when increasing the photon energy. The non-proportionality shows demonstrated excellent proportional property in the energy range, the non-proportionality is about 1.5%.

Acknowledgements. The authors gratefully acknowledge the National Research Council of Thailand (NRCT) for supporting this research and Nakhon Pathom Rajabhat University (NPRU) for facilities.

References

The Effectiveness of Learning Arabic Vocabulary Using Multimedia Technology

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Abstract. Arabic is an international language, so it is also important to be able to learn it. But learning Arabic is certainly not as easy as learning Indonesian which is our mother tongue. The uniqueness of Arabic also lies in its script which is not a Latin letter and how to read it also requires special knowledge. Thus, in order to facilitate learning it needed aids as a medium of learning. Development of learning media with Information Communication and Technology (ICT) utilization can be developed multimedia-based learning media. One of the developments in Multimedia technology is able to give a big and deep impression in the field of communication and education. In this study will be compared how the learning outcomes of students who learn without the help of multimedia technology by using multimedia learning media tool. Thus, it will be known how effective the use of learning media with multimedia technology especially for Arabic lessons.

Keywords: Arabic, learning, effective, multimedia.

1 Introduction

The United Nations (UN) has decided to make Arabic one of the official languages of the United Nations on December 18, 1973. Arabic is accompanied by 5 other official languages of the United Nations (English, Chinese, French, Russian and Spanish). When the official UN meeting was held, representatives of the countries involved gathered in one large room and they delivered various ideas using the 6 official languages. The determination of Arabic as the official language of the United Nations on December 18, 1973 inspired Morocco and Saudi Arabia to propose to UNESCO so that the date is celebrated as World Arabic Language Day in 2010. The purpose of this memorial is as a form of promotion of multilingualism and cultural diversity. Since the establishment of Arabic as the official language of the United Nations, people who want to learn Arabic are increasing every year. As for learners of Arabic language and literature, the inauguration on December 18, 1973, seemed to be a breath of fresh air to expand the reach of working in a variety of new sciences. The implementation of World Arabic Language Day by UNESCO actually awakened various parties in the world that many of the vocabulary from Arabic turned out to have merged with other foreign languages such as English. Many young people are competing to learn Arabic culture and its language and culture because the image of Saudi Arabia itself is so good in the eyes of the Indonesian people. Learning Arabic and enriching vocabulary in Arabic makes it easy to learn Arabic. Various vocabulary related to everyday conversation is divided into various types ranging from the name of the day, objects, or others. It's the same when learning English. By memorizing the various vocabulary, you will certainly find it easy to learn Arabic so that you
will be more proficient in Arabic. In a teaching and learning process, two very important elements are teaching methods and teaching media. These two aspects are interrelated. Learning media are a physical means to convey learning content / materials such as: books, films, videos and so on (Briggs, 1977). Meanwhile, National Education Association (1969) revealed that instructional media is a means of communication in print and in-kind forms, including hardware technology. From the three opinions above concluded that the learning media is everything that can channel messages, can stimulate students' thoughts, feelings, and wishes so that they can encourage the creation of learning processes in students. The evolution of technology that is increasingly developing has given effect to humans to change their lifestyle so that they can better adapt to the existing technological conditions. Technological developments, especially Information and Communication Technology have benefited from the development of learning media used both in theory and practice learning. Information and Communication Technology (ICT) can be used as learning aids, and can even replace the role of the teacher in learning. Information and Communication Technology In Education. ICT stand for information and communication technologies and is defined, as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information." Development of learning media with Information Communication and Technology utilization can be developed multimedia-based learning media. One of the developments in Multimedia technology is able to give a big and deep impression in the field of communication and education. In line with Industry 4.0, at present the development of ICT makes producers compete to produce products that are mobile so that they are more flexible and can be carried everywhere. Thus slowly the use of Personal Computers has slowly begun to decline. Urban communities are increasingly busy and have high mobility so they certainly prefer mobile technology. The mobile era also presents tablets, as one of the sophisticated technology devices and has many uses. Smaller tablet sizes than laptops also cause some people to prefer to use tablets. In addition to laptops and tablets, there are also technologies that have progressed very rapidly now, namely gadgets or smartphones. Today, with a small size, smartphones are increasingly sophisticated and have various applications that make it easier for humans to carry out various communication activities. Using of learning media in the teaching and learning process needs to be planned and systematically planned so that the learning media are effective for use in the teaching and learning process. Effectiveness is often closely related to the comparison between the level of achievement of a goal and a predetermined plan, or the comparison of real results with the planned results. The effectiveness can be used as a measuring tool to measure educational success. The indicator that is used as a benchmark in stating that the teaching and learning process is said to be successful, is the absorption capacity of the learning material taught to achieve high achievement, both individually and in groups that are defined in the teaching objectives.

2 Multimedia Based Learning

Understanding learning media are all teaching tools that are used to help convey the subject matter in the teaching and learning process so as to facilitate the achievement of the objectives of the learning objectives that have been formulated. Association for Educational Communications and Technology. The Association for Educational Communications and Technology (AECT) provides a definition that is everything that people use to channel messages and can stimulate students to learn more. Learning media used in learning activities
can influence the effectiveness of learning. In the beginning, the learning media only functioned as a teacher's tool to teach which was used as a visual aid. Around the middle of the 20th century visual utilization efforts were complemented by the use of audio equipment, so audio-visual aids were born. In line with the development of ICT, especially in the field of education, currently the use of assistive devices or learning media is becoming increasingly widespread and interactive, such as the existence of computers and the internet.

Learning media have several functions, including: (1) Learning media can overcome the limitations of experience possessed by students. The experience of each student varies, depending on the factors that determine the wealth of a child's experience, such as the availability of books, opportunities for travel, and so on. Learning media can overcome these differences. If students are not likely to be brought to the object directly studied, then the object is brought to the students. The object in question can be in the form of real, miniature, models, and forms of images that can be presented in an audio-visual and audible manner; (2) Learning media can exceed the limits of classrooms. Many things that cannot be experienced directly in the classroom by students about an object, which is caused, because: (a) the object is too large; (b) the object is too small; (c) objects that move too slowly; (d) object that move too fast; (e) objects that are too complex; (f) object that sound too smooth; (f) objects contain dangerous and high risk. Through the use of appropriate media, all objects can be presented to students; (3) Learning media allow direct interaction between students and their environment; (4) Media produces uniformity of observation; (5) The media can instill basic concepts that are true, concrete, and realistic; (6) The media evokes new desires and interests; (7) The media evokes motivation and stimulates children to learn; (8) The media provides an integral / comprehensive experience from the concrete to the abstract. In line with the development of ICT so that the mindset of teachers must be changed to a constructive learning system replaced by utilizing ICT. The development of science and technology for media use, both visual, audial, projected still media and projected motion media can be done together and simultaneously through a single tool called Multimedia. Multimedia comes from the words 'multi' and 'media'. Multi means a lot, and media means a place, means or tool used to convey information. So based on the word ‘multimedia’ it can be formulated as a forum or the integration of several media which is then defined as elements of multimedia formation. These elements, such as text, images, sound, animation, and video. Multimedia is a new concept and technology in the field of information technology, where information in the form of text, images, sound, animation, and video is put together in a computer to be stored, processed and presented both linear and interactive. By combining all these multimedia elements, information in the form of multimedia can be received by the senses of sight and hearing, closer to the original form in the real world. Interactive multimedia is when an application contains all existing multimedia elements, and users are given a decision or ability to guard and turn on these elements.
3  Effectiveness Of Learning Media

There are several criteria for assessing the effectiveness of a media. Hubbard proposed nine criteria for assessing its (Hubbard, 1983). The first criteria is cost. Costs must be assessed by the results that will be achieved with the use of the media. Other criteria are the availability of supporting facilities such as electricity, compatible with class size, brevity, ability to be changed, time and energy of preparation, the effect caused, complexity and the latter are used. The more learning goals that can be helped by a media, the better the media. The above criteria are more intended for conventional media. Thorn proposed six criteria for assessing interactive multimedia (Thorn, 1995). The first assessment criteria are ease of navigation. A program must be designed as simple as possible so that language learners do not need to learn computers first. The second criterion is the content of cognition, the other criteria is knowledge and presentation of information. Both of these criteria are to assess the content of the program itself, whether the program has met the learning needs of the learner or not. The fourth criterion is media integration where the media must integrate language aspects and skills that must be learned. To attract the interest of the learner the program must have an artistic appearance so that aesthetics is also a criterion. The last assessment criteria is the overall function. The program developer must provide the learning desired by the learner. So that when a person finishes a program he will feel he has learned something.

4  Testing And Results

For this research we have used android learning application as shown figure 2.
From the menu as shown figure 2, the user may tick the menu like "study" and then Arabic vocabulary will shown as figure 3.

User can see what picture appears and hear the sound how to spell the vocabulary. Our research compares 20 students with ICT capability with 20 students have not ICT capability. And the result shown that users have the capability in ICT is easier for them to use the android learning application. So the multimedia learning android application is effective for student have ICT capability.

5 Conclusions

Learning media are needed to stimulate interest in learning. In this research, we have found that Multimedia-based learning media are very effective if used by students who are
able to use ICT. So, if the student who are not able using ICT, then needs to train how to use the application.

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Student’s Skills of Innovative Thinking using Thermoelectric Devices for STEAM Education in ASEAN

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Abstract. The Science Technology Engineering the Arts and Mathematics (STEAM) education was trend to change from traditional education philosophy based on standardized test scores to a modern trade learning process. We proposed the innovative thinking skills for undergraduate, graduate and high school students in ASEAN counties using new fabrication of thermoelectric device (TED) kit. The TED kit was developed to understand and create basic science and applied science knowledges such as energy, heat, heat converse to electricity, materials and micro generator and refrigerator applications. The 300 students from Indonesia, Myanmar, Vietnam, Loa, Cambodia and Thailand counties have ASEAN-TED Workshop 2018 in SakonNakonRajabhat University (SNRU), Thailand. They are most satisfaction with designing and fabricating thermoelectric cell and thermoelectric devices by them self to create a knowledge of technology and get new idea innovation. The workshop has impacted with students to fabricate new 18 thermoelectric prototypes developing to innovation show and competition in ASEAN-Thermoelectric device fabrication and invention fair 2018 on 1st August 2018 at SNRU every year.

Keywords: Innovative education; thermoelectric technology; STEM fields

1 Introduction

In the ASEAN counties; high school, colleges, and university have trained skills innovative thinking of young scientists similar to the World scientist education. The goal of this project is to develop a curriculum that integrates scientific training with creativity development to promote innovative cognitive skills in undergraduate science students. The Sakon Nakhon Rajabhat University (SNRU), Thailand is an ideal setting for the STEM and STEAM curriculum development (Madden 2013, Young Audiences Arts for Learning, 2018, Lonka, 2018). STEM education is integrated learning approach in which Science Technology Engineering and Mathematics in a discipline, separate, and discrete subjects into a cohesive learning paradigm based on real-world applications (Elaine, 2016, White, 2014).

STEAM education is integrated approach to learn uses Science, Technology, Engineering, Art and Mathematics as access points for guiding student inquiry, critical thinking and innovative thinking. The end results are students who take thoughtful risks, engage in
experiential learning, persist in problem-solving, embrace collaboration, and work through the creative process. These are the innovators, educators, leaders, and learners of the 21st century (Riley, 2018).

21st century skills are considered to be particularly important for success in academic contexts and on the job. These skills include primarily higher-order thinking skills and complex cognitive processes. They are considered very important by researchers and policy makers alike and include concepts such as creativity, problem solving, and information and communication technology (ICT) literacy (Greiff, 2015, Binkley, 2018, Piirto, 2018, Hakkaraine, 2000).

In this work, we proposed the ASEAN students’ skills of innovative thinking using thermoelectric devices to learn uses science (Physics and Chemistry), Technology, Engineering, Art and Mathematics education in TED Fabrication Workshop 2018 and TE Invention Fair 2018 at SNRU, Thailand.

2 Methodology

2.1 Thermoelectric Devices

We created thinking about global warming, increasing pollution, increasing IC heat, the end of cheap oil problems and increasing energy demand in the world. Thermoelectric technology is converted directly into different temperature to electricity and vice versa which opportunities for low grade heat harvesting and green energy production. For example, automobile waste heat thermoelectric power generation and on chip thermoelectric cooling. This technology is solid state construction (no moving parts), diffusion barriers, vibration free operation, no acoustical or electrical noise, size and performance output highly scalable of 2 mm to 60 mm and fully scalable μW to kW of heat pumping or power output depending on design. We need large electrical conductivity, high Seebeck coefficient and low thermal conductivity as following the dimensionless figure of merit: $ZT = (S^2\cdot T)/\rho \kappa$

where S is Seebeck coefficient, $\rho$ electrical resistivity, T is absolute temperature and $\kappa$ is thermal conductivity which all parameters different values in metals, insulators and semiconductors thermoelectric materials (Seetawan, 2015). Thermoelectric devices are used low, medium and high temperature depend on thermoelectric materials. Thermoelectric materials are synthesized by solid state reaction, hotpress, spark plasma and hydro thermal methods. Thermoelectric cell, module and devices are composed p-type and n-type thermoelectric materials connecting by copper or silver electrode to obtain the thermoelectric generator and thermoelectric refrigerator, as shown in Table 1. For example, thermoelectric application is micro generator, cooling computer, drink coolers, recharging devices, space probes, solar power, clothing. We developed thermoelectric device kit for the STEAM education using conference the ASEAN students’ skills of innovative thinking to create new thermoelectric applications and invention. The thermoelectric device fabrication manual step by step is shown in Figure 1. After workshop, we managed the competition of the ASEAN TED fabrication and invention fair 2018 using the same students’ groups are shown in Figure 2.
2.2 Participants

We designed a self-reported questionnaire to measure students’ skills of innovative thinking with thermoelectric devices using 315 students answered the questionnaire. The questionnaire was also measured before and after leaning keynote speaker talk and TED fabrication workshop.

2.3 Assessments Instrument

The self-report questionnaire composed of TE knowledge, time, keynote speaker, TED kit and staff of workshop, which called for rating on a five-point scale; 5 : most, 4 : much, 3 : medium, 2 : minor and 1 : least.

Fig. 1. Thermoelectric device fabrication manual and step detail of fabrication
Table 1. Thermoelectric materials properties at room temperature

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>$S$ (µV K$^{-1}$)</th>
<th>$\rho$ (µΩ m)</th>
<th>$\kappa$ (W m$^{-1}$ K$^{-1}$)</th>
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</table>

3 Results And Discussion

The ASEAN TED fabrication workshop 2018 has been increased interesting by participant form 2014-2018 which 315 persons assessed satisfaction for thermoelectric knowledge, appropriate time, keynote speaker, thermoelectric device kit and staff are shown in Figure 3. The ASEAN Invention Fair 2018 competition was organized by SNRU and Thai Thermoelectric Society (TTS), Thailand. In the competition, student participants consisting of various departments in ASEAN were contested to conduct thermoelectric fabrication so as to produce the greatest power possible. The workshop and competition were divided into two competition categories, namely ‘Thermoelectric Device Fabrication Workshop’ that is open to students in the ASEAN region and an exhibition of ‘Thermoelectric Invention Fair’ for all high school, undergraduate, and graduate students in the ASEAN. This workshop and competition were also attended by 112 teams (high school 73 teams and high education 39 teams) from several countries in the ASEAN. Among them are Indonesia, Myanmar, Laos, Vietnam and the host country’s team, Thailand. A team was consisted three members such as a teacher and two students. In the race competition, student explained, each team is given a component to compile a thermoelectric fabrication kit. The TED kit was consisted alumina, cable, thermoelment, and copper. In the fabricating process, according to students’ skills, each team is granted the freedom to develop their creativity in how the design, the p-n junctions (a type of thermoelectric materials), and the packaging from thermoelectric are to be made. After that, they are will test the power of each thermoelectric that has been made by each team to determine the winner of this competition. The team succeeded in winning the competition if successfully assembled and made the highest voltage thermoelectric module.
All participants have been assessed satisfaction for thermoelectric knowledge, appropriate time, keynote speaker, thermoelectric device kit and coach or staff are shown in Fig. 4. It was found that high satisfaction level about 4, it means much satisfaction for thermoelectric knowledge, time, keynote speaker, TED kit and staffs.

**Fig. 4.** The satisfaction (a) theoretical thermoelectric talk by keynote speaker (b) thermoelectric device kit for fabrication
The awards gave the winner of high electrical power of TED and TE invention due to highly score assessed by international jury. In addition, we gave Gold, Silver and Bronze coins for TE invention depend on score level 80-100 (Gold), 70-80 (Silver) and 60-70 (Bronze), as shown in Figure 5.

![Fig.5. The awards ASEAN TED Fabrication Workshop 2018 and TE Innovation Fair 2018](image)

4 Conclusions

The TED fabrication workshop and TE invention fair 2018 can increased skills innovative thinking and excellently tools supported the STEAM education for ASEAN students. The students can created idea and learned the science (Physics: energy, heat, heat transfer, electricity, semiconductor, solid state and particles, Chemistry: elements, chemical compositions, solutions, chemical reactions and solid state reactions), Technology (thermoelectric, alternative energy, renewable energy, small generator, small refrigerator and solid state air conditioner), Engineering: (design, maker and TE applications), Art: (drawing, conducting map and TE models), and Mathematics (number, area, volume, graphs and statistics). The study, give the limitation of self-report, indicates that a most satisfaction of the ASEAN students, TED very well and responsibility for STEAM education at school, college and university.

Acknowledgements. This work has financial supported Thai Thermoelectric Society (TTS), National Research Council of Thailand (NRCT), ULVAC (Thailand) Ltd. and Kinetics Corporation Ltd and Thailand Research Fund (TRF): TRF Research Career Development Grant, RSA (RSA6180070).

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The Implementation of Linguistic Functional Systemic Approach on the Reading Comprehension to Improve Students Reading Ability

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Abstract. This research is conducted to improve the students reading comprehension ability in French Department of State University of Medan. The specific objective of this research is to improve the process as well as the result ability in reading French texts through the Linguistic Functional Systemic approach. The type of this research is action research, conducted on 48 students of French education in academic year 2014-2015. This action research refers to the cycle of action research of Kemmis and MC Taggart which consist of four steps, planning, acting, observing, and reflecting. The results indicate that the ability of reading comprehension of students for each cycle shows satisfaction. Cycle 1 refers to the aspect lexicogrammar in text, cycle 2 the aspect of discourse semantic, and cycle 3, the register. This research shows that the linguistic functional systemic approach can be applied as an alternative to improve the students French reading comprehension.

Keywords: Linguistic functional systemic, reading comprehension, reading ability.

1 Introduction

Reading is an artificial activity, which is an activity that is learned and continues continuously. The results of Prijana and Saefulah's experimental study said that students have reading skills and training that are different from each other. They also have different reading speed. Prijana and Saefulah note that students who have higher academic achievement tend to be faster in their reading time than those with lower academic achievement. Likewise, in terms of intensity of reading activities. Students with better academic achievement turn out to be more frequent in reading than others.

The ability to understand a text is an important thing that must be owned by students who are learning a foreign language, as well as French. Therefore, this is a major concern of the French Language Education Study Program of the Department of Foreign Language Languages and Arts of the State University of Medan, so that in the 2008 competency-based curriculum, reading clump courses are text studies (étude de texte) as one of courses that must be followed by all students who are studying French, in addition to the scope of other reading courses namely compréhension écrite.

Learning text studies (étude de texte) that took place so far used teaching techniques such as lectures, question and answer, and assignments. Learning media that used are include...
magazine and newspaper texts, advertisements, internet, and television. While the approach to
the text which is used by asking general questions from the text (Question-Reponse).

Based on the experience and observations of the researcher while being a lecturer in text study
courses (étude de texte), students’ ability to read texts has not achieved maximum results
in accordance with the standards of competency-based curriculum in 2008 and the CECRL
(Cadre Européen Commun de Référence pour les Langues). The curriculum that was compiled
since 1996 and entered into force in 2000, as a joint European reference frame for language
teaching which contains provisions on what needs to be achieved at each stage of French
language learning that includes all four language skills, namely: (1) Phase A1 and A2 = base
level, (2. Phase B1 and B2 = middle / independent level, and (3) Phase C1 and C2 = advanced
level.

The explanation above is also reinforced by the student’s final grade data acquisition in
the text study course (étude de texte) of the 2013/2014 academic year, where the lowest score
was obtained with a range of value between 0-69 as many as two students, the range of value
was 70-79 as many as thirteen students, ranging in value from 80 to 89 as many as fifteen
students, and no single student received the highest score with a 90-100 score range. Looking
at the data above, this condition requires an improvement in the learning process by using a
more in-depth approach of reading the text.

The ability to read French text in this study, especially for the sixth semester students is
the ability to read the text for the understanding level, meaning that it refers to the CECRL B2
level standard that is students have the ability to read and analyze French texts related to the
theme of daily activities, work, expressions of feeling, and expectations in personal letters
contained in magazines, newspapers, advertisements, radio, TV5, and film shows.

The LFS approach is used in this study with the assumption that the LFS approach
examines the text used as learning material in text study courses (étude de texte). This
approach is proven to be able to answer a variety of linguistic problems, both micro and
macro..

2 Theoretical Study

2.1 Reading Ability

The ability according to Poerwadarminta is a capability or skill to do things well and
carefully. While reading ability is the ability to understand information provided by other
parties through a writing forum. An important point of reading ability is the ability to
understand the information provided by the author. In other languages, reading ability is the
ability to understand written, implicit or express ideas, and draw conclusions with meaningful
interpretations that are not only merely a reading process without understanding the content of
the material being read.

2.2 Definition and Nature of Reading

The definition of reading has been widely conveyed by experts. Brown for example
argues that reading is an interactive process that is present between the reader and the text, and
produces a new understanding. While Gipe identifies four dimensions of a reading process,
namely linguistic processes, cognitive processes, psychological processes (affective), and physiological processes.

The person’s reading ability is largely determined by the reading quantity factor. This means that a person's reading skills are strongly influenced by the amount of time spent in carrying out reading activities. The more time spent for reading each day, the higher the level of comprehension or the easier it is to understand a text.

Suyatmi, in this context, explained about the factors that support reading activities, including:

1) Internal factors include: language competence or ability, interest, motivation, perseverance, concentration, health both physically and spiritually, the ability to neutralize points of weakness, having a suitable background of knowledge discipline, sufficient vocabulary mastery and understanding the purpose reading quickly and carefully.

2) External factors include: providing the right reading materials as needed, interesting, and giving rise to preoccupations and prices that can be reached by the wider community. Likewise some elements in reading and the nature of the reading environment (readability factors), environmental situations and conditions that stimulate the emergence of reading preferences, including the provision of conducive learning places, family atmosphere, school environment, community, friends, teachers, and community leaders.

Susilowati in her journals cites Brown's opinion which states that there are two forms of reading learning in the classroom, namely reading aloud (oral reading) and reading with no sound (silent reading). Reading aloud focuses on the learner's ability to pronounce language sounds and often applied to beginner learners for second language. Silent reading is further divided into intensive reading and extensive reading.

2.3 Text

Halliday explained that the text is always covered by the context of the situation and culture. The context of the situation is the scope of the entire environment, whether the speech environment (verbal) or the environment in which the text is produced (pronounced or written). After the context of the situation there is a cultural context which includes the text and context of the situation. To understand a text well, it requires an understanding of the context of the situation and cultural context.

In the perspective of Systemic Functional Linguistics, text is a unit of meaning (semantic units) and not a grammatical unit. Text can be realized by various language units, such as sounds, morphemes, words, groups, phrases, clauses, paragraphs, or books. As a unit of meaning, text can be realized by various grammatical units. This means that the text can be in the form of a text(book), paragraph, complex clause, clause, phrase, group, or sound.

A text, if viewed from the manner and purpose of the presentation, is generally divided into five, namely:

a. Narrative text

According to OkkeKusuma, there are four criteria for a narrative text, namely:

1) There is a series of events. In order to make a story be shaped, there must be a minimum series of events that take place within a certain period of time, so that it can be called a story. This whole series of events are arranged in its function towards a final situation. So, sometimes temporal linearity can cause problems, as seen for example in detective stories. Likewise the stories seen in the fourth criterion, temporal linearity is often overlooked.
There is a unity of action at least a subject. A story wants at least one figure to be positioned at a certain time. This can unite criteria a and b, because the presence of this figure allows for unity of action. Even so, the presence of the character does not mean anything if it is not associated with other story elements, such as a series of events that relate temporally and predicate (narrative) that shows the character.

There is a process. In a story, a unity of action is needed, namely the existence of the initial situation, transformation and the final situation. The meaning of this process allows us to ascertain temporal elements by negating ideas about a series of events that are separated from each other.

There is a causal relationship in a conflict. In a story, the most important thing is not a logical relationship or causal link between functional stories. This causal relationship forms the story frame and story structure. In general, for the authors, an excuse that can be obtained is the cause of an action which in turn also creates another action. So the next till the story finishes. This series of logical relationships determines the story.

b. Argumentative Text
   According to Toulmin in Renkema, there are several views regarding the argumentative text, namely:
   1. In a argumentative text the most important is not the logical building, but the way in which the argument is built. The argument is the motivation of ideas or claims that are born through another statement (data). The argumentative relationship between claims and data is also called justification or warrant.
   2. In a logical perspective, the most important thing in an argument is a way of giving reasons (reasoning) for the validity of an argument, which starts from presenting the premise to drawing conclusions.
   3. In a rhetorical perspective, the most important thing in an argumentative text is the technique and its effectiveness for the recipient of the message
   4. Conduct argumentative analysis through pragma-dialectical (pragma-dialectic) approach. They argue that the argumentation is composed of pragma, which is part of a discussion forum where participants act together (moves); and dialectic, part of a critical discussion which, together with moves, became a vehicle for eliminating dissent.
   5. In the social-psychological approach, the main purpose of argumentative texts, such as discussions, advertisements, and pamphlets, is an invitation for the recipient of the message to participate in thinking about, feeling and doing certain actions. In this approach discussed the problem of attitude as an important determinant of behavior. In advertising, attitude change is very important, because the evaluation of the desired product is better.

c. Description text
   Description text is a text that aims to draw, describe, or give something according to what it is. Description text is the result of observations and writer's impressions of the object of observation. If the description is alive, the reader can imagine something described. Of course what is described can be in the form of something real, it can also be fiction.

   In the description there are many descriptions part by part. In this type of text, the sequence structure is facultative, that is, to certain limits, the arrangement can be
c. Exposition Text.

Exposition text is a text does not focus on time and actor and it is oriented to the subject, and its parts are logically bound. This text is not used to change people's opinions, but to provide knowledge, expand views, or explain a subject matter. That is why this text is often used to display scientific descriptions (e.g., papers) and the language used is objective language, not subjective language. The characteristic of this text is the existence of a question as the starting point (opening) of the text. This question is not always explicit but can also be implicit. The answer to that question is contained in the overall explanation of the text.

d. Persuasion Text

Persuasion text is a text whose content is solicitation or advice, usually concise and interesting, and aims to strongly influence the readers or listeners to make the advice or invitation.

2.4 Reading Ability Test

Iskandarwassid and Sunendar stated that the reading ability test is a test of language skills that can be carried out in language teaching, both in teaching for first language and second language or foreign languages. In line with this opinion, Nugiyantor stated that the reading ability test aims to measure the learner's ability to find information and understand the content contained in the reading text. Therefore, the reading text that will be tested must contain information that can require the learner to learn in understanding the text.

Reading learning in text study courses (étude de texte) is based on UNIMED assessment with the following categories:

<table>
<thead>
<tr>
<th>No</th>
<th>Score</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>90-100</td>
<td>Excellent</td>
</tr>
<tr>
<td>2</td>
<td>80-89</td>
<td>Good</td>
</tr>
<tr>
<td>3</td>
<td>70-79</td>
<td>Fair</td>
</tr>
<tr>
<td>4</td>
<td>0 – 69</td>
<td>Poor</td>
</tr>
</tbody>
</table>

2.5 Systemic Functional Linguistics Approach

Systemic Functional Linguistic Approach bases its study on two things, namely first having the understanding that the use of language is a semiotic system. As semiotics, language occurs from two elements, namely meaning and expression. The relationship between these two elements is a realization relationship, that is the meaning realized or encoded by expression. One of the characteristics of language as social semiotics is language has a function in a social or functional language context in a social context. In this connection, there are three notions in functional concepts. First, language is structured based on the function of language in human life. In other words, language is structured according to human needs for language. Second, the function of language in human life includes three things, namely
describing, exchanging, and assembling human experience. These three functions are called language functions. Each function determines the language structure or grammar.

Thus, grammar (lexicogrammar) is a theory of human experience which includes exposure theory, exchange, and organizational meaning. The third definition is each unit of language is functional to a larger unit, in which the unit becomes an element. With this definition, noun groups, verbs, prepositions, inserted clauses, or other units function in their respective tasks to establish clauses. Likewise, clauses have function in complex clauses to build the complex.

The second concept implies that LFS focuses on the study of texts or discourses in a social context, the text is limited as a unit of functional language in a social context. Functional language gives meaning to language users.

Language in social interaction consists of three elements: meaning, form, and expression. The relationship of these three elements can be said as: meaning (semantics or discourse semantics) realized by the form (lexicogrammar) and this form is then encoded by expression (phonology / graphology). In other words, in the LFS view, language consists of three levels, namely semantics, grammar, and phonology / graphology. Semantics is realized by grammar, and then grammar is expressed by phonology (in oral language) and graphology (in written language). The nature of the meaning and form relationship is natural, with the definition of relationship can be referred to the social context, while the meaning and expression relationship is arbitrary.

3 Research Method

The research method used in this study is action research by adopting the Kemmis and MC Taggart’s action research model which consists of four stages, namely, planning, acting, observing, and reflecting. This study occurs for three cycles in the text study course (étude de texte) for the sixth semester students of the French Language Education Study Program, Foreign Language Education Department, Languages and Arts Faculty, Medan State University (UNIMED).

Data collection techniques carried out in this study include observation which has been done before giving actions and at the time of giving actions. Observation during learning take place based on observation sheets.

While data analysis techniques are carried out through three stages, namely data processing, data exposure, and data conclusions. Data processing is done by grouping data into two groups, namely qualitative data and quantitative data. Quantitative data is analyzed by percentage, then the percentage results are expressed or presented in quantitative sentences. Qualitative data is analyzed by making a score on items that need to be scored. Then percentage, the percentage results are interpreted in the form of quantitative sentences and summarized into descriptive sentence forms.

4 Result Of The Research

4.1 Description of Research Result

1. The Process of Improving the Reading Ability on French Text through the LFS Approach
The reading learning process was carried out in three cycles. In the first cycle, the learning objective was so that students could read the lexicogrammar aspect of the text which includes transitivity, Thème and Rhème, and the mood and residue.

In the second cycle, the learning objective was so that students could read the aspect of the discourse semantic in the text which includes complex clauses, conjunctive relationships, anaphore and cataphore, and lexical relations in the text.

Whereas in the third cycle, the learning process of reading French texts discusses the aspect of the register which discusses fields, modes, and tenor in the text.

2. The result of Increasing Reading Ability on French Text through the LFS Approach

The activity which had done before this research was the researcher gave a test of reading French text to students to find out their initial abilities.

Based on the result of the pre-test reading French text, it was known that the lowest score with a score range of 0-69 as many as five (5 students) and the highest score with a score range of 90-100 of one (1 student).

Based on the results of the pre-test it can be concluded that the ability to read French text in students is still in poor category, this can be seen from the number of students who get a minimum score of 85 in each aspect of the reading ability on French text. This is the basis for implementing actions in the first cycle.

The implementation of the first cycle occurred four times. At the end of the cycle, a test was done for 90 minutes, and the result of the French text-reading ability of students in the first cycle increased when compared with the result of the pre-test, that was the absence of students who received the lowest score with a range of values between 0-69, while scores 70-79 obtained by 27 students (56.25%), a score of 80-89 obtained by 15 students (31.25%), and the highest score with a range of 90-100 scores obtained by 6 students (12.50%). Display of result data from the first cycle score can be seen in the following figure:

Furthermore, the test result of the reading ability on French text in the second cycle has increased compared to the first cycle, that is the absence of students who obtained the lowest score with a score of 0-69, while the score 70-79 obtained by 13 (27.08%), a score of 80-89 was obtained by 28 people (58.33%), and the highest score with a 90-100 score range of 7 people (14.58%)

In the third cycle, based on the test result, it is known that the ability of students has increased compared to the results of the second cycle. This can be seen from the absence of students who obtained the lowest score with a score of 0-69, while a score of 70-79 obtained by 7 people (14.58%), a score of 80-89 obtained by 33 people (68.75%), and highest score with a range of 90-100 obtained by 8 people (16.67%).

Based on the data obtained, it can be concluded that the use of the LFS approach to the aspect of speed can improve students' ability to read French text.

Based on the data obtained through this study it can be stated that the improvement in student learning outcomes in reading French texts through the LFS approach is very clear at the end of each action that has been carried out.

At the end of the first cycle, the average ability of students was only 79. The figures or data can be interpreted that in general the ability of students to read French texts in this cycle was included in the sufficient category.

Furthermore, in the second cycle, the average ability of students to read French text has experienced an increase, namely obtaining a score 83 in the good category but not in accordance with the minimum standards that the researcher has determined was 85.

Furthermore, in the third cycle, the average ability of students to read French text has
experienced an increase, namely obtaining a score 87 and included in the good category and in accordance with the minimum value standards that researchers have set. Although the average score did not differ too much, but qualitatively the score obtained differed significantly.

4.2 Discussion

The discussion on the result of increasing the ability to read French text through the LFS approach was obtained from the results of the tests carried out at the end of each cycle.

Before the implementation of the action, the average ability of students to read French texts was only 16.7%. In the first cycle, the learning outcomes of students in reading French texts showed a mean of 33.3%. This means that the ability of students is categorized into fair criteria when discussing lexicogrammar analysis in the text. Nevertheless, there was an increase in the ability of students to read French texts from pre-test and ability in the first cycle of 16.6%.

In the second cycle, researcher applied semantics discourse analysis, the ability of students increase to 40%. Based on these data it can be concluded that through the implementation of the second cycle by discussing semantics discourse analysis, the ability of students to read French text increased by 23.4% of the ability of students in the first cycle.

Furthermore, student learning outcomes in the third cycle generally got an average of 86 with good value categories. When viewed from the results of achievements in the third cycle, there was an increase in student learning outcomes by 75% when applying the register analysis.

Based on the result of these achievements, it can be concluded that the results of reading learning on French text increase significantly from cycle to cycle. When compared with the initial data, data were obtained regarding to the improvement of students' ability to read French texts by 58.3% when learning was applied through the LFS approach.

From the finding result of the research, it can be said that the formulation of the action research hypothesis, that is “if the LFS approach is applied, then the students’ reading ability on French text will be increased.”

5 Conclusion

Based on the results obtained, it can be concluded: (1) The learning process of reading skills in text study course (étude de texte) with lexicogrammar analysis material (transitivity analysis, thème and rhème analysis, mood and residue analysis), semantic discourse analysis (analysis of complex clauses, conjunctive relationships, lexical relations, and references (anaphore and cataphore), and register analysis (field, mode, and tenor) which have been going on for three cycles have increased students' interest in reading the text. (2) Based on the learning process that has been carried out, the results show that the LFS approach is effectively used to improve the students' reading ability on French text. It can be seen from the percentage of minimum standard score that the researcher has stated that was 85. In the first cycle, students who were completed as 43.75% of all students, in the second cycle as 73%, while in the third cycle as 85.42% of the total number of students had obtained scores according to the standards set.
5.1 Implications

Based on the learning process that has taken place, the results show that the quality of learning and student learning outcomes in text study course (étude de texte) through the LFS approach in each cycle has increased, this shows that the LFS approach can be used as an alternative approach to French language learning in order to improve the quality of students especially in learning reading courses.

The learning process of reading French text skills through the LFS approach begins with reading the text as a whole and then analyzing lexicogrammar aspects (transitivity analysis, thème and rhème analysis, mood and residue analysis), semantics discourse analysis (complex clause analysis, conjunctive relationships, lexical relations, and references (anaphore and cataphore), and register analysis (fields, modes, and tenors. The advantages of this LFS approach compared to other approaches can be seen from the detailed analysis of features that build a text, this makes students better understand the content of text reading However, this approach has weakness in the terms which must be explained first to the Students in Languages and Arts Faculty French Language Study Program who attend lectures.

5.2 Suggestion

Based on the conclusion and implication above, the following suggestion are suggested:
(1) Lecturers of French courses are generally expected to be able to understand and to use the LFS approach in the teaching and learning process of French courses in the classroom as in text study course (étude de texte), understanding of writing (compréhension écrite) by selecting LFS discussion according to the situation and condition of the student (débutant, intermédiaire, and avancée) so that the learning objectives to be achieved can be maximized.
(2) Lecturers can develop discussion in LFS in accordance with the teaching objectives to be achieved and in accordance with the ability of students by knowing the French language skills of students in the previous semesters before applying the LFS approach. (3) Lecturers and students are expected to be able to dig up information about the LFS approach in French both through books about French teaching as well as through the internet.

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Context Exploration: An Example from the Implementation at Discrete Mathematics Classroom

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Abstract. Context is recently claimed as an important aspect of mathematics learning in many countries, including Indonesia. Context proposes many opportunities for students to learn mathematics, including logic. In this case, the role of context is intended to enhance the students’ desire towards logic and to develop a better insight into it to solve contextual problems. Moreover, context can provide students with different strategies for mathematical problems. Thus, this paper attempts to descriptively describe the results from a developmental study which aims to investigate the concept of context, context design and the examples of context used in discrete mathematics classrooms. Students’ written works were also presented to show how students deal with context-based problems. Several articles and books related to the issues about what context basically means, why it is important in mathematics classrooms and how to design the context were also studied. Lecturers’ awareness and perception about context were essentially needed in order to design the context that can be implemented in the classroom. The results of this study show that context can be a powerful instrument for students to construct their mathematical knowledge, especially in discrete mathematics, and to react with high-quality mathematical reasoning. Moreover, the lecturers need to acquire a better understanding of how to design context that bridge the students’ previous knowledge to right mathematics procedure.

Keywords: Context, Context-Based Problems, Discrete Mathematics, Logical Reasoning, Higher Education.

1 Introduction

Several recent studies have claimed that living in present environment demands people to acquire not only problem-solving skills, but also it requires more than content knowledge (i.e. Ananiadou & Claro, 2009; OECD, 2016; Wijaya et al., 2010). To practically meet the demands of living in this modern environment, people necessarily need to be capable of employing their skills and knowledge. One possible way to generate this condition is through educational practices, including higher education. In this case, Nasution & Lukito (2015) stressed out that there exists a prominence to link these educational practices with students’ daily lives. This means that there is a need for lecturers and educators to continuously eliminate the discrepancy between what students have learned in the classroom and how they implement the knowledge to solve real-life problems. Therefore, the educational practices
should not only focus on transferring knowledge to the students, but also providing them with life skills (Tomlinson, 2004; Griffin, Care, & McGrath, 2012).

In higher education, a number of empirical studies have been conducted to potentially develop students’ ability to construct mathematical knowledge and to apply the concepts (i.e. Lubis & Nasution, 2017; Reeves & Clarke, 2003; Flach, 2007; E. Serna & A. Serna, 2015). The National Council of Teachers of Mathematics (2000) emphasized that the curriculum of mathematics must focus on preparing the students for their next study and for solving daily-life problems at school, home and future work environments. The students’ ability in order to apply mathematics concept in everyday life context is seen as a successful factor of mathematical competence in many countries (Eurydice, 2011), including Indonesia (The Indonesian Ministry of Research, Technology and Higher Education, 2017). At a wide scope, the important intention of real-life mathematics is to generate the pre-service teachers that they could prepare their students to participate in the Programme for International Student Assessment (PISA).

The argumentations about mathematics application in daily life have increased the important use of mathematics context-based problems with the real-life enactment in the teaching and learning process. In this case, students need to recognize the situation where the concept of mathematics is being used (Van Galen et al., 2005), including logic, and contexts are expected to develop their ability to transfer their knowledge (De Lange, 2003). In line with those two statements, NCTM (2000) emphasized that it is necessary to provide the students with occasions to deal with contextual problems in mathematics. In some studies conducted by PISA show that tasks would be authentic if they could be essentially embedded in various real-life situations and had a context in mathematics to deal with the problems (OECD, 2003).

Based on the above description about the importance of context in the mathematics teaching and learning process, we attempt to conduct a study which is aimed to explore context used in teaching mathematics at higher education, including logic. Several examples of context implementation in teaching logics were depicted from recent studies to show how context could construct students’ mathematical knowledge. Therefore, the main question “How can we support the lecturer to design meaningful context to teach logic in the classroom?” is explored in this paper.

2 Theoretical Framework

2.1 Context-Based Problems

The term “context-based problems” have been introduced in many studies and its importance in teaching and learning process, especially in mathematics classroom. A number of terminologies have been addressed to describe what context-based problem certainly means. In this case, contextual problems should be able to link what students have experienced and the intended mathematical concepts (Bustang, 2014). In addition, Van den Heuvel-Panhuizen (1999) highlighted that contextual problems allow students to start with lower level strategies, such as drawing pictures and doing several manipulatives. Hence, the context-based problems providemany opportunities for the students to overcome the problems at different levels of understandings.

The existence of contexts is also described by Van den Heuvel-Panhuizen (2005) who explicitly stated that a ‘context in mathematical problem’ should be authentic for students and
should mandatorily require them to think in the scope of the context of the problem. “By imagining themselves in the situation to which the problem refers, the students can solve the problem in a way that was inspired, as it were, by the situation” (Van den Heuvel-Panhuizen, 2005, p. 6). It means that context-based problems can encourage students to apply strategies to seek a solution, such as using pictures, tables, or graphs. Another term that is used to refer to problems situated in reality is ‘modeling tasks’ (see, e.g. Blum, 2011; Maass, 2010; Tasova & Delice, 2012). Modeling tasks emphasize modeling or translation between real-world contexts and mathematics.

Considering the aforementioned descriptions of problems that use contexts, in this article we define a context-based mathematics problem as a mathematics task that is situated in real-world settings and provides elements or information that need to be mathematically organized and modeled. We do not utilize the term word problems or story problems since the settings can likewise be delineated in non-verbal depictions, for example, pictures. An outcome of our definition is that we apply a high standard to the accompanying qualities of context-based problems: the undertakings have pretty much data than what is expected to discover the solution and should not obviously provide the required mathematical formulas.

2.2 What is a Good Context?

Learning mathematics with inquiry lessons at university can sometimes begin with a context problem. The emphasis of the problem is to provide the students a space where they can apply the mathematical concepts they have learned to deal with contextual problems and the ideas that the students encounter (Wijaya et al., 2010). Therefore, it is necessary to give the students much time to think and to undergo exploration to discuss their ideas in determining the problem solutions.

Thus, what is a good context in mathematics? According to Van Galen (2018), a good context is a real-world context that entails meaningful and interesting problem which can possibly stimulate the students to think. Moreover, a good context can be designed through an open problem that cannot be answered by a standard algorithm and therefore encourages the students to apply their own explanations.

3 Methodology

3.1 The participant

This study was conducted in the third semester at mathematics department, Medan State University. During conducting this study, we engaged 45 mathematics-education students who enrolled mathematics discrete course. In addition, the lecturer who taught discrete mathematics in the classroom was also involved.

3.2 Data Collection

In order to acquire the information about the use of context, we include different types of data, such as video recordings, students’ written works, interviews and field notes. In this case, the video recording was installed to record what the students do in during conducting this study. All the students’ written works and activities along the teaching and learning process
were recorded so they can be descriptively analyzed. The data from the students’ written works were collected to acquire information about the students’ strategies to solve context-based discrete problems. A pretest was conducted at the beginning of this study to discover whether the students already knew what were intended for them to learn or not. In this study, interview was also carried out to several students before the teaching and learning process. During the interview, students were asked to explain what they did to answer the problems in the pretest and to communicate their argumentations on how they got the answer. The results of the pretest and the interview showed that the students had no understanding about discrete mathematics.

3.3 Research Design

Aforementioned, this study was conducted to positively contribute to the development of teaching and learning process in discrete mathematics classroom. In this study, five questions related to discrete mathematics were designed to get the impression how they deal with the context-based problems with their understanding. Several examples were depicted to demonstrate these contexts were implemented in discrete mathematics classroom.

3.4 The Problems

1. Badren wants to give two boxes to his friend. Both of the boxes contain present or empty. The first box was written “At least one of these boxes contains present”. The second box was written “The first box is empty”. Badren tells his friend that both of the writings are true or false.

   Based on your opinion, which box should his friend choose?

2. Given a graph G which is a complete graph with 28 edges. According to your opinion, how many vertices does the graph have?

3.5 How to Solve the Problems?

To solve the problem, the students need to better understand the situation in which the mathematical concept is being used (Nasution & Lukito, 2015). In this case, we provide one possible alternative that the students could possibly do to deal with the problems.

Problem 1

This problem aimed to test the students’ ability to better understand about the value of two disjunctive prepositions (P(x)˅Q(x)). From this problem, we can observe that the first box is written “At least one of these boxes contains present” and it is written “The first box is empty” in the second box. The last statement “Badren tells his friend that both of the writings are true or false” can be the beginning way in order to solve this problem. The yielding explanation about this problem as follows.

P(x): At least one of these boxes contains present
Q(x): The first box is empty

In order to check the value of these two statements, see the truth table for disjunction of two prepositions in Table 1 below.
Table 1. The truth table of disjunction

<table>
<thead>
<tr>
<th>P(x)</th>
<th>Q(x)</th>
<th>P(x) ∨ Q(x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>True</td>
<td>False</td>
<td>True</td>
</tr>
<tr>
<td>False</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>False</td>
<td>False</td>
<td>False</td>
</tr>
</tbody>
</table>

Based Badren’s statement “both of the writings are true or false”, we can conclude that the value of both preposition (P(x) and Q(x)) is true. Thus, his friend should choose the second box.

Problem 2

This problem is designed to find out the students' basic understanding of graphs, especially complete graph applications. Here, students are given problems to determine the number of vertices that exist if a complete graph has 28 pieces. To solve this problem, students must understand the meaning of a complete graph. Because complete graphs are simple graphs where each node is close together, the number of paths can be determined using sequence series.

\[(n-1)+(n-2)+(n-3)+(n-4)+(n-5)+(n-6)+(n-7)+(n-8) = \text{The number of vertices}\]

\[8n - 36 = 28\]
\[8n = 28 + 36\]
\[8n = 64\]
\[N = 8\]

So, a complete graph, which has 28 sides, has 8 vertices.

4 Result

Problem 1

In order to solve the first problem, some students come up with drawing pictures. One possible reason is that the students use the pictures to represent the problem situation. The example of this strategy can be seen in Figure 1 below.

![Fig. 1. Students strategy to solve problem 1](image-url)
Based on Figure 1, we can obviously see that the student attempt to solve the first problem by using his own pictures. Firstly, he wrote if the statements are true, then there will be two possible conditions based on the first statement. This student drew two boxes with a black dot inside the box to represent the box that contains present. He arrived at the first box contains present and the second box is empty (condition I) and vise versa (condition II). Secondly, if the statements are incorrect, then he also found two possible conditions. Based on the first statement, the two boxes are empty; on the other hand, the first box contains present and the second box does not (from the second statement). Thus, he concluded that the second box must be chosen since it contains present.

In this case, the student’s answer is correct; however, he did not provide sufficient argumentations that can support his answer. The reason why he concluded such answer is still unclear and needs further exploration. However, this type of answer can be used by the lecturer as a way to develop his reasoning.

Problem 2

In determining the number of nodes, students generally solve the questions using manipulatives and word descriptions. Some students use pictures, but they try to find the appropriate picture to be the answer to that question. Student strategies can be seen clearly in Figure 2 below.

In Figure 2 above, it can be seen clearly that the student already has a basic understanding of the graph. In the event that the student makes eight vertices which are then named V (G) = \{v1, v2, v3, v4, v5, v6, v7, v8\} and names each path with E (G) = \{e1, e2, e3, e4, e5, e6, ..., e28\). Here, the student's answer is correct that the complete graph has eight vertices. However, it is still unclear how he got the eight nodes because there was no explicit explanation.

In addition, other students complete the first question using the Word Description as shown in Figure 3 below.

In Figure 3 above, the student uses the number of vertices and the number of edges to determine the type of graph. Here, the student states that there are 28 edges and 8 vertices, which is correct for a complete graph.
From Figure 3 above, it can be seen clearly that the student already has a standing point regarding complete graphs because he writes "complete graphs: graphs that all vertices are connected". However, in completing this first question the student only wrote a graph $G$ can be described with 28 sides and 8 vertices. The same thing with students in Figure 1 above. Although the student’s answer is correct, there is no sufficient explanation about how he got the 8 vertices. To clarify the answer, we conducted interviews with students.

From Figure 2 and Figure 3 above and the results of the interview, it can be concluded that students have an understanding of the graph, but they still find it difficult to express "why" they can get results like that and "how" the way they get it. This can be seen from the results of their work, namely there is no in-depth explanation of the answers they get (see Figure 2 and Figure 3).

5 Conclusion

We are convinced that it takes time to develop students’ mathematical thinking, especially in discrete mathematics course. In answering the crucial question of this particular study, we used the analysis of the data collection, such as students’ written work and interview. One possible way to get the students’ reasoning on how they solve logical problems is by the commencement of a contextual situation. Commencing a contextual problem can be meaningful if there is a good problem in it.

A good context is a real-world context that entails meaningful and interesting problem which can possibly stimulate the students to think. Moreover, a good context can be designed through an open problem that cannot be answered by a standard algorithm and therefore encourages the students to apply their own explanations. Some examples can be obviously seen through the above students’ written work. For example, some students come up with drawing pictures. One possible reason is that the students use the pictures to represent the problem situation, in order to solve the first problem (see Figure 1). Other students come up with their argumentations (word description).

Based on Figure 1, we can obviously see that the student attempt to solve the first problem by using his own pictures. Firstly, he wrote if the statements are true, then there will be two possible conditions based on the first statement. This student drew two boxes with a black dot inside the box to represent the box that contains present. He arrived at the first box contains present and the second box is empty (condition I) and vise versa (condition II). Secondly, if the statements are incorrect, then he also found two possible conditions. Based on the first statement, the two boxes are empty; on the other hand, the first box contains present and the second box does not (from the second statement). Thus, he concluded that the second box must be chosen since it contains present.

In this case, the student’s answer is correct; however, he did not provide sufficient arguments that can support his answer. The reason why he concluded such answer is still unclear and needs further exploration. However, this type of answer can be used by the lecturer as a way to develop his reasoning.

Another instance can be depicted in the second problem. In determining the number of nodes, students generally solve the questions using manipulatives and word descriptions. Some students use pictures, but they try to find the appropriate picture to be the answer to that question. Student strategies can be seen clearly in Figure 2. In Figure 2 above, it can be seen clearly that the student already has a basic understanding of the graph. In the event that the
student makes eight vertices which are then named \( V(G) = \{v_1, v_2, v_3, v_4, v_5, v_6, v_7, v_8\} \) and names each path with \( E(G) = \{e_1, e_2, e_3, e_4, e_5, e_6, \ldots, e_{28}\} \). Here, the student's answer is correct that the complete graph has eight vertices. However, it is still unclear how he got the eight nodes because there was no explicit explanation.

In addition, other students complete the first question using the Word Description as shown in Figure 3. From Figure 3 above, it can be seen clearly that the student already has a standing point regarding complete graphs because he writes "complete graphs: graphs that all vertices are connected". However, in completing this first question the student only wrote a graph \( G \) can be described with 28 sides and 8 vertices. The same thing with students in Figure 1 above. Although the student's answer is correct, there is no sufficient explanation about how he got the 8 vertices. To clarify the answer, we conducted interviews with students.

From Figure 2 and Figure 3 above and the results of the interview, it can be concluded that students have an understanding of the graph, but they still find it difficult to express "why" they can get results like that and "how" the way they get it. This can be seen from the results of their work, namely there is no in-depth explanation of the answers they get (see Figures 2 and 3).

References

Development of Chemical Principles Class XI Senior High School Based on the Project in the Material Solubility and Solubility

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Abstract. The investigation was a research and development using ADDIE method which aims to get a standardized project-based chemical practicum guided book on solubility and solubility (Ksp) products. Population of the study was all of the Unimed chemistry lecturers, chemistry teachers and students of grade XI IPA 14 Medan, and all of the practical guide books published in Medan. Sampling was selected by purposive sampling technique which consists of 3 chemical practicum guided books published by three companies called A, B and C chemistry laboratory guide books; 2 chemistry lecturers; 2 chemistry teachers; and grade XI IPA-1 as experiment group 1 and IPA-4 as experimental group 2. Average standardized scores of practicum guided books developed = 3.78 was higher than the practicum guided books A = 3.14; B = 3.32; and C = 3.11 respectively. Percentage of normalized gain test of the practicum guided book developed in the experimental group 1 was higher than the experimental group 2 i.e 88.00% > 80.00%. Post-test scores on the right side at α = 0.05, obtained t-count. = 6.4 > t-tab. = 1.67. This shows that the project-based chemistry practical guided book developed is in accordance with BSNP standards and can be used in high schools.

Keywords: Practical Guidance, project-based-learning, solubility and solubility results, ADDIE method.

1 Introduction

Chemistry is one of the subjects at the senior high school level that is taught through Scientific Method. A number of students have difficulty in learning chemistry because the concepts are abstract (Tatli and Alipasa, 2012). Scientifically, chemistry is experimental science, which means that in studying chemistry it is not recommended to deliver by asking the students to listen and read, but they are encouraged to do learning by doing in laboratory class in order to build students’ knowledge about the material being studied. One of the obstacles experienced by teachers in practicum implementation at schools, is the unavailability of chemistry practicum guided books that can be used to motivate the students to achieve learning objectives (Tuyrus, 2010). Generally laboratory experiments which are integrated with chemistry subject matter will enable students to build their own experiences with concrete materials (Tatli and Alipasa, 2013). Constraints that are often experienced by teachers in the practicum at schools are due to limited equipment, time, and the unavailability of the chemistry lab guided books that can direct students in doing practical works (Tuyusuz, 2010). Sakri et.al., (2014) reported that an integrated learning approach in Semi-Small Scale
(SSSEs) -based experiments can significantly improve student learning outcomes of grade XII. Kalek and Lee (2012), found that integrated project-based learning practices can change students' understanding of abstract chemical concepts that are considered difficult, become easy to understand and can significantly improve student chemistry learning outcomes. Shi-Jer Lou et al., (2012), integrated learning practices in organic chemistry experiments using three forms of multimedia teaching materials, in the form of static images, video, and animation, can significantly improve student chemistry learning outcomes.

In learning integrated with practicum required module in the form of a module according to BSNP standard. Teaching materials in the form of module that meet the standard eligibility criteria of BSNP, facilitate the students in obtaining a picture of the purpose, benefits and process activities that will be practiced. Teaching materials in the form of a good module should be arranged systematically, interestingly, clearly, can be used by students independently anytime according to the needs of students (Anwar, 2010). In the development of teaching materials in the form of textbooks and modules, there are a number of methods one of which is ADDIE (Analysis, Design, Development, Implementation, and Evaluations) (Sugiyono, 2010).

In Project Based Learning environments, students learn primarily by constructing knowledge and making meaning through iterative processes of questioning, active learning, sharing, and reflection. It service learning emphasizes educational opportunities that are interdisciplinary, student-centered, collaborative, and integrated with real-world issues and practices (Chiang and Lee, 2016). PjBL also involves students' knowledge and skills in solving real life-reflective problems and focuses on organizing independent learning in projects (Robinson and Vega, 2013).

Considering the importance of chemistry in the learning process of integrated practice to improve the students' scientific skills, it is necessary to develop textbooks in the form of an innovative chemistry module that meets the standard criteria of BSNP for high school / MA students, and as a textbook of high school chemistry for teachers chemistry. Based on the description above, then conducted research: "Development Module Chemistry Class XI SMA Based Project on Solubility and Solubility Product".

2 Theoretical Framework

Method used is a Research and Development (R & D) with a model ADDIE modified model development Sugiyono (2010), consists of the analysis, design, development, implementation, and evaluation. The development stages of ADDIE are presented as shown below.
2.1 Stage Module Analysis

Before conducting the research, firstly done the analysis of syllabus, and analysis of module SMA circulating Medan, ie module class XI SMA publisher Pudak Scientific (A), Bumi Aksara (B), and Erlangga (C).

2.2 Stage Module Design

After analyzing the chemistry module, the researcher drafted the draft which will be developed to module the project-based innovative practice by taking note of the advantages and disadvantages of the chemistry lab work that has been analyzed.
2.3 Stage Module Development

At this stage of development, the researcher makes the module become the reference source in developing and developing innovative project-based module on Solubility and solubility product (Ksp) material in accordance with the BSNP assessment standard.

2.4 Stage Implementation Module Chemistry developed

Implementation module chemistry that has been developed was conducted in the experiment class. Done the first Pre-test is, then continued learning integrated practice after that done post-test.

2.5 Module and Data Analysis

At this stage, an assessment and analysis of student learning outcomes. Qualitative data in the form of questionnaire obtained from the validation team of 2 lecturers of chemistry Unimed and 2 chemistry teachers SMA Negeri 4 Medan. Quantitative data were obtained through pre-test and post-test to the students. Student activity data was obtained through observation of 4 observers during the samples treatment. The eligibility analysis of the module uses the formula:

\[ X = \frac{\Sigma X}{n} \]

Where,
- \( X \) = average value
- \( \Sigma X \) = number of validator assessment answers,
- \( n \) = number of validators.

Normality test with Chi-Square at the level of real \( \alpha = 0.05 \) with criterion Chi Square \( (X_2)_{count} < (X_2)_{table} \) hence stated normal distribution.

The validity of the \( F_{count} = (\text{the greatest variance})/(\text{the smallest variance}) \) if \( F_{count} > F_{table} \) of data homogeneous.

Percent increase learning outcomes calculated using the formula \( "g" \) factor (gainscore normalized).

The formula “\( g \)” factor used is \( %g = \frac{(\text{score post-test} \ - \text{score pre-test})}{(\text{maximum score} \ - \text{pre-test score})} \times 100\% \)

Hypothesis test using test formula for two sample groups with one-party \( t \)-test.

\[ t_{count} = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \]

\( \bar{X}_1 \) = student learning outcomes1
\( \bar{X}_2 \) = student learning outcomes2
\( S \) = Standard deviation
\( n \) = numbers of sample
3 Results And Discussion

3.1 Module Validated

Analysis of the module A, B, and C based on BSNP obtained indicators, it was found data as shown in the following table 1.

<table>
<thead>
<tr>
<th>No</th>
<th>BSNP Standard</th>
<th>Mean scores of Teachers and Lecturers on the Module Published</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>1</td>
<td>Eligibility of content (moderately valid)</td>
<td>3.23</td>
</tr>
<tr>
<td>2</td>
<td>Eligibility of languages (moderately valid)</td>
<td>3.25</td>
</tr>
<tr>
<td>3</td>
<td>Eligibility of presentation (moderately valid)</td>
<td>3.22</td>
</tr>
<tr>
<td>4</td>
<td>Eligibility of graffiti (moderately valid)</td>
<td>2.84</td>
</tr>
</tbody>
</table>

As shown in the Table 1 it is known that the average scores of teachers and lecturers on the chem. lab guided book A which met the BSNP standards, the eligibility of content, language eligibility, eligibility of presentation, and eligibility of graffiti were classified as moderately valid of 3.23; 3.25; 3.25; and relatively of 2.84. The highly valid criteria ranges from 3.26 to 4.00. It was found that the module of the chem. lab. guided book (A) does not meet the standard criteria according to the BSNP. It was also found that the eligibility of validity of module B classified as moderately valid with an average score of 3.0; while the content, language, and presentation eligibility were classified as highly valid with the average scores of 3.45; 3.33 and 3.50. It was found that the eligibility of graffiti of the Bumi Aksara module B does not meet the standard criteria of the BSNP. Analysis of the C module, published by Erlangga and it was found that the language eligibility scores of 3.33 was classified as moderately valid, meanwhile the content eligibility, presentation, and graffiti classified as moderately valid with the average scores of 3.23 3.22; and 2.67 respectively. Therefore, the C module of the Erlangga does not meet the standard of the BSNP. The analysis of the chemistry module A, B, and C were presented in the following figure 3.1
4 Module Analized

The chemistry module developed was analyzed and the result presented in the following Table 2. From Table 2 can be seen the average validator 2 chemistry teacher of SMA Negeri 14 Medan and 2 chemistry faculty lecturers FMIPA UNIMED to module the groundbreaking of project-based innovative chemicals developed for the eligibility of the contents of 3.95 and 3.95 respectively, 3.95 average; for the eligibility of languages 3.75 and 3.83, averaging 3.79; for eligibility of presentation of 3.56 and 3.72, averaging 3.64; and for the eligibility of 3.67 and 3.83 feats, an average of 3.75. This indicates that teachers and lecturers have given a positive opinion on the chemistry study material Solubility and solubility product (Ksp) that has been developed, is valid and no longer need revision. The average end score of the module chemistry that has been developed is 3.78, meaning that it is in accordance with the BSNP standard and feasible to be used in SMA / MA. The diagram of the result assessment of the chemical module that has been developed is as in the following Figure 4.1.

<table>
<thead>
<tr>
<th>No</th>
<th>Criteria</th>
<th>BSNP Average assessment</th>
<th>Validator Teacher</th>
<th>Lecturer</th>
<th>Average</th>
<th>Criteria validation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Eligibility of content</td>
<td>3.95</td>
<td>3.95</td>
<td>3.95</td>
<td></td>
<td>Valid and no need revision</td>
</tr>
<tr>
<td>22</td>
<td>Eligibility of Language</td>
<td>3.75</td>
<td>3.83</td>
<td>3.79</td>
<td></td>
<td>Valid and unnecessary revision</td>
</tr>
<tr>
<td>33</td>
<td>Eligibility of presentation</td>
<td>3.56</td>
<td>3.72</td>
<td>3.64</td>
<td></td>
<td>Valid and no need for revision</td>
</tr>
<tr>
<td>44</td>
<td>Eligibility of graffiti</td>
<td>3.67</td>
<td>3.83</td>
<td>3.75</td>
<td></td>
<td>Valid and no revision</td>
</tr>
</tbody>
</table>

3. 3.78 According to BSNP Standard
The qualities of module chemistry that has been developed are presented as in the following table.

**Table 3. Quality of the Chemistry Module Developed**

<table>
<thead>
<tr>
<th>Standards of BSNP</th>
<th>Quality Module Chemistry That Has Been Developed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eligibility of contents • Have 5 lab work titles that have been sequenced and according to Curriculum 2013 and syllabus: (1) Explain the dissolution difference of a substance; (2) Describing the relationship solubility with the constant of solubility product; (3) predict the occurrence of sediment; (4) Explain the determination of the constant of solubility product and the influence of ion names; (5) Observing the nature of hardly soluble salts. • The scope of the material presented reflects the substance of the substance contained in the KI and KD. • The material depth has been expanded. • Every Trial is a mini research project • Using the correct Indonesian rules in accordance with EYD • Using short sentences, clear, and simple, so easy to understand learners</td>
<td></td>
</tr>
<tr>
<td>Eligibility of Language • A4 paper size. • Front and back book cover is in sync. • Background module using an attractive color. • The completeness of the presentation of the module includes: • Table of contents • Occupational Safety in Laboratory • Symbol or security symbol in laboratory</td>
<td></td>
</tr>
<tr>
<td>Eligibility of presentation</td>
<td></td>
</tr>
</tbody>
</table>

**Fig 4.1. Diagram Assessment of the Chemistry Module Developed**
5 Implementation Of The Module Chemistry Developed

5.1 Learning Outcomes

Percent gain of the experimental group 1 is higher than the percent gain of the experimental group 2, with a ratio of 88% to 80%, thus the difference in gain of experiment group 1 learning result with experiment group 2 by 8%. By testing "t test" of one party at (α = 0.05), tcount is bigger than ttable (6.4 > 1.67). This proves that the module chemistry that has been developed in the criteria are very good according to BSNP standard and are suitable for use in SMA.

5.2 Student Activity

Student performance activity is one indicator that must exist in the practicum process because it influences student learning outcomes. Student activity data is obtained during the practicum, when students do the lab work on Solubility material and solubility (Ksp) results. Assessment of student activities was carried out by 3 observers, where observer I observed groups 1 and group 2 observer II observed group 3 and group 4, observer III observed groups 5 and groups 6. Activities observed were student activities related to practicums that were not independent of psychomotor rubric, including laboratory clothes, work readiness, systematics,
skills, curiosity, using tools, cleanliness, work results, and observational data. Average values of each aspect of the experiment group 1 and experiment group 2 activities (performance) are presented as in the following figure 5.2.

![Figure 5.2: Student activity](image)

From Figure 5.2, can be seen the average value of the performance aspects of 36 students in the experiment group 1 was obtained: completeness aspects of clothes 90.76; work readiness 90.19; skills 92.59; use of tools 91.67; management 93.78; cleanliness 94.44; work results 96.30; and observation data 92.59, each in very competent criteria. The average performance aspect for 36 students of experiment group 2 was obtained: aspects of completeness for clothes for practicum suits 78.70; work readiness 78.70; systematic 76.90; management 76.77 all in the criteria are quite competent, and for the skill aspect 86.11; use of tools 87.65; cleanliness 83.75; work result 86.11; and observation data 81.48, each in competent criteria. Overall, it can be seen that the performance aspects of experiment group 1 are very competent, while the experiment group 2 are competent and quite competent.

The activity value of students in experimental group 1 and 2 is presented in the following table.

<table>
<thead>
<tr>
<th>No</th>
<th>Type of Data</th>
<th>Exp. Group 1</th>
<th>Exp. Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Number of Students</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>2</td>
<td>Lowest Value</td>
<td>85.19</td>
<td>62.96</td>
</tr>
<tr>
<td>3</td>
<td>Highest Value</td>
<td>96.30</td>
<td>88.89</td>
</tr>
<tr>
<td>4</td>
<td>Average</td>
<td>90.84</td>
<td>82.30</td>
</tr>
</tbody>
</table>

From Table 4, the mean activity (grade) of the experimental class students using the module chemistry that has been developed in the Solubility and solubility product (Ksp) materials was higher than experiment group 2 using the teaching materials provided by the school. In the experiment group 1 the average score of activity of students is 90.84 with highly competent criteria and the average value of activity of experiment group 2 is 82.30 with competent criteria.
The activity diagram of students during the chemical practice of the subject matter Solubility and solubility results (Ksp) in experiment group 1 and 2 is as in Figure 5.3 below.

![Activity Scores of the Exp. Group 1 and 2.](image)

Fig 5.3. Activity Scores of the Exp. Group 1 and 2.

6 Conclusion

The XI class high school chemistry practicum guidance module from publishers (A), (B), and (C) circulating in the city of Medan needs to be innovated and developed in the form of project-based innovation that integrates practicum and character internalization according to the 2013 curriculum. Module innovative project-based chemistry practicum on solubility material and the results of the solubility [Ksp] of the development results have been in accordance with BSNP standards. Student chemistry learning outcomes through the implementation of project-based chemistry practical guides developed in solubility material and solubility [Ksp] higher than the reference of student handbooks. The psimotoric and affective values of students who carry out the practicum using a project-based practicum guide that is developed higher than the reference of the student handbooks.

Recommendation

It is recommended that high school teachers should carry out teaching and learning chemistry material integrated with lab experiment and character based on the 2013 curriculum, so that the learning process based on student-centered and they will be more proactive in studying chemistry and will be able to have a better understanding the material being taught. Chemistry teachers should be trained to implement the innovative project-based guided modules developed. It is also expected to carry out in-depth research on the chemical practicum guided books for grades X, XI, and XII of senior high school that met the BSNP criteria.
Acknowledgement. I would like to thank to the Directorate of Research and Community Service (DRPM) of the Directorate General of Strengthening Research and Development of the Ministry of Research Technology and Higher Education, for the financial assistance provided to finish the research properly. I would like also to thank to the School principal of Senior High School 14 Medan for her assistance in providing the location of the study, to the chemistry teachers of the Senior High School 14 Medan and the chemistry lecturers of Unimed for their willingness to validate the practicum guided books developed. Hopefully the project-based innovative chemistry practicum guided book which met the BSNP standards can be used in high schools in Medan Indonesia.

References

[8] Tatli, Z and A. Ayas, Effect of Virtual Laboratory on Student’s Achievement, Educational, 2013.
Differences in Chemical Learning Outcomes That are Taught with Problem Based Learning and Discovery Learning Using Lab Real Media on Subject of Solubility and Solubility Product

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Abstract. This research is an experimental research that is able to find out whether there are differences in students' chemistry learning outcomes that teach with Problem Based Learning model (PBL) and Discovery Learning (DL) using Real Media Lab. In my experiments I was taught by PBL model with real lab and experiment II class with DL model using original lab. Data analysis uses two-t test. Expectation I class has an average pre and post test score of 51.5 + 7.27 and 77.12 + 8.90 with an average gain of 0.55. The experimental class II has a pre-test average of 43.1 + 6.65 and a post-test of 58.25 + 7.73 with an average gain of 0.26. Result of t test at α = 0.05 obtained tcount = 10.08> ttable = 2.0021 hence alternative hypothesis accepted, and concluded there are difference of learning result which significant between student taught by PBL model and DL model that is equal to 26%.

Keywords: Problem based learning (PBL); discovery learning (DL); real lab.

1 Introduction

The main problem of learning that is still widely found is about the low learning outcomes of students. It is known that the learning outcomes of high school / equivalent students are still low in terms of achieving the minimum completeness criteria (KKM), especially for MIPA subjects including Chemistry not meeting the KKM. This is indicated by the results of the TIMSS international study (Trends in International Mathematics and Science Study) about math and science achievements. The results of the average percentage of correct answers for Indonesian students in the 2011 TIMSS survey were: 31% for knowing, 23% for applying and 17% for reasoning. The average is far below the average percent of true international answers, namely: 49% for knowing, 39% for applying, and 30% for reasoning. The low percentage of knowing and applying domains shows that the ability to understand concepts and application of students in Indonesia is still low 1). With these achievements, Indonesian students are only able to recognize a number of basic facts but have not been able communicate and link various science topics, furthermore to apply complex and abstract concepts. One of the chemical subjects that some of the concepts are conceptual, and abstracts are solubility material and solubility results (Ksp). 2)(Devetak et all, 2007). Some research shows that some students have difficulties in learning this material. Onder and Geban (2006) 3)
state that students have difficulty understanding the dynamic state after the equilibrium of the solution is reached and solving the Ksp questions.

Jahro, I dan Susilawati (2008)\textsuperscript{4}) writes that chemistry learning cannot be learned only through reading, writing or listening. Chemistry learning is directed at the scientific approach where science process skills are carried out through experiments to prove a truth so that based on experience directly shapes the concepts, principles and underlying theories (Octaviany, 2014)\textsuperscript{5}). Studying chemistry is not only mastering a collection of knowledge in the form of facts, concepts, principles, but also a process of discovery and mastery of procedures or scientific methods. In chemistry it is recognized the need to link theory and practice. What is found in practical experience needs to be found in the theoretical basis, so that the relationship between theory and practice can be mutually studied. One media that can be used to convey chemistry learning is real (real) media such as laboratory activities. Sugiharti, G. (2018)\textsuperscript{6}) found that students who are taught using the media get higher learning outcomes compared to students taught without using the media. To create the chemistry learning mentioned above, a learning model is needed. The results of the research by Sugiharti, G and Kholilah (2017)\textsuperscript{7}), found that there was an influence of the learning model with student learning outcomes. Problem Based Learning (PBL) learning models and Discovery Learning (DL) can be an alternative in chemistry learning. The results of the research by Sugiharti, G and Habeahan, B (2018)\textsuperscript{8}) also show that students taught with PBL models using virtual media get higher learning outcomes compared to students taught with PBL models using real lab media on thermochemical materials. Likewise Sugiharti, G and Limbong E.R (2018)\textsuperscript{9}), found that there was an influence of the learning model using media on student learning outcomes, where PBL models with virtual media provided higher learning outcomes than PBL models with real media on Acid Bases.

Whereas the DL model, examined by Balim. A,G (2009)\textsuperscript{10}) found that there are differences in learning outcomes between experimental groups taught with DL and control groups taught conventionally, in line with that Donuk, D (2016)\textsuperscript{11}) said that conventional learning processes have turned to learning independently through discovery learning or DL models.

The existence of differences in the learning model raises the hypothesis, are there significant differences in the results of students' chemistry learning that are taught with PBL learning models with DL models on the subject of solubility and solubility results.

2 Research Methodology

This research was carried out at SMA Negeri 1 Tj. Pura, with a population of all students of class XI Science consisting of 4 classes, and the samples were taken randomly in 2 classes.

The design of this study uses the design of True Experiment Design which involves two classes, namely the first class applying PBL learning model with real media lab, the second class DL model with real media lab. The design form used is Pretest-Posttest Control Group Design.
Table 1. Pretest-Posttest Control Group Design

<table>
<thead>
<tr>
<th>Class</th>
<th>(Pre-Test)</th>
<th>Treatment</th>
<th>(Post-Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment I (PBL)</td>
<td>$T_1$</td>
<td>$X_1$</td>
<td>$T_3$</td>
</tr>
<tr>
<td>Experiment II (DL)</td>
<td>$T_2$</td>
<td>$X_2$</td>
<td>$T_4$</td>
</tr>
</tbody>
</table>

While testing the hypothesis, using the $t$-test formula (two-party test), namely the average test of two classes of samples with $t$-test at alpha 0.05.

3 Result And Discussion

Table 2. Result of Average Pretest and Posttest.

<table>
<thead>
<tr>
<th>Class</th>
<th>Type of Data</th>
<th>Pretest</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\bar{X}$</td>
<td>$S$</td>
<td>$S^2$</td>
</tr>
<tr>
<td>Experiment I</td>
<td>51.5</td>
<td>7.27</td>
<td>52.82</td>
</tr>
<tr>
<td>Experiment II</td>
<td>43.1</td>
<td>6.65</td>
<td>44.23</td>
</tr>
</tbody>
</table>

$\bar{X}$ = Average value; $S$ = Deviation; $S^2$ = Varians

51.5 and the experimental class II was 43.1 and the average post-test experimental class I was 77.12 and the experimental class 58.25 which could illustrated through the diagram below. Based on the results of data processing, the average pre-test for experimental class I was.

![Fig. 1. Results of Sample Pretest and Posttest Results Diagrams](chart)

While the results of the $t$ test obtained $t_{table} = 2.0$ and $t_{count} = 10.08$ at alpha 0.05 so that $t_{count}$ was in the critical area that is reject $Ho$ with $-t_{count} < -2.021$ and $t_{count} > 2.021$. Thus $Ho$ is rejected, $Ha$ is accepted. Means: There are differences in students' chemistry learning outcomes that are taught using PBL models with the chemistry learning outcomes of students who are taught using the DL model on solubility and solubility results. This is in line
with the results of the research by Sugiharti, G, et all (2017)\textsuperscript{12} that the PBL model provides better learning outcomes (26.57 ± 5.81) than the Direct Instruction model (24.04 ± 2.86). From the results of this study it can be said that learning with PBL models get higher learning outcomes than learning with DL models. This is in accordance with Gallagher's view, (1995)\textsuperscript{13} that PBL is a good alternative to improve understanding of chemical concepts. This learning involves students in an active, collaborative, student-centered learning process, which develops problem-solving abilities and independent learning abilities.

Problem-based learning is a learning solution designed to improve learning by bringing, delivering, requiring students to learn the content of teaching materials when solving problems. This is in line with Jonassen DH's opinion, (2011)\textsuperscript{14} that "Problem Based Learning is an instructional strategy, is, it is an instructional solution designed to improve learning by requiring studies to learn content while solving problems. This problem-based learning according to Smith's opinion cited by Amir. M.T(2009)\textsuperscript{15} explained that PBL can be useful for: improving problem solving skills, easier to remember, increasing understanding, increasing knowledge relevant to the world of practice, encouraging them full of thought, building leadership and collaboration skills, learning skills and motivating learners. Finally, this study concluded that there were significant differences in students’ learning outcomes between those taught with the PBL model and those taught with the DL model on the subject matter of the solution and solubility results. This study found that in teaching subjects the solution and solubility results are better taught using PBL models than the DL model.

References

Secondary Metabolites Phytochemical Analysis of n-Hexane, Ethyl Acetate and Ethanol Extracts of Sarang Banua (Clerodendrum fragrans Vent Willd) Leaves

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Abstract. Sarang banua plant (Clerodendrum fragrans Vent Willd), the Verbanaceae family is found in village Raya Usang, Simalungun district of Indonesia, traditionally used as medicinal plant. Secondary metabolite research from C. fragrans local plant extract aims to develop its potential as a drug ingredient. The result of phytochemical analysis showed that in the n-hexane extract of C. fragrans leaf there are secondary metabolites alkaloid, steroid and flavonoid. In the ethyl acetate extract there are alkaloids, steroids, saponins and tannins. In ethanol extract there are alkaloids, triterpenoids, flavonoids, saponins, tannins and quinones. The yield of n-hexane extract, ethyl acetate and ethanol of C. fragrans Vent Willd were 3.82%; 10.63% and 15.42%(ww).

Keywords: Phytochemicals, Leaves, Sarangbanua plant (Clerodendrum fragrans Vent Willd), Medicinal plant of Indonesian.

1 Introduction

Sarang banua plant is commonly found in Simalungun, Indonesia. Sarang banua have been used by the community as a traditional (ethnomedical) medicinal plant, including medication for stomach pain, fever, high blood pressure, sugar medicine, cough and others. Sarang banua plant (Clerodendrum fragrans) are shrubs, grow to around 2.5-3 m. The leaves are simple and opposite, oval and wide, about 6-25 cm long and 5-25 cm wide. Flowers are whitish pink (whitish pink) and flower petals are usually reddish purple, flowers are 10-15 mm long (Figure 1). Based on the results of the determination of plants by the "Herbarium Bogoriense" Botanical Field of the Biology Research Center-LIPI Bogor, sarang banua plant is a type of Clerodendrum fragrans Vent Willd, including the Verbanaceae family and has been stored in herbarium form "Herbarium Bogoriense" since June 2017.

The Genus Clerodendrum (Family of Verbanaceae) has more than five hundred species that have been identified, which are semi-woody shrubs and are widespread in the tropics. Root, stem, leaf extracts of several species of the genus Clerodendrum have been traditionally used for the treatment of asthma, cataracts, malaria, blood, skin and lung diseases (Shrivastava and Patel, 2007).

According to Kar, et al., (2014) different plant parts such as leaves and extract of C. indicum, C.pholmidis, C.serratum, C.trichotomum, C. chinense and C. petasites extracts have been used for the treatment of rheumatism, asthma, febrifuge, incephalagia, ophthalmia and other inflammatory diseases. Types of plants C. indicum and C. inerme are used for the
treatment of cough, genital infections, skin diseases, elephantiasis, rheumatism, burns, vermifuge, febrifuge, malaria and so on. *C. pholmidis*, *C. colebrookianum*, *C. calamitosum* and *C. trichotomum* plants have been used as anti-diabetic, anti-hypertensive and sedative. Ethanol extract of *Clerodendrum infortunatum* leaves showed effective anti-microbial activity against several Gram negative bacteria and fungal strains. Ethanol, hexane, chloroform and water extracts from the roots, leaves and stems of *Clerodendrum viscosum* showed effective antibacterial activity against strains of Gram-positive, Gram-negative bacteria and fungi.

Medicinal plants are pharmacological sources that are rich in active secondary metabolites such as alkaloids, steroids, tannins and phenol compounds, which are available at low cost and easily decomposed. Senjobi et al. (2017) reported that the *Clerodendrum volubile* plant could be used as an analgesic, containing chemical compounds saponins, tannins, anthraquinones, flavonoids, alkaloids, phlinoin, phenols, terpenes and glycosides.

**Fig.1.** Sarang banua plant (*Clerodendrum fragrans* Vent Willd) from Simalungun Region, Indonesia.

Secondary metabolites in plants can be obtained through extraction using solvents in accordance with the principle of solubility and polarity of secondary metabolites. According to Smallwood (1996), n-hexane, ethyl acetate and ethanol solvents have different polarities, namely non-polar, semi-polar and polar with dielectric constant (20 °C), each of which is 1.90; 6.02 and 22.40.

Publication or research on sarang banua (*C. fragrans* Vent Willd) plant is still very limited. Phytochemical analysis of secondary metabolites from extracts of n-hexane, ethyl acetate and ethanol of sarang banua plant that are widely found in the Simalungun region of Indonesia needs to be done to develop the potential of local medicinal plants as raw materials for natural medicine. The development and research of this plant-based drug ingredient is very beneficial in addition to the fact that the source of natural ingredients is sufficiently available, also to overcome the side effects and the high price of synthetic drugs and antibiotics.

## Materials And Methods

### 2.1 Materials and Tools

The tools used are vacuum rotary evaporator, Buchner funnel, vortex mixer and glass (pyrex) equipment, which are separating funnels, erlenmeyer flasks, measuring flasks, stirring rods, volume pipettes, test tubes and measuring cups.

The chemicals used are technical grade solvents for extraction including n-hexane, ethyl acetate, ethanol and proanalyst (pa) (Merck) chemicals including chloroform, ether, amyl alcohol, glacial acetic acid, anhydrous acetic acid, sulfuric acid (p), ethanol 96%, NaOH, HCl,
HNO₃, Bi(NO₃)₃, HgCl₂, KI. The plant material used is fresh leaves of sarang banua (C. fragrans Vent Willd), originating from Raya Usang village, Dolok Masagul sub-district, Simalungun district, North Sumatra, Indonesia. Plant sample was identified by the "Herbarium Bogoriense" in the Bogor LIPI-Biology Research Center.

Mayer Reagent: 1,360 g of HgCl₂ were weighed, dissolved in distilled water up to 60 mL. In another container as much as 5 g of KI is dissolved in 10 mL of distilled water. The two solutions are mixed and distilled water is added to a volume of 100 mL solution (Harborne, 1998).

Dragendorff Reagent: As much as 8.0 g of KI dissolved in 20 mL of distilled water (solution 1). A total of 0.86 g of bismuthnitrate was dissolved in 2 mL of distilled water (solution 2). Both solutions were mixed and added 7.0 mL HCl (p) and diluted with distilled water to a volume of 100 mL solution (Harborne, 1998). Lieberman Burchard Reagent: A total of 5.0 mL of sulfuric acid (p) was put into a 50 mL solution of 96% ethanol, then 5.0 mL of anhydrous acetic acid was added (Harborne, 1998).

2.2 Plant Extraction

A total of 4.0 kg of fresh C. fragrans Vent Willd leaves were washed clean, drained, dried and protected from direct sunlight and mechanically ground to a simplicia powder (515.5 g). The simplicia powder of C. fragrans Vent Willd leaves was macerated with solvents with a polar level, namely n-hexane solvent, followed by ethyl acetate and ended with ethanol solvent.

Simplicia powder of C. fragrans Vent Willd leaves (500.0 g) were macerated with n-hexane solvent, filtered and the filtrate obtained was concentrated on the rotary evaporator vacuum to obtain concentrated n-hexane extract. The pulp portion was macerated with ethyl acetate solvent, filtered and the filtrate obtained was concentrated to obtain concentrated ethyl acetate extract. Furthermore, the pulp portion was re-macerated with ethanol solvent, filtered and the filtrate obtained was concentrated to obtain concentrated ethanol extract. Each maceration process for each solvent lasts for 48 hours, with three times the addition of solvent. From the extraction results obtained each yield of n-hexane, ethyl acetate and concentrated ethanol extract from C. fragrans Vent Willd leaves.

2.3 Phytochemical Test

Phytochemical testing of secondary metabolites of C. fragrans Vent Willd leaf extract was carried out as follows:

2.3.1 Identification of Alkaloid Groups

A total of 0.50 g of extract plus 5 mL of 10% hydrochloric acid, whipped and added 5 ml of 10% ammonia solution. Extracted with 10 mL of chloroform and evaporated. The residual evaporation plus 1.5 mL of 2% hydrochloric acid, divided into two tubes. The first tube was added with 3 drops of Mayer reagent, the formation of a yellowish white precipitate showed the presence of alkaloids. The second tube is added with 4 drops of Dragendorff reagent, the formation of brick red deposits indicates the presence of alkaloids (Harborne, 1998).
2.3.2 Identification of Steroid and Triterpenoid

A total of 0.5 g extract extracted with 10 mL ether. A total of 0.5 mL of the solution was tested with Lieberman Burchard reagent. The formation of blue or green indicates the presence of steroids and green or purple shows triterpenoid (Harborne, 1998).

2.3.3 Identification of Flavonoids, Saponins, Tannins and Quinines

A total of 0.50 g of the extract was dissolved in 10 mL of water and placed on a water bath, then the solution was divided into four tubes. To the first tube 100 mg of magnesium powder is added and 1 mL of concentrated hydrochloric acid and 3 mL of amyl alcohol are added, shaken vigorously and allowed to separate, red, yellow, orange in the amyl alcohol layer indicating flavonoids. The second tube is shaken vertically for 10 seconds, it will form a stable foam, left for 10 minutes, added 1 drop of 1% hydrochloric acid. If the foam is not lost, it shows saponin. The third tube is added with a few drops of 1N sodium hydroxide, the red filtrate shows quinone. The fourth tube is added with a few drops of 1% iron (III) chloride solution, the formation of dark blue or blackish green filtrate indicates the presence tannin (Harborne, 1998).

3 Results And Discussion

3.1 Plant Extraction

The selection of maceration method for extracting the leaves of C. fragrans Vent Willd in addition to its effectiveness, practicality, safety, and economics, also aims to avoid damage to the active compounds in the leaves of the banua nest which are not heat resistant. Maceration is done by soaking the C. fragrans Vent Willd leaf powder in a solvent for 48 hours, by adding the solvent three times, then releasing the solvent from the extract using a vacuum rotary evaporator. The selection of solvents in the maceration process is based on the principle of "like dissolve like" solubility, meaning that polar compounds only dissolve in polar solvents, and vice versa for semipolar and non-polar compounds.

Solvents used in this study for maceration are non-polar solvents to polar solvents namely n-hexane, ethyl acetate and ethanol. The use of various types of solvents with different polarity levels was carried out to obtain extracts with optimal results from compounds of unknown type. The yield of n-hexane extract, ethyl acetate extract and ethanol extract of C. fragrans Vent Willd leaves were 3.82; 10.63; 15.42% (w/w) (Figure 2).
3.2 Phytochemical Analysis

Phytochemical analysis is one way to find out the secondary metabolites in a plant. Secondary metabolite compounds in plants include alkaloids, flavonoids, steroids and triterpenoids, tannins and others. Basically these secondary metabolites are toxic to plants and animals. In some plants the secondary metabolites produced are used to defend themselves from the enemy, but at certain doses can be used as medicine. Phytochemical analysis results of C. *fragrans* Vent Willd leaf extract are presented in Table 1.

<table>
<thead>
<tr>
<th>Type of the secondary metabolites</th>
<th>Types of C. <em>fragrans</em> Vent Willd Leaf Extract</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n-Hexane</td>
</tr>
<tr>
<td>Alkaloids</td>
<td>+</td>
</tr>
<tr>
<td>Steroids</td>
<td>+</td>
</tr>
<tr>
<td>Triterpenoid</td>
<td>-</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>+</td>
</tr>
<tr>
<td>Saponin</td>
<td>-</td>
</tr>
<tr>
<td>Tannin</td>
<td>-</td>
</tr>
<tr>
<td>Quinon</td>
<td>-</td>
</tr>
</tbody>
</table>

Color: Yellowish Green, Green Black, Reddish Green

Note: (+) Present and (-) Absent

The results of phytochemical analysis of secondary metabolites, showed that the n-hexane extract of C. *fragrans* Vent Willd leaves contained alkaloid, steroid and flavonoid secondary metabolites. There are alkaloids, steroids, saponins and tannins in ethyl acetate extract. In the ethanol extract there are alkaloids, triterpenoids, flavonoids, saponins, tannins and quinones (Table 1).

In ethyl acetate extract and ethanol of C. *fragrans* Vent Willd leaves there were more alkaloids than n-hexane extract. Flavonoids were only found in n-hexane and ethanol extracts. Steroids are only found in n-hexane and ethyl extracts of C. *fragrans* Vent Willd leaves. In
ethyl acetate extract, leaves of \textit{C. fragrans} Vent Willd contained alkaloids, steroids, saponins and tannins, whereas in ethylacetate extract leaves of \textit{Clerodendrum philomidis} L. there are steroids, alkaloids, phenolics, amino acids and no saponins, sugars, flavones and catachins (Devika et al., 2012).

Extract of \textit{n}-hexane from \textit{C. fragrans} Vent Willd leaves contained secondary metabolites of alkaloids, steroids and flavonoids, whereas in hexane from \textit{C. philippinum} (one species of the genus \textit{Clerodendrum} in India) positively contained alkaloids, carbohydrates, flavonoids, essential oils and fats. (Udayanet al. 2014).

Ethanol extract of \textit{C. fragrans} Vent Willd leaves contained the most complete secondary metabolites compared to \textit{n}-hexane and ethyl acetate extracts, namely alkaloids, triterpenoids, flavonoids, saponins, tannins and quinones, except steroids, while Udayan et al. (2014) reported that crude ethanol extract from the leaves of \textit{Clerodendrum philippinum} (one of the species of the genus \textit{Clerodendrum} in India), contained flavonoids, steroids, glycosides, phenolic compounds, tannins, saponins, carbohydrates, alkaloids and essential oils. Devikaet al. (2012) reported that the ethanol extract of \textit{Clerodendrum philomidis} L leaves also contained steroids and phenols.

Saponins are widely found in ethanol extract of leaves of \textit{C. fragrans} Vent Willd, followed by ethyl acetate extract and there is no saponin in \textit{n}-hexane extract. Whereas the results of Devikaet al. (2012) study showed that saponins were not present in ethyl acetate, alcohol and chloroform extracts from the leaves of \textit{Clerodendrum philomidis} L. Dey et al., 2014 reported on leaf extracts of \textit{Clerodendrum viscossum} Vent containing alkaloids (1.30 ± 0.09 g / 100 g), flavonoids (16.04 ± 1.33 mg /g), phenolic compounds (57.48 ± 0.71 mg/g), tannins (46.63 ± 0.03 mg/g) 100 g), and saponins (13.31 ± 0.47g/ 100g).

The results of Simorangkir et al. (2017a) also showed that the most secondary types of metabolites were ethanol extract (polar) of \textit{Solanum blumei} Ness ex Blume leaves compared to \textit{n}-hexane (semi-polar) and ethanol (polar) extracts, namely alkaloids, steroids, triterpenoids, flavonoids, phenols, saponins ,tannin and quinone. Sujatha et al. (2013), reported that the non-polar fraction of \textit{Brassica nigra} (Koch) plant is stronger that antimicrobial activities than crude extract (polar). Sowmya et al. (2013) also stated the same thing that the most common types of secondary metabolites were in ethanol extract compared to ethyl acetate, chloroform, petroleum ether and water extracts from \textit{Boerhaavia diffusa} Linn (root), \textit{Terminalabellerica} Linn (fruit) and \textit{Tribilusterestris} Linn (fruit) plants. Flavonoids and triterpene are present in all plant extracts.

Phytochemicals are the core of phytomedicin. The therapeutic efficiency of phytomedicines directly correlates with the presence of various phytochemicals. Some research results show that alkaloid, flavonoid, steroid, tannin, saponin secondary phenol, which are found in plants, have various biological activities/ drugs.

Flavonoids are one of the major classes of phytochemicals associated with diverse pharmacological activities which include antioxidant, anti-cancer and anti-aging properties (Sharma, 2006). Flavonoids with two 6-carbon rings and one 3-carbon linkage (usually forming a 3 ring) are divided into chalcones, flavones, flavonols, isoflavones, flavan-3-ols, and anthocyanins, according to the modification of the basic carbon skeleton. Suggest that flavonoids may bind to gamma-aminobutyric acid. A receptors having sedative or anxiolytic effects on the nervous system and can act to upregulate the cholinergic nervous system (Kennedy et al., 2011) and flavonoid-rich supplements may reduce neuro degenerative processes (Spencer, 2010).

Alkaloid compound \( \beta_2 \)-solanine [Solanid-5-ene-(1'→3)-\( \beta \)-D-glucopyranosyl-(1"→3')-\( \beta \)-D galactopyranoside] with the molecular formula \( \text{C}_{39}\text{H}_{63}\text{NO}_{11} \) found in ethanol extract of \textit{S.
Blumei Nees ex Blume fruit (Simorangkir et al., 2016). That ethanol extract of S. Blumei Nees ex Blume fruit has the activity of inhibiting the growth of L1210 leukemia cancer cells with IC\textsubscript{50} values of 14.88 mg/mL (Simorangkir et al., 2017b).

Saponins also exhibit a wide range of biological activity such as immunostimulatory, anti-inflammatory, hypocholesterolemic activity etc (Tamura et al., 2012).

Various plant derived phenolic compounds such as curcumin, genistein, resveratrol and catechins act as potent inhibitors of growth factor and signalling pathways associated with cancer (Wahle et al., 2010; Shen et al., 2003). Plant derived phenolics have also demonstrated immunomodulatory activity by modulating cytokines and chemokines.

Several different plants of the Clerodendrum genus have been extensively studied in the practice of different traditional medicines. Based on the results of research on plant secondary metabolites that have been carried out, local plants of sarang banua (Clerodendrum fragrans Vent Wild) have the essential to be developed as natural materials that have various biological activities/drugs.

### 4 Conclusions

Through the maceration process of the sarang banua (Clerodendrum fragrans Vent Wild) leaf by using its polarity multilevel solvent, the highest yield obtained sequentially was ethanol extract (15.42% w/w), ethyl acetate (10.63% w/w) and n-hexane (3.82% w/w). Secondary metabolites found in ethanol extract are alkaloids, triterpenoids, flavonoids, saponins, tannins and quinones, ethyl acetate extracts have alkaloids, steroids, saponins, tannins and n-hexane extracts have alkaloids, steroids and flavonoids.

Based on the results of research on plant secondary metabolites that have been carried out, further research is needed to test the bioactivity and isolation of active compounds in local plant of C. fragrans vent Wild as raw material for natural medicine Indonesian.

### 5 Acknowledgements

Acknowledgments are addressed to the Directorate of Research and Community Service, Directorate General of Research and Development Strengthening, Ministry of Research Technology and Higher Education, for the provision of research funds in accordance with the Research Contract Number 027 / UN33.8 / LL / 2018 dated February 12, 2018.

### References


Student Interaction and Communication Skills

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Abstract. This study aims to provide an overview of the communication and interaction skills of students in terms of major and gender groups. This research was conducted using survey methods at the Universitas Negeri Medan (UNIMED). Student samples totaling 400 people were determined by purposive random sampling technique. Communication and interaction skills data are captured using a questionnaire with a Likert scale model with a reliability coefficient of 0.726. Research findings are: (1) Communication and interaction skills of students tend to be in the medium category; (2) Students' communication and interaction skills can be influenced by major groups (natural science or social science) and gender.

Keywords: Communication skills, interaction skills, gender.

1 Introduction

Universities must continue to strive to develop communication skills and student interaction in learning, so that after the student has graduated, he can become a human resource with character. Lecturers are a very strategic part in developing student communication and interaction skills, because lecturers directly act as learning designers, instructors and mentors for students. As a designer, lecturers can integrate the components of communication and interacting skills in lecture plans and lecture contracts, thus students who attend lectures not only gain knowledge and hard skills, but students also have the skills to communicate and interact well. According to Soelistiyowati and Nugroho (2012) that communication and interaction skills are a component of building soft skills of a person. The author agrees with Elfindri, et al. (2010) who stated that growing soft skills in the world of education can be done in 3 (three) ways, namely: 1) soft skill design into the learning curriculum; 2) developing activities and activities of children in the dormitory or at home; and 3) developing soft skills in extra curricular activities. Thus, the implementation of soft skills is carried out through integration into the curriculum, namely through the learning process or lectures contained in the Semester Lecture Plan. From the description above, it can be seen that universities are very strategic in developing communication skills and student interaction because they can be integrated by lecturers in learning practices and through example. Therefore, the description of students communication and interaction skills really needs to be studied. The problems are: 1) What is the condition of students’ communication skills at Universitas Negeri Medan? 2) What is the condition of students’ interaction skills at Universitas Negeri Medan? 3) Are there differences in communication skills between men and women? and 4) Are there interactions between men and women? The results obtained can be used as consideration for the university to develop students’ communication and interaction skills. In the practice of learning, it is possible that the students’ communication skills are...
adequate but the students’ interaction skills may not be sufficient. In conditions like this the lecturer needs to provide a larger portion of the student's skills to interact in each lecture compared to communication skills.

2 Literature Review

2.1 Communication Skills

In general, characters can be interpreted as personality. Masnur Muslich (2011: 71) concludes some opinions about character, namely that characters are related to moral strength, have positive connotations, not neutral ones. Education is building character that means building a character that is related to a positive moral dimension or good not negative or bad. From this conclusion it can be seen that education greatly contributes to the development of one's character. In related matters, Elfindri, et al. (2010: 16) explained that the importance of the character formation process so that they have soft skills and are ready to be released to live in the community. Living in a community means that a person is able to devote his knowledge to the community through the work he does. Universities that produce many scholars are certainly not enough if they are only equipped with knowledge and hard skills, but must be balanced with the skills of soft skills to be successful in the workforce. Furthermore, Elfindri, et al. (2010: 156) has stated that there are 19 skills needed by the labor market according to rankings, namely: communication, honesty/integrity, collaboration, interpersonal, good work ethic, motivation, adaptability, technical, computer, organization, detail orientation leadership, confidence, courteous, wise, achievement index, creative, humorous, skills, and entrepreneurship. From the description above it is clear that the communication skills of a person ranks first for success in work, while the achievement index as a symbol of one's mastery in certain sciences (hard skills) is only ranked 16. Furthermore, the interaction skills also remain ranked above the communication skills. This can be seen from the interpersonal skills that are ranked fourth. Communication skills are one of the components of a person's soft skills. Communication skills are one's skills to express their intentions and goals to others appropriately. Communication skills consist of several aspects, namely: 1) The skills to recall information conveyed by the other person: the skills to remember information and the correctness of information; 2) Conveying the things that are believed to be true: the skills of a person to maintain the truth of his words, because the untrue facts that are spread will lead to things that are not good; 3) Provide just enough information, because providing more than enough information can saturate and confuse the other person; 4) Selecting the context of the conversation involving the interlocutor (Soelistiyowati and Nugroho (2010: 39-67).

2.2 Interaction Skills

The skills of interaction is a component of forming soft skills in addition to communication skills. The interaction skills is the skills of a person to interact socially with the community, including the environment. The skills to interact consists of several aspects, namely: 1) Selection of a safe topic for conversation: do not choose a topic of conversation that can corner the other person who causes the relationship to be tenuous; 2) The choice of the topic of conversation that is appropriate to the place and situation: the incompatibility of places and situations with the topic of the conversation can make the atmosphere and
relationship become bad; 3) Adjustment of language, language style and variations: responsiveness to the language used and the variety of languages desired by the interlocutor (Soelistiyowati and Nugroho (2010: 69-94). The skills of communication and interaction can be developed in daily life by learning and training each day.

3  Methodology

The research method used was the ex post facto method (Kerlinger (2006: 604). Data collection tools used were questionnaires. According to Universitas Negeri Medan statistics, there were 21,364 students (BAAK UNIMED 2012: 27). Determination of the sample used formula from Taro Yamane in Riduwan and Kuncoro (2008: 44), namely: \( n = \frac{N}{N_d^2 + 1}; n \) = Number of samples; \( N \) = Number of population; \( d^2 \) = Femalecision (5%). Then the sample of students in the study was 400 people, women and men of 200. Data collection tools used in this study were questionnaires developed by Soelistiyowati and Nugroho (2012: 139-145). Therefore, a number of items were drawn up which could reveal communication skills and student’s interaction skills. The statement items are arranged using a Likert scale model with 8 choices of scale, namely: never, almost never, rarely, sometimes, usually, often, almost always, and always. Reliability coefficient used was 0.726. Data were analyzed using the SPSS program.

4  Results And Discussion

Based on the results of descriptive analysis, communication skills and student interaction skills can be seen in Table 1. Based on Table 1, it shows the average score of communication skills is higher than the average score of student’s interaction skills. Based on gender, the description of the data of communication skills and student’s interaction skills can be seen in Table 2. Based on Table 2, it shows the average score of communication skills and the skills of male students to interact more than the communication skills and interaction skills of female students. Based on the group of knowledge, the description of the data of communication skills and interaction skills of the students of the Natural Sciences group and Social Sciences can be seen in Table 3.

<table>
<thead>
<tr>
<th>Variable</th>
<th>X1</th>
<th>X2</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Mean</td>
<td>23,05</td>
<td>22,09</td>
</tr>
<tr>
<td>Median</td>
<td>23</td>
<td>22</td>
</tr>
<tr>
<td>Mode</td>
<td>22</td>
<td>20</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>3,98</td>
<td>4,28</td>
</tr>
<tr>
<td>Variance</td>
<td>15,88</td>
<td>18,33</td>
</tr>
<tr>
<td>Range</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Min.</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Max.</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Min. Ideal</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Max. Ideal</td>
<td>32</td>
<td>32</td>
</tr>
</tbody>
</table>
Table 2. Description of Student Interaction and Communication Skills Data based on Gender.

<table>
<thead>
<tr>
<th>Variable</th>
<th>X1</th>
<th></th>
<th>X2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>N</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Mean</td>
<td>23,35</td>
<td>22,74</td>
<td>22,46</td>
<td>21,71</td>
</tr>
<tr>
<td>Median</td>
<td>23</td>
<td>22</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>Mode</td>
<td>25</td>
<td>21</td>
<td>25</td>
<td>18</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>4,01</td>
<td>3,94</td>
<td>4,12</td>
<td>4,41</td>
</tr>
<tr>
<td>Variance</td>
<td>16</td>
<td>15,5</td>
<td>16,9</td>
<td>19,5</td>
</tr>
<tr>
<td>Range</td>
<td>20</td>
<td>20</td>
<td>21</td>
<td>21</td>
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<td>Min.</td>
<td>12</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Max.</td>
<td>32</td>
<td>31</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Min. Ideal</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Max. Ideal</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>32</td>
</tr>
</tbody>
</table>

Explanation:
X1 = student communication skills
X2 = student interaction skills

Table 3. Description of Interaction and Communication Skills Data based on Major.

<table>
<thead>
<tr>
<th>Variable</th>
<th>X1</th>
<th></th>
<th>X2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NS</td>
<td>SS</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>N</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Mean</td>
<td>23,03</td>
<td>23,07</td>
<td>22,46</td>
<td>21,71</td>
</tr>
<tr>
<td>Median</td>
<td>23</td>
<td>23</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>Mode</td>
<td>24</td>
<td>22</td>
<td>25</td>
<td>18</td>
</tr>
<tr>
<td>Std. Deviasi</td>
<td>4,14</td>
<td>3,84</td>
<td>4,12</td>
<td>4,41</td>
</tr>
<tr>
<td>Variance</td>
<td>17,10</td>
<td>14,71</td>
<td>16,9</td>
<td>19,5</td>
</tr>
<tr>
<td>Range</td>
<td>20</td>
<td>21</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Min.</td>
<td>12</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Max.</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Min. Ideal</td>
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<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Max. Ideal</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>32</td>
</tr>
</tbody>
</table>

Explanation:
X1 = student communication skills
X2 = student interaction skills
NS = student of the natural science group
SS = student of social science group

Based on Table 3 shows the average score of the communication skills of natural science students is not much different compared to the average score of Social Science students'
communication skills. However, the average score of Social Science students' interaction skills is higher than the average science students' skills to interact.

Based on the group of major and gender, the description of the communication skills and student interaction skills data can be seen in Table 4.

Based on Table 4 shows the average score of communication skills of female science students is higher than the communication skills of male science students. The average score of male Social Science students' communication skills is higher than that of female social studies students. Furthermore, the average score of the interaction skills of male science students is not much different from the average score of the interaction skills of female science students. However, the average score of male Social Science students' interaction skills is higher than that of female social studies students.

Table 4. Description of Communication and Interaction skills Data Based on Major and Gender Group.

<table>
<thead>
<tr>
<th></th>
<th>X1</th>
<th></th>
<th>X2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NS</td>
<td>SS</td>
<td>NS</td>
</tr>
<tr>
<td>N</td>
<td>M</td>
<td>F</td>
<td>M</td>
</tr>
<tr>
<td>Mean</td>
<td>22,83</td>
<td>23,23</td>
<td>23,88</td>
</tr>
<tr>
<td>Median</td>
<td>23</td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td>Mode</td>
<td>22</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>4,00</td>
<td>4,28</td>
<td>3,97</td>
</tr>
<tr>
<td>Variance</td>
<td>16,04</td>
<td>18,30</td>
<td>15,76</td>
</tr>
<tr>
<td>Range</td>
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<td>17</td>
<td>18</td>
</tr>
<tr>
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<td>12</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Max.</td>
<td>32</td>
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<td>32</td>
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<tr>
<td>Min id.</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Max id.</td>
<td>32</td>
<td>32</td>
<td>32</td>
</tr>
</tbody>
</table>

Explanation:
X1 = student communication skills
X2 = student interaction skills
NS = student of the natural science group
SS = student of social science group
M = Male
F = Female

Testing the differences in the average scores of each group can be seen in Table 5.

Table 5. Summary of Communication and Interaction Skills T-Test Analysis Results based on Major and Gender Group.

<table>
<thead>
<tr>
<th>Skills and Group</th>
<th>$t_{count}$</th>
<th>$\alpha_{observation}$</th>
<th>$\alpha_{table}$</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication of Female student</td>
<td>1,552</td>
<td>0,12</td>
<td>0,05</td>
<td>Not significant</td>
</tr>
</tbody>
</table>
Based on Table 5 shows the communication skills of female Social Science students differ significantly from the skillsof male Social Science. This means that the communication skills of female Social Science students are better than those of male Social Science students. Then, the interaction skills of female Social Science student differed significantly from the social science interaction skills of male students. This also gives the meaning of the skills of female Social Science students to interact better than male Social Science students.

Based on descriptive analysis and the t-test conducted, it can provide the following description. First, students' communication and interaction skillstend to be in the medium category. This finding supports of Dahlan Nariman's (2013: 1) explanation which suggests that the important factors that should receive attention are the soft skills of students which include communication skills. Research on students' communication skills in schools has received attention since several decades ago, such as Ndongko and Agu (1985: 205) suggesting that students communication in class correlates with their academic behavior. These findings also provide clues that efforts to improve communication skills are needed for students. Efforts to improve category communication skills are being carried out by improving information processing skills when communicating, while efforts to increase interaction skills category are being carried out in an effort to follow the changes in one's speech style. Soelistiyowati and Nugroho (2012: 149-150). In the 4.0 industry revolution era now it is not enough to rely solely on academic skills, but must have high communication skills and interaction skills. Hidayatullah (2010: 111) suggested that students as prospective leaders must have and study

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Skills of Student Social Science and Natural Science</td>
<td>0,099</td>
<td>0,92</td>
<td>0,05</td>
</tr>
<tr>
<td>Communication Skills of Natural Science Female and Male Student</td>
<td>0,658</td>
<td>0,512</td>
<td>0,05</td>
</tr>
<tr>
<td>Communication Skills of Student of Social Science Female and Male Interaction Skills of Female and Male student</td>
<td>3,373</td>
<td>0,001</td>
<td>0,05</td>
</tr>
<tr>
<td>Interaction Skills of Student Social Science and Natural Science Interaction Skills of Natural Science Female and Male Student</td>
<td>1,736</td>
<td>0,08</td>
<td>0,05</td>
</tr>
<tr>
<td>Interaction Skills of Student of Social Science Female and Male Interaction Skills of Female and Male student</td>
<td>1,159</td>
<td>0,248</td>
<td>0,05</td>
</tr>
<tr>
<td>Interaction Skills of Natural Science Female and Male Student Interaction Skills of Student of Social Science Female and Male</td>
<td>0,181</td>
<td>0,856</td>
<td>0,05</td>
</tr>
<tr>
<td>Interaction Skills of Student Social Science Female and Male Interaction Skills of Female and Male student</td>
<td>2,971</td>
<td>0,004</td>
<td>0,05</td>
</tr>
</tbody>
</table>
in higher education, expected to prepare themselves especially those related to personal development and character. Second, in general the communication skills of female and male students are not significantly different. This provides guidance if the efforts to improve communication skills are carried out through training, that male and female students can be placed in the same group. These results provide support for the research results of Sitanggang and Saragih (2007: 46) which found that student characteristics (emotional skills, extraversion, openness, conscience and prudence) of male upper secondary school students did not differ significantly compared to females in Medan City. Third, based on the group of science and gender, the communication skills of the students of Social Science for women and men differed significantly, and the value of $t = 3.373$ with $\alpha = 0.001 <0.05$. These results are reinforced by descriptive analysis which shows that the communication skills of male Social Science group students scored an average score of 23.35 or greater than the communication skills of female social science students who obtained an average score of 22.74. Therefore it was concluded that the communication skills of male Social Science students were higher than female Social Science students. These results provide support for the research results of Sitanggang and Saragih (2008: 46) which found that male high school students are more responsible than women and male Vocational High School students are more independent and responsible than women. This finding also supports the findings of Robbins and Coulter (2007: 330) that there are differences in the communication styles of men and women, men are accustomed to speaking in order to emphasize status, while women use talks to create relationships. Fourth, the interaction skills of female and male Social Science students was significantly different, and the value of $t = 2.971$ with $\alpha = 0.004 <0.05$. These results are reinforced by descriptive analysis which shows that the interaction skills of male Social Science group students scored an average score of 22.46 or greater than the interaction skills of female Social Science group students who obtained an average score of 21.71. Therefore it was concluded that the male social science student's interaction skills was higher than female Social Science students. This provides a clue if efforts to improve interaction skills are carried out through training, that students of the Social Science group of women are not placed in the same class as men. Based on the research findings, the College needs to map the communication and interaction skills of students to find out the real picture.

### 5 Conclusion

The results found prove that differences in communication skills and student interaction skills depend on the group of major and gender. Communication and interaction skills of each student need to be improved continuously. Students in the current Industrial Revolution 4.0 era are not enough to rely solely on academic skills, but must have high communication and interaction skills. To improve student communication and interaction skills, it can be done through training by conducted personally or institutionally with the following efforts: (1) Familiarize yourself with saying something properly according to the topic of the conversation; (2) Familiarize yourself with processing information well when communicating with others; (3) Familiarize yourself with the thoughts of others; and (4) Trying to follow the changes in other people's speech styles.
6 Acknowledgement

Thank you to the Directorate of Research and Community Service Ministry of Research, Technology and Higher Education who have provided research funding through the Higher Education Leading Research scheme and the leaders of the Medan State University who have given permission so that this research can be carried out properly.

References

Theoretical Study on the Reaction Mechanism of Acetalization of 3-Chlorobenzaldehyde Catalyzed by Halogen Acid

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{yusuf.6423@gmail.com}
Department of Chemistry, Universitas Negeri Medan

Abstract. The reaction mechanism of the acetalization of 3-chlorobenzaldehyde have been studied by ab initio method. 3-Chlorobenzaldehyde is an organic compound that contains aromatic aldehyde group. The double bond and the carbon chain at the benzaldehyde compound can allow it to occur the acetalization reaction. This study focused to examine the acetalization of 3-chlorobenzaldehyde catalyzed by Lewis acid catalysts (HCl) through computational calculation with basis set 6-31 G* within Hyperchem 8.0.3 program (Windows version). Based on the computational calculation showed that there are seven intermediate compounds and two resonance structure to produce acetal product. It is also known that the formation energy of the hemiacetal structure higher compared to all structure due to its lability. Whereas, the acetal product as the final product has the lower formation energy among the other structure due to its stability.

Keywords: ab initio method, acetalization, 3-Chlorobenzaldehyde, Lewis acid.

1 Introduction

Acetalization of 3-chlorobenzaldehyde is carried out between 3-chlorobenzaldehyde and an alcohol wherein acid is used as the catalyst as shown in Scheme 1. Currently, some acid catalysts have been successfully in the acetal formation include HCl, HBr, H4[SiW12O40]/SiO2 [1], Mesoporous metal-organic framework MIL-100(Fe) [2], metal copper, iron, zeolite beta [3], and benzimidazoliumcation [4]. The utilization of acid catalysts such as benzimidazolium-organic frameworks (MOFs) based on the UiO-66(Zr) structure [5], aluminium and thiourea containing MOF [6][7], MOF MIL-101 bearing sulfonic acid groups [8], MCM-41 [9], indium triflate [10] and NCS/thiourea [11], cation catalyst, Cu3(BTC)2, and UiO 66 catalyst in the acetalization of benzaldehyde showed a good catalytic activity (>88%) [4][6][12].

Acetal is known to be useful as fragrances in cosmetics, food and beverage additives, pharmaceuticals, solvents, detergents, drug design, carbohydrate chemistry, intermediates or final products in petrochemicals, and in lacquer industries [13].

The acetal formation is the reversible reaction wherein the first step is the formation of a hemiacetal (hemi = half; hemiacetal = half acetal). Hemiacetal occurs through the protonation of benzaldehyde by an acid catalyst followed by nucleophilic attack of methanol. The last process was deprotonation to form a hemiacetal. The second step is the acetal formation from hemiacetals that only occur if catalyzed by acid followed by loss of water. The next steps were the nucleophilic attack of the second methanol. This step is analog with the SN1 reaction.
mechanism that is carbocation formation and the nucleophilic attack. And the last process was deprotonation to form acetal product [14][15][16][17].

The reaction mechanism of acetal formation is interesting to learn because the formation energy of each step of the mechanism can be known. In addition, this study can also provide information about the steps of the SN1 reaction mechanism. The Mulliken charge of the atoms in each molecule is also calculated to determine the electronegativity of the atom.

![Chemical structure diagram](image)

**Fig. 1.** Acetalization of 3-chlorobenzaldehyde using acid catalysts [14][15][16][17].

2 Experimental

Every model of the compound is created 2D structure with a software package Hyperchem version 8.0. The process continues with the geometry structure optimization to obtain stable structural conformation and also the minimization energy of the structure using the ab initio method. Convergence limit determined 0.1 kcal / (Å.mol) or about 32767 maximum cycles so that reaches gradient limit as close as possible.

The optimization method carried out based on the Polak-Ribiere method. The result of calculations includes energy data, electronic compounds structure, and Mulliken charge recorded on the log menu [18].

3 Result And Discussion

Based on the computational calculation, we have suggested seven intermediate structure and two resonance structure to produce acetal product. The energy level diagram as presented in Figure 1 is a different molecule, however, it has the same number of molecules so that can be compared. The most stable structure is stated with the lowest energy. To determine the most stable molecule structure is characterized by the lowest energy level.
Fig. 1. Plausible reaction mechanism of acetalization of 3-chlorobenzaldehyde.

The formation of hemiacetal and acetal are the two main steps to produce 3-chlorobenzaldehyde dimethyl acetal. The first step to produce hemiacetal as shown in Figure 1 begins with carbonyl protonation on the benzaldehyde compounds by Bronsted acid site (H+ ion from acid catalyst) due to the presence of weak nucleophiles in the group (1). Because of the electronegativity of the oxygen atom, compound 1 also has another resonance structure (1'). The difference in bond energy and length is clearly seen in this protonation step where the substrate energy is 0 kJ/mol while the energy of the compounds (1) and (1') is almost similar (542.1 kJ/mol and 541.8 kJ/mol).
The formation of the second intermediates structure (2) occurs through the reaction of the resonance structure(1 or 1') with a first methanol. The formation energy decreased from 541 kJ/mol to 444.2 kJ/mol. It’s mean compound 2 more stable than compound 1 and also compound 1’. The next step is the formation of the hemiacetal (3) through the process of losing protons from compound 2 (oxonium ion). The formation energy increased from 444.2 kJ/mol to 574.2 kJ/mol. Hemicetal intermediate structure is the most unstable molecule during the reaction occur from the substrate until hemiacetal based on the formation energy (574.2 kJ/mol). Hemicetal not only unstable molecule but also has a short lifetime so that tend to reverts back as a substrate or tend to produce acetal. Besides that, the yield of hemicetal also cannot be isolated.

The next step is produce acetal product as shown in Figure 1. The process that occurs in the formation of acetal products is almost similar to hemicetal formation. The first step to produce acetal product started from the formation intermediate structure (4). In this step, carbonyl protonation by Brønsted acid site (HCl) occurs again and produce a compound which has a good leaving group (OH2). The formation energy decreased from 574.2 kJ/mol to 458.7 kJ/mol. The next step is the formation of compound 5 by removing the leaving group from compound 4 (OH2). The resonance structure not only compound 2 but also compound 5. The formation energy increased from 458.7 kJ/mol to 509 kJ/mol. Both compound 5 and 5’ has a similar formation energy due to both of that is a resonance structure(509 kJ/mol).

Similar with the formation of compound 2, the formation of the intermediates structure 6 also occurs through the reaction of the compound 5 or compound 5’ with methanol. The formation energy decreased from 509 kJ/mol to 459.7 kJ/mol. It’s also mean compound 6 more stabil than compound 5 and also compound 5’. The final step is the formation of acetal products (7) which occur by deprotonation of compound 6. Acetal structure is the stable molecule (29.7 kJ/mol) during the reaction occur from compound 1 until acetal based on the formation energy (29.7 kJ/mol). But when compared to substrates, acetals are more unstable than substrates.

On the hemicetal formation, the hemicetal structure is the most unstable compared to other molecules (2, 1, 1’, 0). On the hemicetal formation, the hemicetal structure is the most unstable compared to other molecules (2, 1, 1’, 0). While on the formation of acetal from hemicetal, resonance structure (5 and 5’) showed higher energy compared to the other molecule (compound 4,6,7). On the hemicetal formation, the hemicetal structure is the most unstable compared to other molecules (2,1,1’, 0). While on the formation of acetal from hemicetal, resonance structure (5 and 5’) showed higher energy compared to the other molecule (compound 4,6,7). Based on the reaction mechanism, there are 7 steps acetalization of 3-chlorobenzaldehyde that is protonation, 1,2-addition, deprotonation to form hemicetal, protonation, removal of water, 1,2-addition, and a final was deprotonation to form acetal. The electronic compounds structure of all compounds in acetalization of 3-chlorobenzaldehyde shown in Figure 2.
3.1 Mulliken Charge

Hyperchem is the software that can analyze the Mulliken charge of an atom in a molecule. Mulliken charge analysis is the most widely used method in various software because this method is easy to understand. The results of the Mulliken charge calculation showed that the order of Mulliken charge of C8 atom in the compound was $3 > 7 > 6 > 4 > 5', 5' > 0 > 2 > 1, 1'$. Hemiacetal compound (3) has the highest Mulliken charge on C8 atoms as shown in Table 1 compared to other compounds due to the presence of electron withdrawing group that is methoxy and hydroxy groups on that compound. Acetals also have a
high Mulliken charge on C8 atom also due to the presence of electron withdrawing group that is methoxy groups on that compound. Whereas compound 1 has a low Mulliken charge on C8 atom due without electron withdrawing groups. In addition, neighbor oxygen atoms also have the positive charge, thus weakening the Mulliken charge of a C8 atom. The molecule model of the compound represented in Figure 3.

Table 1. Mulliken charge of C8 atom in compound 0-7.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Mulliken Charge of C8</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.337</td>
</tr>
<tr>
<td>1</td>
<td>0.333</td>
</tr>
<tr>
<td>1'</td>
<td>0.332</td>
</tr>
<tr>
<td>2</td>
<td>0.335</td>
</tr>
<tr>
<td>3</td>
<td>0.564</td>
</tr>
<tr>
<td>4</td>
<td>0.425</td>
</tr>
<tr>
<td>5</td>
<td>0.365</td>
</tr>
<tr>
<td>5'</td>
<td>0.370</td>
</tr>
<tr>
<td>6</td>
<td>0.469</td>
</tr>
<tr>
<td>7</td>
<td>0.483</td>
</tr>
</tbody>
</table>

Fig. 4. The molecule model of 3-chlorobenzaldehyde, intermediet, and acetal.

4 Conclusion

Theoretical study on the acetal formation has been done. Based on the reaction mechanism, the hemiacetal structure is the most unstable compound compared to other molecules according to the formation energy. The Mulliken charge of the C8 atom on the hemiacetal compound also higher compared to other molecules due to the presence of an electron withdrawing group that is methoxy and hydroxy groups. Whereas, the formation of acetal carried out by reaction of two equivalents of an methanol and elimination of water using acid catalysts (HCl). On the formation of acetal, SN1 reaction mechanism also studied especially in the compound 4, 5, 5', and 6.
Acknowledgements

My would like to especially thank Directorate of Higher Education, the Republic of Indonesia which has given financial support for this work via fundamental Grant 2016 (No. 022A/UN33.8/KU/2016), 2017 (No.045A/UN33.8/LL/2017), PDUPUT Grant 2018 (027/UN33.8/LL/2018). MY would like also especially thank for States University of Medan which has given facility support for this work.

References


Effects of Giving Red Fruit Oil on Creatinine and Urea Levels of Rats (Rattus Norvegicus) on Maximal Physical Activity

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Abstract. Maximal physical activity can produce an imbalance between reactive oxygen species (ROS) and antioxidants which is possibly related to fatigue and tissue injury. This study investigated the effect of red fruit oil on serum creatinine and urea level in maximal physical activity. This study used posttest-only control group design. Twenty four rats were divided into 4 groups. The control group (I) was administered with 1.5 ml distilled water, intervention groups (II), (III) and (IV) were administered with different doses of Red Fruit Oil (0.15 ml, 0.3 ml, and 0.6 ml/kgBW, respectively for 30 day). All groups were trained to swim for 4 weeks and then were forced to swim without a load until being exhausted. The serum creatinine and urea levels were measured in all groups. The results showed that creatinine and urea level obtained was decreasing significantly (p=0.000) in the intervention groups. The results suggest that red fruit oil can obviously reduce creatinine and urea level induced by maximal physical activity in rat.

Keywords: Red fruit oil, creatinine, urea, maximal physical activity.

1 Introduction

Heavy physical activity causes oxidative stress due to the production of free radicals that exceeds the total antioxidant in the body (Daniel et al, 2010; Urso, 2003). Oxidative stress from the training can cause brain damage and affect other tissues including the heart, kidneys, liver, brain and erythrocytes (Kocer et al, 2008).

During physical activity, several organs like the heart, kidneys, and other organ are in hypoxia and ischemia as oxygen is higher at the contracted muscles. This disturbs the metabolism and cell homeostasis also causes damaged in the tissue (Radak et al, 2013). After the exercise, the blood quickly flows back into the kidneys. Along with that, a big oxidant is released which can damage kidney cells and activate leucocyte. Therefore, the kidneys will severely damaged (Daniel et al, 2010). Progressive damage in the kidneys can be measured clinically by measuring serum creatinine and urea level (Verdiansah, 2016).

Several studies have been conducted to see the effect of physical activity on kidney function. Foranet al., (2003) found that the short-term effects of marathon training increased creatinine and blood urea nitrogen (BUN). According to Warburton et al., (2002) concentrations of urea and creatinine increased after prolonged strenuous exercise in which
this increase was associated with decreased renal blood flow and glomerular filtration rate, increased protein catabolism and creatinine release due to muscle work.

In the body, there is endogenous antioxidant or anti free radicals. The free radical formed is neutralized by elaboration of defense system between enzymatic and non-enzymatic antioxidant (Christopher, 2004; Urso, 2003). One of the natural resources known to contain antioxidant is red fruit Pandanusconoideus Lam, found in Papua. Red fruit contains high nutrients and active compounds such as beta carotene, tocopherol and fatty acid (Budi, 2005; Alam Syah, 2005).

The results show that red fruit is able to reduce malondialdehyde (MDA) level in rats which did maximum physical activity (Sinaga, 2015). The study is very interesting. Therefore the effect of red fruit to kidney function in rats which have done maximum physical activities need to be done.

2 Methods

2.1 Design, Place and Time

This is a true experiment with posttest-only control group design. The research was conducted in Pharmacology Laboratory in Pharmacy Faculty Universitas Sumatera Utara from March to April 2018.

2.2 Sample Retrieval Type and Method

The sample used in the study was 2-month old male Wistar rats, weighed ±200g from Pharmacology Laboratory in Pharmacy Faculty Universitas Sumatera Utara. Total sample was 32 rats which were divided into 4 groups with Group I as control group, Group II, III and IV as experimental groups with different treatments. The equipment used was cage, feed container, aquarium as pool for swimming practice, digital scale, creatinine and urea testing equipment. Feed for rats, Comfeed AD II, and red fruit oil were obtained from a drugstore.

Tables. All included tables must be referred to in the main text and the table title and caption are to be positioned above the table. The captions need to be written in Times New Roman, 9pt.

2.3 Research Stages

32 rats were made adapted for 7 days and they were given standard feed, Comfeed AD II, aquadest and libitum. Next, rats were weighed and given maximum physical activities by letting them swim to drown. The duration of the swim was used to determine the time for exercise program, which is 70% from maximum physical activity. Next, all subjects went through training program, 3 times a week for 30 days. During the program, three experimental groups were given Pandanusconoideus Lam oil as much as 0.15 ml/kgBW, 0.3 ml/kgBW and 0.6 ml/kgBW, while control group was given 2 ml of aquadest. The next step was to reweigh each of the subjects and followed by maximum swimming exercise. The duration of activity was recorded. Blood sample was taken and creatinine and urea levels were measured using spectrophotometry.
2.4 Data Processing and Analysis

Data of research result determined homogeneity and normality to determine statistical analysis used. Data were analyzed using one-way ANOVA test to determine the mean difference between treatments using SPPS 19.0 program. If there is a significant difference, further proceed with the Tukey test to determine the differences value between treatment groups. Based on the significance value, p<0.05 is considered statistically significant.

3 Result And Discussion

The average weight of rats in the research can be seen in Table 1.

Table 1. Average weight of rats (g) before and after the administration of red fruit oil.

<table>
<thead>
<tr>
<th>Body Weight (g)</th>
<th>Group</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
</tr>
<tr>
<td>Before treatment</td>
<td>204.33</td>
<td>204.66</td>
</tr>
<tr>
<td>After treatment</td>
<td>225.33</td>
<td>225.83</td>
</tr>
</tbody>
</table>

Normality and homogeneity tests data show that the average weight of rats before and after the administration of red fruit oil is normal and homogenous (p>0.05). Based on statistical test with one way ANOVA test, there is no significant difference in weight of rats before and after treatment intervention (p>0.05). This result shows that the use of experimental animals in the research has met the ethical standard for animal welfare. Following 3-R principle: Replacement, Reduction and Refinement, in the animal welfare ethical standard is mandatory.

The measurement of urea and creatinine in Wistar rats after maximum physical activity can be seen in Figure 1 and Figure 2 respectively.

![Fig. 1. Average rats urea level after maximum physical activity. Value are mean ± SD of 8 animal in each group. I, control group; II, 0.15ml/kgBW red fruit oil, III, 0.3ml/kgBW red fruit oil, IV, 0.6ml/kgBW red fruit oil.](image-url)
Normality and homogeneity data gave $p>0.05$ which shows that data is distributed normally and homogenously. ANOVA test gave $p=0.000$ ($p<0.05$) which tells that Pandanus conoideus Lam oil intake for 1 month during the training program is able to reduce urea and creatinine level at maximum physical activity. To see the influence of each Pandanus conoideus Lam oil dosage to urea and creatinine level, Turkey HSD test was conducted and $p=0.000$ ($p<0.05$) result was obtained. This shows that red fruit oil dosage significantly affect urea and creatinine levels. The higher the dosage given, the lower urea and creatinine levels are.

![Average rats creatinin level after maximum physical activity. Value are mean ± SD of 8 animal in each group. I, control group; II, 0.15ml/ kgBW red fruit oil, III, 0.3ml/ kgBW red fruit oil, IV, 0.6ml/ kgBW red fruit oil.](image)

In this study, the urea level in rats after maximum physical activity was reported as 62.33 mg/dl while the creatinine level was 0.82 mg/dl. The high urea and creatinine levels in this study were caused by maximum physical activity where the kidneys are in hypoxia state due to most blood flows to contracted muscles. Then after the physical activity has stopped, blood quickly flows back to kidney and along with that a big amount of oxidant is released (Daniel et al, 2010). Oxidant damages the kidneys and activates the leucocyte. This worsen the damages in the kidneys which is shown by the increase level of urea and creatinine.

The effect of red fruit oil administration in this study shows that it can reduce urea and creatinine levels produced by maximum physical activity. Antioxidant content in Pandanus conoideus Lam oil, such as beta carotene and tocopherol, is known to be very high (Budi, 2005). As one of the plants that contain antioxidant, the activity of this fruit has been tested invtro by Rohman et al (2010) and Widowati et al (2008). Then carotenoid bioavailability test was conducted by Roreng et al (2014). Tocopherol is a potential inhibitor to lipid peroxidation. It can easily donate hydrogen atom to hydroxyl functional group (OH), from ringstructures to unreactive free radicals (Silalahi, 2006).

β-carotene is a color pigment in Pandanus conoideus Lam which is converted by the body to become vitamin A. It functions as antioxidant that works as defense mechanism to highly reactive oxygen (Alamsyah, 2005). The study done by Sandhiutami (2010) concluded that Pandanus conoideus Lam oil has IC50 value of 451.51 μg/ml at in vivo analysis. In in vivo test, 0.15, 0.3 and 0.6 ml/kg weight dosages are able to reduce MDA level in the blood sample from rats given maximum physical activity (Sandhiutami, 2010; Sinaga, 2015). The antioxidant potential in red fruit oil has also been reported to increase Glutathione Peroxidase (GPx) antioxidant level (Sinaga, 2018). Furthermore, it can decrease creatine kinase (CK) level in rats given maximum physical exercise (Sinaga, 2017).
4 Conclusions

The administration of Pandanusconoideus Lam oil during the exercise program can reduce the urea and creatinine levels in rats due to maximum physical activities.

5 Acknowledgements

The authors thank to Directorate for Higher Education, The National Education Ministry of Republic Indonesia for for Research Grant of Hibah Fundamental for financial support.

References


The Sustainability of Construction Technology of Mandailing Traditional Wooden House in Sibanggor Julu Village

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Abstract. Sibanggor Julu is one of traditional village located in Mandailing, Sumatera Utara. The houses in the village were built by tradition ability from generation to generation. However, the sustainability of craftsmanship and technology slowly lost by cultural and economic change. The objectives of research was to identify and inventory the communities technology and expertise in construct a traditional house and find best solutions to preserve its existence. The identification and inventory is done by making a technical drawings, materials description, and craftsman skills. The research method approaches by qualitative and experimental. It discussed by descriptive analytic from observation, interview and study of literature relevant with focus of discussion. The results obtained that the technology of construction of Mandailing traditional house is currently applied and downward to the next generation. The sustainability of craftsman expertise are preventing because of the availability of local materials and the economic capacity of communities to build their houses. Nevertheless, the traditional houses of Mandailing still have place in the hearts of the community with all its limitations. Finally, the solutions provided to maintain the sustainability by preserving, craftsman training and informing similar material and strength properties.

Keywords: sustainability, construction, traditional house, Mandailing.

1 Introduction

Sibanggor Julu Village is a traditional village in Mandailing, Sumatera Utara. The village is very unique and distinctive which is shown by the house form with a strategic location in the BatangGadis National Park (TNBG). TNBG is a tourist spot located at the foot of SorikMarapi Mountain. The attraction of SorikMarapi Mountain is the entrance for tourists to come to the Sibanggor Julu village. Typical architecture should be maintained as another attraction in the TNBG area. Therefore, it is very important to maintain the sustainability of Mandailing traditional wooden house in Sibanggor Julu.

The traditional house in Sibanggor Julu is a type of traditional wooden house with the characteristics of a stilt house and palm fiber as the roof covering. The building is made with wood construction and the use of local materials done through traditional craftsmanship skills. However, the houses are threatened with extinction along with economic and cultural developments. The availability of local materials and craftsmanship skills slowly disappear and are not inheritance to the next generation is one of the causes of the loss of tradition of
establishing traditional wooden houses in SibanggorJulu. In fact, this happened almost all over Mandailing area.

The Knowledge of traditional wooden house construction is an attempt to translate skills, materials, tools and building processes with local knowledge. Thus, it can survive in the community, and technically become a document for learning the reliability of traditional wooden building structures.

2 Methodology

This research was conducted with an experimental and qualitative approach which was explained descriptively analytic. Data obtained from observation, interviews, field and laboratory testing. Research location is in several villages in Mandailing. Some of villages have similar forms of houses, craftsmanship skills, and materials. However, there are some modifications that have been made by the community that reduce its authenticity. Meanwhile, the houses in SibanggorJulu Village are still preserved. Therefore, the locus of SibanggorJulu Village was chosen as the observation location.

3 Traditional Wooden House Of Sibanggor

SibanggorJulu settlement is dominated by wooden houses that are traditionally built, and some of built with conventional. Besides, many houses in the village have been modified, both in form and material.

The location of strategic settlements in TNBG causes the village always be visited by local tourists. The emergence of tourists became the gateway for SibanggorJulu village to improve themselves, especially from architecture. The wooden houses that are still preserved can be introduced to tourists who go through villages. The uniqueness of building techniques and materials used can be an attraction for tourists to get to know the history and culture of Mandailing.

Traditional wooden houses in Mandailing consist of three types, including bagasgodang (the king's house), the house of the royal family, and the community house. The difference in typology of the house is marked by the size of the building, the shape of the roof, the arrangement of spaces, number of column, and ornamentation. Construction is composed of local wood materials, namely Bania, Medang and Surian wood, as well as traditional building techniques. The difference in construction is clearly visible on the roof frame. Bagasgodang roof shape is larger than other types of houses, composed of a complex roof frame, but with a simple arrangement. And the arrangement is different from conventional wooden houses.

Foundations and roofs are the most prominent building components and characterize traditional house architecture in Mandailing. The foundation of stone material was chosen and taken from around the settlement. Foundation joints with building frames do not use bonds found in conventional construction. The stone serves as the foundation of the building frame and aligns the lateral movement of the earth when an earthquake occurs. This foundation construction can be calculated for its strength because it has survived for decades. However, the traditional wooden house in SibanggorJulu is vulnerable to damage and burning, both material and construction.
Therefore, it is necessary to trace construction technology in field observations and laboratories to support sustainability efforts and maintain the reliability of buildings in a longer period of time, as well as carry out building maintenance according to the character of materials and construction.

4 Construction Technology Of Wooden House

Sibanggor traditional wooden house construction technology can be traced to the method and technique of building construction, which consists of construction, material and craftsmanship skills.

4.1 The Construction and Material

The architecture of the traditional Sibanggor wooden house is a stilt house. The building is composed of components and elements of building, such as foundation, floors, walls, roofs and supporting elements. The characteristics of construction are marked by a frame system composed of column and beams, and walls as fill elements. This house uses local materials, namely stone, timber, bamboo and palm fiber. Overall, the construction of the SibanggorJulu wooden house is a lightweight construction and context with natural conditions.

SibanggorJulu Village is located in PuncakSorikMarapiSubdistrict, Mandailing Natal District. The village is located at foot of SorikMarapi Mountain. Mandailing Natal Regency is included in the physiographic unit of GrabenPanyabungan which is part of the Sumatra Fracture System (madina.go.id, 2014). Mandailing geological conditions are quite complex with types of rock are Permocarbon to Resen. The land is rocky hard soil. And rocks obtained from lava that came out of volcanic eruptions decades ago. Thus, this village is very close to the earthquake epicenter, especially earthquakes caused by volcanic eruptions.

![The characteristic of environment of SibanggorJulu.](image-url)

Earthquakes occur and will damage the human environment (i.e. buildings) one of which is determined by the distance of the hypocenter or epicenter (Idham, 2014). In addition, the type of soil, the duration of the earthquake and the design of the building also determine the
damage. Earthquake activities around the SorikMarapiMountain area are dominated by type of distant tectonic earthquakes.

The energy of the earthquake force and the load of the building itself greatly affects the physical building as a whole during the earthquake. In addition, environmental factors also determine the effect of the earthquake on buildings. The same magnitude of earthquake in different areas will have a different impact on buildings. Building damage due to earthquake depends on the strength of the earthquake source and the energy waves that are transmitted to the building site are located. Therefore, it is necessary to consider the size of buildings, structural systems, and building materials to reduce the lateral load of earthquakes that shake the building.

Sibanggortimber houses are included in the category of non-engineered buildings that are builtin local or traditional ways and techniques without expert building services. In general, traditional local buildings tend to have a high response to earthquakes. Because of rapid developments and changes of construction technology are necessary to keep analyzing the reliability and sustainability of these buildings.

![Fig. 2. The tie between foundation and column.](image)

The structure of Sibanggor traditional wooden house is a lightweight building structure system, consisting of a column and beam frame system, a wall as a fill element, and palm fiber as a roof covering. Building size is between 4 x 5 meters to 5 x 6 meters. This size can be categorized as a small building. The building function is very simple, consisting of a common room (called pantar), a kitchen (called bolat), and a bedroom (called bilik). The uniqueness of the building is also marked by local materials such as timber, stone, bamboo and palm fiber. These materials are quite light for the building support system which is the foundation, especially to reduce the lateral movement of the earthquake. Overall, the building structure applies a flexible system by applying a mortise-join system connection. In this case, the mortise-join system serves to reduce rigidity in the structure. Therefore, Sibanggor traditional wooden houses can be said to fulfill the requirements of earthquake resistant buildings. And it is necessary to apply for sustainability of the reliability and performance of the building structure. Efforts can be made through determining the level of vulnerability of buildings to earthquakes with the RVS (Rapid Screening Visual) method which aims to categorize the level of security of the building population quickly.
Timber is the dominant building material that forms the Sibanggor house. Besides timber, other materials are bamboo, palm fiber and stone. The types of wood materials used include: Bania, Surian, medang, buluh soma (Schizostachyum Brachyladum Kurz), and aren / enau / bargot (Arenga Pinnata Merr.).

These building materials were obtained from the area around the village. The growth location of each material is in preserve forests, in community plantations, and grows wild around settlements. Bania is a type of hard wood, Surian is lighter than others, Medang gives off a distinctive aroma, and Buluh Soma is a wild plant that has a harder character than other bamboo species in the Sibanggor Julu area.

Based on the Indonesian Forest Management Unit (KPHI), timber forest products in Mandailing Natal are dominated by Medang (Litsia firma HK.F), Kelat (Xylopia altissima Boerl), Lesions (Taretia), Meranti (Shoreasp), Resak (Fatica Songa V.Si), and Laban (Vitex pubescensvalil), Kapur, Kruing, Bania, Merbau, Rengas. The wood is very potential to be developed or utilized.

Timber is mainly used to build houses in Mandailing Natal, including Sibanggor. Bania is a type of wood generally used for structure compared to Medang. They are used on columns and beams. Other woods namely Surian are usually used for building elements such as walls, door-window frames, and floor boards. Moreover, bamboo is also used as a building element, among others, as a wall, underpurlin, and to tied the roof covering.

The wood age ranges ± 20 to 30 years. Before apply as building components, the woods first dried through natural processes. The process is done by drying the wood in the sun for ± 2 weeks or more, depending on the sun’s heat. After the building is built, maintenance of building materials is carried out in a natural and chemical treatment process. Natural treatments occur through the burning process, when the cooking process is in the kitchen area. In addition, the chemical method used is to apply oil to timber parts, especially those that intersect with the outside area.

The characteristics of wood materials used for Sibanggor traditional wooden house are as follows (Winoto, 2014).

1. Bania known as Meranti Merah. The wood included in a primary class of wood. Specification of density is 0.05, durability classified in class III and IV, strength in class II and IV on timber industry’s Indonesia. If Bania used as column and beams, then its durability can last long for several years. However, if this type of wood is associated with moist soil, then its durability is very short about ± 3 years. This wood is quickly attacked by insects and is rarely attacked by dry wood powder.
2. Surian included in the jungle wood category that included in a secondary class of commercial timber. Surian known as good quality wood. This wood has economic value. It is a good quality of wood and not easy to decomposition and attack by insect. The wood sizes range from 40 to 60 meters. Almost all parts of wood can be used because it has a free of branches can reach a height of 25 meters. Wood diameter ranges from 1 to 3 meters with a height of 2 meters. Wood characters are physically broken and overlap on the trunk. This wood is characterized by the colour of the bark which is Whitish brown and grayish, and release a distinctive aroma when it cut. It is a lightweight timber and suitable for building materials, especially for walls, door-window frames, and floor boards. Specification of density is 0.39, durability classified in class III and IV, strength in class III and IV on timber industry’s Indonesia.

3. Medang included in the Meranti category. It is a primary class of wood. Durability classified in class III and IV, strength in class II and V on timber industry’s Indonesia. The durability of Medang is not different from Bania and Surian. There are species of Medang susceptible to insect-attack and dry wood powder, some are not.

4. Schizostachyum Brachycladum is known as Bamboo Betung / Petung. Type of bamboo forms area cluster, timeless, green throughout the year. The culm has a length of 10-15 meters and a diameter of 60-80 mm. The internodes has a thickness of 3-5 mm and a length of 20-50 cm, smooth, pointed and cylindrical. Bamboo Betung including the appropriate type of bamboo used for buildings. Bamboo in the Sibanggor wooden house is used as a wall, a purlin, and joinery. Bamboo is not the main material in the Sibanggor wooden house, but can be used as a substitute for a member of roof frame because of its lightweight.

Based on the results of field testing using a Sylvatest measuring instrument (Nasution, 2018), in general the Modulus of Elasticity (MoE) Static averages 12432.77 Mpa. Based on SNI 7973: 2013 included in the E12-E13 quality wood category. This type of wood meets the requirements for building structural components (column, beams, floor boards, walls, roof ring beams, and roof frames). From the test results found MoE below the average which indicates a change or decrease in strength or quality of wood due to cracking or weathering due to age.

4.2 The Craftmanship

Building knowledge of timber has become a tradition in almost all regions of the archipelago (Armand, 2014). Traditional Indonesian society has known this tradition for hundreds of years. However, knowledge of how to build and the building is not generously documented. Today, documentation on traditional architecture have been encountered and discussed from a variety of perspectives. The documentation is important to continue to be carried out so that a sustainable tradition can be maintained, even though the artifacts are lost or damaged.

Traditional building consciousness cannot be separated from the periodization of history in Indonesia. Traditional craftsmanship artistry develops not only in terms of skills, equipment, but art and architecture that have material consciousness. As quoted from Armand (2014), material consciousness is the awareness of a craftsman to produce something of quality with sensitivity to energy, materials, natural environment through local equipment. However, the rapid development slowly eliminated the art of material consciousness from building craftsmen, even architects today. This is important because Indonesia still have well-made traditions, manpowers surplus, rich of natural materials, and prioritizing the equipments, in a period of time.
The traditional SibanggorJulu wooden house was built by techniques, equipment, and craftsmanship skills from generation to generation. The craftsmanship skills slowly disappear and shift into conventional skills. It persists when the techniques and building itself is still in demand and preserved by the community. SibanggorJulu Village is potential to maintain its tradition, especially the tradition of wooden houses. The community interest and needs to establish traditional wooden houses still exist, but the availability of skilled human resources is very limited.

The number of experts in traditional wooden houses in SibanggorJulu Village is very limited. Currently, there are only three craftsmen who have close family ties. In addition, other craftsmen are not categorized as an expert but a beginner. The skills of expert craftsmen to the beginners are not done specifically and intentionally. The skills are derived by observing and following building techniques applied by expert craftsmen. This process can shift from noblecraftsmanship skills into practical skills. The desire of the young generation is decline as traditional carpenters. It is caused by a long and difficult work process, financially unable to cover the needs of everyday life. The availability of craftsman, local materials, equipment, and traditional techniques will be lost, if these elements are not inherited and spreaded to the next generation. Efforts must be supported by material consciousness from expert craftsman, who act as architect and finally able to produce traditional architecture that is ethical and aesthetic.

4.3 The Sustainability of Traditional Wooden House of SibanggorJulu

Traditional wooden structures, in this case old or historic buildings, represent an important part of the World Cultural Heritage. The techniques and timber building materials are the history and conservation activities are essential contributions to cultural diversity and cultural wealth globally (Cavalli, 2014). Traditional timber cannot be seen and assessed as a new construction, because the testing continues until now. When a timber structure cannot be conserved, it needs to be repaired or given reinforcement. Therefore, traditional timber testing activities need to be continuously carried out.

Based on the Wood Committee Principles described in the Conservation of Historic Timber Structure (Larsen, 2016), in the effort to preserve and repair the timber structure of historic buildings such as traditional buildings, as much as possible make duplication that aims to reward previous generations' insights, policies and knowledge. This means that 1) when replacing one of the timber structures it should be replaced with the same type of wood or similar quality, 2) the tools and techniques used are identical or similar to the tools and techniques used by the previous craftsmen to be formed and assembled according to wood. The policies and knowledge of previous generations through material, tools and craftsmanship techniques became authentic historical documents. By duplicating the choices and efforts of the previous generation, the beauty expected by the creator of the structure can be maintained. If the original choices do not prove to last long, then the latest solution must be chosen.

The characteristic change of construct traditional wooden house is by replacing parts of the structure damaged by fungi and insect-attack, or weathered and burned. And the sustainability of traditional craftsmanship skills is to carry out continuous preservation activities.
5 Conclusion

The sustainability of building techniques, local materials, and traditional craftsmanship skills in establishing traditional wooden houses in SibanggorJulu is important to be preserved. Efforts are made through substitution of building materials with local materials that have strength and durability qualities that resemble existing timber, and apply local construction techniques. In term of craftsmanship skills, the approach can be done through participatory community in the form of craftsmanship training for beginner craftsman about the importance of construction and traditional skills to be developed in SibanggorJulu, even in other Mandailing areas.

6 Acknowledgment

The author is very grateful to the UNIMED Research Institute who has funded The Institution of Strategic National Research in 2018. Infinite gratitude is also addressed to Kemenristekdikti Institution of the Republic of Indonesia which has opened up opportunities for lecturers and faculty in State Universities to follow various research schemes to expand and develop scientific insights

References

Abstract. In the research on the development of zombie tsunami games to improve basic motor skills for class I MIN children, this is a process used to develop and validate learning products. Research and development in this learning uses the Research & Development (R & D) development model. Target clients or users who are the target in the research on the development of zombie tsunami games to improve basic motion skills for class I MIN children with a total of 40 students. This study was carried out in 2 large group trials and 1 small group trial. The ultimate goal of this development research is to produce a product in the form of a zombie tsunami game to improve the basic motion capabilities of MIN students, so that it can help the teaching and learning process so that student learning can be more effective, efficient and interesting.

Keywords: Games, Play, Zombie Tsunami.

1 Introduction

The Education Curriculum covers six aspects of development namely moral and religious values, social-emotional and independence, language, cognitive, physical / motoric and artistic abilities, is a form of early childhood education program. Elementary school is an education level that must be followed and provide benefits for preparing children to enter junior high school. In general, learning in elementary schools for many aspects of physical development has been done by adjusting to certain sports. Physical exercise in early childhood should still pay attention to simple basic movements. Simple movements will make children easy to understand and carry out instructions. This will also minimize the occurrence of injuries to children.

If the physical development of the child gets an exercise that is in accordance with the characteristics of the child, then the tendency of the child will be easier to achieve in the desired sport. Children's motor skills begin with basic motion exercises. Basic motion is very important in an effort to instill the correct foundation in motion. Therefore, it is necessary to have a discussion about what basic movements are important and must be controlled by the child.

Playing for children is an exciting thing. Especially traditional games which involve many children and are in open spaces. So, it is not wrong with the results of Kurniati's research (Novi, 2016: 75). In his research he showed that traditional games can stimulate children in developing cooperation to help children adjust, interact positively, can condition children in self-control, develop empathy for friends, obey rules, and respect others. Thus, it can be
understood that traditional games can have a very good impact to help develop children's emotional and social skills.

Based on this thought, it is carried out by observing students who include running, jumping, jumping, throwing, and spinning. These movements are movements that are often carried out by elementary school students. Based on observations at MIN Medan for class I students that there were problems: 1) Where from all the basic motion samples chosen by the researcher, it turns out that only a few students understand the instructions. And students are not interested if the material is carried out just to do the movement without the game. 2) Based on the observations of teachers and researchers that primary school children are already infected by virus games on smartphones, observations made several months by the teacher where the conversation students during recess usually discuss gaming on smartphones and this is the negative effect of technology that has been attacking children's thinking. Where should children play at their age but instead use smartphones without parental guidance. Smartphone addiction is a very complex problem if it occurs in early childhood. 3) The researchers also found motor problems in some children that there are children who trembled when instructed to run, no child is easily tired when instructed to jump and there are children who are not able to perform a series of movements running, jumping, throwing and turning. 4) Based on the observations of researchers that physical education teachers do not apply the concept of playing an interesting game so that to provide basic motion learning will be very difficult to provide stimulus to students and the learning objectives will not be maximized. Learning movement (motor learning) is the study of skills to acquire and enhance the movement, which according to HeriRahyubi (2012: 208) to learn the motion is influenced by various forms of training, experience and situation of human learning. To be able to do so requires attention control and concentration or concentration.

The term motoric is often considered the same as motion because the two terms are very difficult to be limited in concrete terms, even using the two terms (motor and movement) interchangeably, and defining motoric is a latin event that includes the whole process of controlling and regulating the functions of good organs physiologically and psychologically so that movement occurs.

The ability to move can be understood as an indicator of the level of proficiency or mastery of a thing that requires body movement. Mastery of a movement is a process in which a person develops a set of responses into a coordinated, organized and integrated movement pattern. Every ability of motion requires the organization of muscles according to the place, meaning that there is a group of muscles selected to perform a movement, organizing according to time means that the muscles contract or relax must occur at the right time and in harmony. HeriRahyubi, (2012: 209) someone who does the process of learning the motion properly and correctly will experience a change, for example from "not being able" to "being able", from "unskilled" to "skilled", relating to things of motion.

Playing or playing is colored by the atmosphere of paidia but in games, the elements of life stand out (Agung, 2017: 78). Formal games are competitive interactions and aim to achieve a predetermined goal. He has an end point called game people. According to Calhoun (in Agung, 2017: 78) the game is a play activity that has clear rules, specific goals, elements of competition and sequences of actions that are essentially repeated every time the game.

Game is a branch of sport that we use as a tool in educational efforts (Soedjadi, 1979: 1). Every time we use a tool we certainly expect the use of the tool in our use to reach a goal. To what extent is the role of the game in the formation of the child and how much help is the game in helping to learn and improve the skills of other branches.
In this study, researchers adopted a tsunami zombie game on a smartphone. And this game is quite popular with children in elementary school. And by applying this game into motion activities, it increases students' interest and motivation in learning physical education.

2 Method

Research and development in this learning uses the Research & Development (R & D) development model of Borg & Gall (1983: 776) which consists of ten steps including: (1) Conducting research and gathering information (literature review, subject observation, preparation principal report) (2) Planning (defining skills, formulating objectives, determining teaching sequences, and small-scale trials) (3) Developing initial product forms (preparation of teaching materials, preparation of handbooks and evaluation tools) (4) initial field test (using 6-12 subjects) (5) Revising the main product (in accordance with suggestions from the results of the initial field test) (6) Conducting the main field test (with 30-100 subjects) (7) Revising the product (based on suggestions and results of the main field trials) (8) Field testing with 40-200 subjects (9) Revision of the final product (10) Making a report on the product in a journal, working with enerbit who can conduct commercial distribution.

3 Result And Discussion

Learning motivation in elementary school children in class I, in particular there are several objectives including: 1. Develop and implement a tsunami zombie game on learning physical education for elementary students. 2. Obtain empirical data about the effectiveness, efficiency and attractiveness of the results of the development of tsunami zombie games for elementary students. The ultimate goal of this development research is to produce a product in the form of a game module that contains zombie tsunami games, so that it can complement the learning that is currently available, namely that students can learn more: 1. Effective, meaning that it is complete in increasing the effectiveness or convenience for students in mastering basic movements. 2. Efficiency, the meaning is the completeness of learning assistance, where with minimal costs and time so that maximum results can be obtained in mastering manipulative basic motion material. 3. Interesting, meaning that it is the completeness of learning that has appeal so students can be motivated to use it.

In this development research data analysis techniques used are quantitative descriptive analysis techniques with percentages. This technique is used to analyze quantitative data obtained from the results of questionnaire evaluation evaluation from game experts and physical education learning experts on the results of products developed.
References


Analysis of the Conditional Verb in the Novel I’ete Des Lucioles

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Abstract. In general, the use of conditionnel mode in life is to show politeness, both verbally and writing. Novel is an interesting work of writing to read, but there are many modes in it including conditionnel mode which if it is not understood so the meaning will not be got. Therefore, the aim of this study is to find out conditional verb and the most conditional meanings used in the novel l'Eté des Lucioles by Gilles Paris. The method used in this study is a qualitative descriptive method with data sources is the novel l'Eté des Lucioles by Gilles Paris. The theory used in this study is the theory of Isabelle Chollet et Jean-Michel Robert. Based on the results of the study and discussion, it is known that the conditional present meaning found in the novel l'Eté des Lucioles by Gilles Paris is a meaning in the form of desire / le souhait / le désir as many as 19 times out of the 57 conditional meanings found. Besides that, the conditional meaning in the past form which uses the most conditional meaning in the novel l'Eté des Lucioles by Gilles Paris is le souhait / le désir for 5 times out of 12 conditional meanings found.

Keywords: Verb Meaning, Conditional Verb, l'Ete des Lucioles Novel.

1 Introduction

Le mode (from Latin, that is, way) is a grammatical part that shows how verbs express facts. Mode is the expression or description of the psychological situation of the speaker's actions or the speaker's attitude towards the subject in question. One form of mode is Conditionnel mode that shows condition, hypothesis, presumption that sometimes the context of the sentence is presented as an illusion or dream.

In accordance with the opinion of Chollet (2009: 106) which says that mode expresses the attitude of the speaker with relation to what he is talking about. There are several modes, namely: L'indicatif, Le subjonctif, Le conditionnel, L'estatif, Le infinitive mode, Le mode participe.

In general, the use of conditionnel mode aims to express the courtesy of the speaker. Example Sérieux, volontaire et immédiatement disponible, j'aimerais avoir l'opportunité de me former au métier de caissier et, ainsi, de servir votre enseigne de grande distribution.

Dans l'attente d'une réponse de votre part, veuillez agréer, Madame, Monsieur, l'assurance de ma considération distinguée.

Based on the example above, the use of conditionnel mode in a text must be known by students, otherwise the value of the text is not meaningful.
Novel is a very interesting literary work, with many modes contained in it, including *le mode indicatif, impératif, conditionnel, et subjonctif* so to be able to understand a novel, we must know the meaning of each different modes.

In the novel L'été du Lucioles de Gilles Paris, we found several examples of the use of conditionnel présent, ce sont:

« … des fois, *j'aimerais* être un roman pour ne plus quitter sa main» (Gille paris, l’été des lucioles, p. 113).

«…, ils ont dit qu’elle *reviendrait* bientôt dans son pays. « (Gille paris, l’été des lucioles, p. 135).

In the first example, an example of conditionnel présent that shows *la volonté*

In the second example, conditionnel mode is preceded by a past verb that shows *le futur dans le passé*.

This makes conditionnel mode important to be understood because when reading a novel without understanding the good conditionnel mode so the value of the sentence can be wrong.

This is what makes this research important.

1 Les Valeurs du Conditionnel

Chollet (2009 : 139) dit que les emplois du conditionnel présent sont:

La conditionnel présent expresses a request, hope, or desire at a time of present. Le conditionnel signifies courtesy;

1) Expressing a request politely, usually using verbs such as comme être, avoir, pouvoir, savoir.

**Exemple:**

*Pourriez* - vous me renseigner? *Auriez-vous* l'heure?

Je *voudrais* un renseignement. *Seriez-vous* aimable pour m'aider?

2) Can also express desire or hope politely, with verbs such as aimer, désirer, préférer, vouloir.

**Exemple:**

Bonjour, je *voudrais* un café. (*demande polie*)

Je ne voudrais pas être en retard. (*souhait*)

J’*aimerais* bien aller au cinéma, tu *voudrais* venir avec moi? - Je *préférerais* aller au concert.

3) By using the verbs *; aimer, vouloir, adverb does not show but refers to asking politely (demande)*

**Exemple:**

J’*aimerais* beaucoup aller au cinéma avec toi. (*j'ai très envie*)

J’*aimerais* bien aller au cinéma avec toi. (*si possible*)

4). With other verbs, verb that indicates the desire follows adverb, the conditionnel expresses hope, which the expectation is determined by the context.

**Exemple:**

Je *boirais* bien un café. (*réalisable chez soi dans un café*)

Elle folle de cet acteur célèbre, elle *sortirait* bien avec lui. (*difficilement réalisable*)

J’*habiterais* bien dans chez château. (*irréalisable pour le touriste de passage à Buckingham palace*)

5). Le conditionnel exprime aussi le advice, reprimand, suggestion and suggestion

Advices by using verbs such as devoir and falloir

**Exemple:**

- Tu *vase* être en retard, tu *devrais* te dépêcher.
- Vous avez l'air très fatigué, il *faudrait* que vous preniez un peu de repos.
6). Reprimand by using the verb pouvoir et devoir.  
**Exemple:**
- Tu _pourrais_ me parler sur un autre tons!
- Ce devoir est plein de fautes, vous _devriez_ faire plus attention.

7). Suggestions with verbs such as aimer, dire, plaire, pouvoir, vouloir, etc.
**Exemple:**
- Ça te _dirait_ d'aller au concert? Ça te _plairait_ d'y aller avec moi? On _pourrait_ réserver pour demain.

8). Le conditionnel présent can also express la possibilité, la probabilité, le doute. Il exprimer:
- Un fait probable.
**Exemple:**
Il _aurait_ une grève des transports à Marseille. Aucun train _ne fonctionnerait_.
Mais aussi un fait possible, réalisable dans le futur.

9). Avec certains verbes comme pouvoir, sembler, paraître, le conditionnel insiste sur la possibilité. (le _doute est plus grande_)
**Exemple :**
La grève _pourrait_ durer une semaine, il semblerait que la direction refuse de négocier.

10). Dans les phrases interrogatives, le conditionnel exprime la surprise devant un fait possible, possible ou douteux.
**Exemple :**
- Il _aurait_ encore un grève demain? « _Possible ou probable_ »
- Toi ? tu saurais _réparer_ un ordinateur? « _Douteux_ »

11). In the preposition relative, the conditionnel present can change the subjunctive present that shows the hesitation.
**Exemple :**
Tu ne connais personne _qui irait_ (aille) demain à Marseille en voiture et _qui pourrait_ (puisse)m'emmener ?

12). Le conditionnel présent bisa mengekspresikan l'hypothétique, l'imaginaire ou l'irréel.
It depends on the concept of its imagination. Le conditionnel est utilisé dans le cas de projets plus ou moins réalisables (imagination ou projets hypothétiques).
**Exemple :**
- Ce serait drôle de faire un musée de la grammaire. On _mettrait_ les portraits des grands grammairiens, il _aurait_ la salle des exceptions… - Tu crois qu'on _aurait_ beaucoup des visiteurs ?

13). It is used to substitute unreal situation or incident.
**Exemple :**

14). Le conditionnel exprime aussi le futur dans le passé.
Le conditionnel présent est utilisé pour indiquer le futur dans le passé.
**Exemple :**
- Il _avait_ rendez-vous avec elle à six heures. Il l’a longtemps étendue. À neuf heures, il a compris qu’elle ne _viendrait_ plus.

15). Au style indirect, le conditionnel présent remplace le futur simple lorsque le discours rapporté est au passé.
Exemple :
- Damien m’a demandé l’heure de fermeture de la bibliothèque. Je lui a répondu que la bibliothèque fermerait à huit heures. (La bibliothèque fermerait à huit heures).

2 Les Emplois du Conditionnel Passé
Le conditionnel passé exprime une demande, un regret.
Lorsque le conditionnel passé exprime une demande polie, il est peu différent d’un conditionnel présent.

Exemple :
J’aurais voulu un renseignement (je voudrais un renseignement)
Le conditionnel passé exprime aussi un souhait ou un désir dans le passé, un regret.

Exemple :
Elle aurait aimé devenir musicienne. Ça lui aurait plu d’être guitariste.

Exemple :
Elle aurait aimé devenir musicienne. Ça lui aurait plu d’être guitariste.

2) Le conditionnel passé exprime un conseil, une suggestion ou un reproche.
Comme le conditionnel présent, le conditionnel passé exprime un conseil (avec devoir et falloir), une suggestion, un reproche (avec pouvoir et devoir) une suggestion mais dans le passé.

Exemple :
Tu es fatigué, il aurait fallu que tu te repose. (conseil)
On aurait pu regarder le film. (suggestion)
Tu aurais pu penser à acheter du pain. (reproche)

2) Le conditionnel passé exprime aussi une possibilité, un doute dans le passé.
Le fait a pu se réaliser, mais le doute subsiste.

Exemple :
Cette espèce animale aurait disparu depuis longtemps.

3) Dans les phrases interrogatives, le conditionnel passé exprime la surprise devant un événement possible du passé.

Exemple :
Pierre aurait gagné des millions au loto ?

4) Le conditionnel passé exprime l’hypothétique dans le passé
Il exprime l’hypothétique dans le passé, dans le cas de projets qui n’ont pas été réalisés.

Exemple :
On aurait pu aller en Bretagne, on aurait mangé des crêpes et on aurait visité Rennes.

5) Pour l’emploi du conditionnel passé dans les phrases complexes (si + plus que-parfait, conditionnel passé ; au cas où dans l’hypothèse où + conditionnel passé, etc.).

Exemple :
Au cas où tu aurais fini ton travail à temps, on pourrait sortir ce soir.

6) Le conditionnel passé peut exprimer un futur dans le passé. Il est utilisé pour exprimer un futur antérieur dans le passé. Il indique une action antérieure au futur dans dan le passé (indiquée par le conditionnel présent).

Exemple :
Le journaliste était très fatigué, mais il ne se reposera que lorsqu’il aurait terminé son article.

7) Au style indirect, le conditionnel passé remplace le futur antérieur lorsque le discours rapporté est au passé.

Exemple :
Il m’a téléphoné qu’il serait bientôt arrivé.
2 Methodology

This means that qualitative research is research that aims to understand all the phenomena that occur in the object, for example, character, perception, motivation, action, etc. At the description stage, D'onceon descriptive en quelques termes et langues, and the context for specific equalement en utilisant la méthode scientifique.

Descriptive method is a form of research that is suitable for identifying sentences in a novel. The research source is the novel «l'été des lucioles». 2014, par Gilles Paris and Précis de Grammaire. 2009, par Isabelle Chollet et Jean-Michel Robert as the source of the grammar book which explained the conditionnel mode.

As for the steps taken in the research, it begins with searching for the novel «L'été des lucioles», finding the verbs conditionnel in the novel «L'été des lucioles», reading and understanding carefully the use of the existing conditionnel values, classifying conditionnel verb from a novel based on Chollet's theory, finding the most widely used Trouver le système de formation de la valeur au conditionnel in the novel «L'été des lucioles», drawing conclusions and making a percentage from identification of the conditionnel values found in the novel «L'été des lucioles », making conclusions and giving possible suggestions.

3 Result And Discussion

After analyzing the research object, there are many conditionnel verbs both at the time of présent and those contained in the novel L'été des lucioles par Paris Grille.

<table>
<thead>
<tr>
<th>Les Verbes Au Conditionnels</th>
<th>Fréquence</th>
<th>Pourcentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONDITIONNEL PRÉSENT</td>
<td>128</td>
<td>80%</td>
</tr>
<tr>
<td>CONDITIONNEL PASSE</td>
<td>32</td>
<td>20%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>160</td>
<td>100%</td>
</tr>
</tbody>
</table>

Based on Le tableau 1, it shows that the conditionnel présent verb is more than the conditionnel passé verb, with the number 80%. Meanwhile, based on Chollet's theory, there are ten values of the conditionnel. That is valeurs d'une politesse / une demande polie, d'un souhait / un désir, d'un conseil, d'une suggestion, d'un reproche, d'une possibilité, d'un doute, d'une hypothétique, d'une imaginaire ou l'irréel, et d'un futur dans le passé.

To make this research sequent, so as to make a code for each valeur au conditionnel, as follows: les valeurs de A (Une politesse / une demande polie), B (Un souhait / un désir), C (Un conseil), D (Une suggestion), E (Un reproche), F (Une possibilité), G (Un doute), H (Une hypothétique), I (Une imaginaire ou l'irréel), J (Un futur dans le passé).

The percentage of each valeur found in the novel L'été des lucioles par Paris Grille is shown in the table below:
**Distribution des Valeurs des Verbes au Conditionnel dans le Roman l'Été des Lucioles**

The table above shows that there is a difference between the frequency and percentage of 10 valeurs conditionnels found: 1) In conditionnel présent, there is no value of A (Une politesse / une demande polie) et de E (Un reproche). On the contrary, in the conditionnel passé, there are no values of C (Un conseil), D (Un suggestion), F (Une possibilité), H (Une hypothétique) et J (Un futur dans le passé); 2) The lowest value in conditionnel présent sont celle D (Un suggestion), et F (Une possibilité) there is only one. While the lowest value in the passé conditionnel is at E (Un reproche) et G (Un doute).

<table>
<thead>
<tr>
<th>Les valeurs</th>
<th>Conditionnel présent</th>
<th>Conditionnel passé</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fréquence</td>
<td>Pourcentage</td>
</tr>
<tr>
<td>A.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>B.</td>
<td>19</td>
<td>33,33%</td>
</tr>
<tr>
<td>C.</td>
<td>3</td>
<td>5,27%</td>
</tr>
<tr>
<td>D.</td>
<td>1</td>
<td>1,75%</td>
</tr>
<tr>
<td>E.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>F.</td>
<td>1</td>
<td>1,75%</td>
</tr>
<tr>
<td>G.</td>
<td>18</td>
<td>31,57%</td>
</tr>
<tr>
<td>H.</td>
<td>9</td>
<td>15,78%</td>
</tr>
<tr>
<td>I.</td>
<td>2</td>
<td>3,50%</td>
</tr>
<tr>
<td>J.</td>
<td>6</td>
<td>10,52%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>59</td>
<td>99,98%</td>
</tr>
</tbody>
</table>

Then, the thing that also exists in the table is the most dominant valeur found in the novel that is the conditionnel présent verb et passé with valeur B (Un souhait / un désir) qui paraît 19 fois et 5 fois. This is because a novel not only divulges real life but there is also a fictional element in it. S'il était évaluée à travers la littérature de la psychologie, on peut tirer la conclusion que chaque être humain a une passion et un désir. Voilà pourquoi cette valeur se trouve souvent dans le roman L'été des lucioles.

Next, based on table 2 above shows that valeur du conditionnel H (Une hypothétique) was found 7 times or 12.29% at présent time, and 3 times or 25% in passé time, value du conditionnel D (Un suggestion) was found 1 time or 1.75% at présent time and also found 1 time or 8.33% in passé time, and valeur du conditionnel F (Une possibilité) was found 1 time or 1.75% at présent time and found 1 time or 8.33% in passé time.

Based on the table la valeur du conditionnel G (Un doute) was found 18 times or 31.57% at présent time, la valeur du conditionnel J (Un futur dans le passé) was found 6 times or 10.52% at présent time, la valeur C (Un conseil) was found 3 times or 5.27% at présent time, la valeur du conditionnel I (Un imaginaire ou l irréel) was found 2 times or 3.50% at présent time, la valeur du conditionnel A (Une politesse / une demande polie) which was found 2 times or 16.67% in passé time.

Besides, there are several valeurs du conditionnel that are not found in the novel l'Été des Lucioles at the time of présent ou passé. namely la valeur du conditionnel A (Une politesse / une demande polie) et la valeur du conditionnel E (Un reproche). Au contraire, dans la formation passé, ce sont C (un regret) D (un conseil), F (un reproche), G (une possibilité), H (un doute) et J (un futur dans le passé).
4 Conclusions

After conducting a study focused on Après des verbes au conditionnel et les valeurs du conditionnel in the novel l’Eté des Lucioles. It can be concluded that the conditionnel verbs found in the novel l’Eté des Lucioles are as follows. The verb of Être, avoir pouvoir, savoir et vouloir are to show la politesse / la demande polie. The verb of aimer, préférer, adorer, vouloir utilisés are to show le désir et le souhait / le désir. The verb of devoir et falloir utilisés are to show le conseil. The verb of pouvoir et devoir utilisés are to show le reproche. The verb of dire, pouvoir et vouloir utilisés are to show la suggestion. The verb of pouvoir utilisés is to show le doute.

La valeur au conditionnel, which is most commonly found in the novel l’Eté des Lucioles, is valeurs B (Un souhait / un désir), found 19 times or 33.33%. This is because a novel also expresses an imaginative (fictional) dream and hope from the author. The most common valeur du conditionnel passé is la valeur du conditionnel B (Un souhait / un désir) found 5 times or 4.67%. Because a novel actually also contains a life story that is far from reality, it shows that every writer wants to express his character.

References

Entrepreneurship Training in Labour Training Centre at North Sumatera

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Abstract. The purpose of this study was to evaluate the implementation of Labour Training Centre (LTC) in North Sumatera to create entrepreneur, to identify the current and future skills needed by industry business, to describe the obstacle factors of apprentice program between Labour Training Centre and industry, to investigate the effort done by state own LTC and industry, to improve the apprentice program and to anticipate the future need. The location of the research is LTC Medan, Lubuk Pakam, Stabat, and Binjai. The population were all LTCs in North Sumatera and the sample 4 LTCs: Medan, Lubuk Pakam, Stabat, and Binjai. The sample were 108 trainees of LTC and 32 instructors. The data were collected by documentation and questionnaire. Descriptive qualitative-quantitative method was used to analyse the data. The results were (1) generally the implementation of apprentice between LTC and industries do not reach its goal yet, (2) the trainees need entrepreneurship skill and competencies, (3) LTC have business unit to create the trainees to be entrepreneur, (4) to create the entrepreneurship competence by arrange the training modular, (5) content of syllabus can create the entrepreneurship competence, and (6) competency based curriculum and competency based training were the strategy to create entrepreneurship competence.

Keywords: Entrepreneurship, module, and training labour centre.

1 Introduction

LTC needs to train the workforce of elementary and junior high school graduates because unemployment from education level reaches 7.24 million people. If the LTC determines the requirement of high school education then the labor force elementary and junior high school will be difficult to be absorbed in the world of work, whereas in the implementation of industrial MEA many require labor, for that candidate labor must be prepared especially graduate elementary and junior high school is usually still productive age. Ministry of Manpower (Kemenaker) noted there are 276 LTCs in Indonesia, of which there are 14 LTCs owned by the Ministry of Manpower and the rest are owned by provincial and district/city governments. The training patterns in local government-owned LTCs are emphasized on training according to the needs of the workers in their respective regions such as automotive,
welding, wood and stone buildings, electronics, computers, handicrafts, agriculture and plantations. Thus, the training sectors in LTC need attention in order to fill the job field.

Many efforts have been made by the government to improve the quality of the exercises, among others, to cooperate with the industry, improve the ability of instructors, provide training equipment, etc. but the skills obtained by the participants is not adequate and still found the gap between the workforce generated training hall with DU/DI. The quality of Indonesian labor is still low both in terms of education and skills, whereas the world of work and society demands better quality. The results of the Department of Labor's employment data processing found the comparative figures among applicants as job seekers, job vacancies, and who can be filled in accordance with the skills they possess, is 10: 2: 1. This means that out of ten job seekers, and two vacancies available, only one is acceptable because it has the skills to suit what you want. The results of the study found that in the implementation of PSG in North Sumatera was 25.19 percent of the industrial parties that became industry couples in implementing industry practice and assume that the ability of vocational students is low and dubious [1]. Learning in school tends to be very theoretical and unrelated to the environment in which the child is located, as a result the child is unable to apply the lessons learned in school to solve life problems faced daily and as if education deprives learners of so that the environment feels strange in its own society [2]. For that need to be given training that synergizes various training materials into life skills that are needed individuals wherever located, working or not working. With the provision of life skills LTC graduates are expected to solve life problems encountered including finding or creating jobs for himself and even for others. For that reason it is necessary to develop life skills based learning model based on competence.

Then from the observations so far it turns out that the skills obtained by participants LTC training is not enough to be used in solving engineering problems that exist around the environment, so for it would require life skills that can accumulate ability to solve problems found around his life. Based on the above facts it can be argued that the students' skills need to be improved and require serious handling so that the LTC graduates can produce graduates who are fit to work and able to solve the problems faced in their environment. One alternative that is seen to improve the skills of LTC training participants is through the application of effective and efficient learning model, finding the appropriate subject matter with the job field, providing skills that can equip life skill, and using the appropriate learning module and have the appeal so that the competence which is owned by graduates is a competence in accordance with the demands of employment. Thus, the development of life skill learning model to improve entrepreneurship competency of LTC training participants is an alternative to generate training participants in order to enter the work field.

In regard to the use of competency-based module, it can be alternatively used to substitute the conventional learning for improving the students’ learning achievement effectively at technological and vocational schools [3]. Also, the implementation of learning process using competency-based module affects higher on the students’ achievement in practice of electrical engineering than using student work-sheet [4]. Similar research also proved that the strategy of competency-based module application contributed more effective learning for both theory and practice in Basic Electrical Installation subject [5].
2 Method

The research was conducted in 4 (four) LTCs located in North Sumatra, namely Medan, Binjai, Lubuk Pakam, and Stabat. Research subjects are participants and trainers or instructors. The sample of this research is 108 participants of LTC and 32 instructor. Research data was collected through documentation technique to obtain LTC mapping. Questionnaire instruments are given to instructors and trainees. However, for more information digging has used observation guidelines and interview guides for instructors, trainees, and industry leaders. Data analysis technique used is descriptive statistical analysis both qualitative and quantitative.

3 Result

To determine the competencies that need to be prepared so that the trainees can have the provision for entrepreneurship, it is necessary information from the trainees, it is based on the consideration that some trainees have been intern and work in various job sectors. When asked what the reason for the training in LTC can improve entrepreneurship competence hence obtained the opinion that: ability in a field can open and develop a business, training make student more independent, have ability of entrepreneurship, training can improve student skill, because in LTC every student has taught how to entrepreneurship and what should be considered for every business, Competence owned by participants can manage/run business, Training in LTC students get knowledge and skills in entrepreneurship, Training in LTC provides the skills of participants to be able to compete in the world of work, confident in entrepreneurship, know the spirit of entrepreneurship, open an independent business.

Based on the data obtained from the training participants it appears that the training obtained at LTC in various skills with various entrepreneurship competencies through various materials can form entrepreneurship competence. Therefore, based on the data analysis, it is known that some things related to entrepreneurship development in training participants are as follows:

In determining the competencies that need to be prepared so that participants can have the training to be entrepreneurship required information from the trainees. This is based on the consideration that some trainees have been intern and working in various job sectors. Based on the data obtained from trainees it is known that the training in LTC has various skills with various entrepreneurship competences. The giving of entrepreneurship materials is able to form entrepreneurship competence to the participants.

Efforts to be done by the LTC to improve the competence of trainees in entrepreneurship can be done by holding seminars on entrepreneurship, bringing people who have succeeded in entrepreneurship, internship in the field of entrepreneurship, and entrepreneurship mentoring. In addition, it is also necessary to present people who have successfully entrepreneurship so that trainees obtain information directly and motivated to entrepreneurship.

Enhancement of knowledge and understanding of participants on entrepreneurship needs to be established cooperation between LTC parties with the industry so that knowledge and skills are prepared in LTC with the needs of employment. This can also be done through cooperation in the form of coordination between mentors and industry and also in the form of apprenticeship. The following is presented data on the efforts that need to be done so that participants are encouraged to practice entrepreneurship.
Meanwhile, the information generated from the training instructors in general is as follows: From the data obtained from both the instructor and the trainee that to improve the competence of entrepreneur, it would be more appropriate to apply training oriented model to the trainees. Explicitly both LTC and trainees alike think that the right model to apply is a competency-based training model. Similarly, the opinions of instructors and trainees suggest that the use of training modules will be more appropriate and more efficient in entrepreneurial learning.

In the training conducted in several LTCs it is known that the approach model is based on the competency approach. This relates to the seven principles underlying competence-based training: (1) trainees can master most tasks at a high level (skills at 95 to 100 percent) when training is provided with high quality and sufficient time, (2) the ability of trainees to learn does not require an estimate of the extent to which the trainee can learn the lesson well, (3) the degree of difference in job mastery is mainly due to errors in the learning environment (training) rather than the characteristics of the small learner characteristics, (4) the training will achieve similarity in terms of learning ability, learning speed, and learning motivation if given a favorable learning condition, (5) training rather than directed to the different nature of the trainee, but rather directed to differences in learning, (6) training benefits learning benefits, and (7) discontinued elements in the process of teaching and learning is the type and quality of training obtained by trainees.

3 Conclusion

From this research, several conclusions can be stated as follows: (1) generally the application of apprenticeship between LTC and industry has not reached its target, (2) ability and competence of entrepreneurship of trainees are needed, (3) LTC has a business unit to create training to become an entrepreneur, (4) create entrepreneurship competence by organizing training modules, (5) the contents of syllabus can create entrepreneurial competence, and (6) competency-based and competency-based training is a strategy to create entrepreneurship competence.

Acknowledgments. Our thanks go to Kemenristekdikti (Ministry of Research and Technology), University Negeri Medan (Medan State University), Medan State University Research Institute, instructors and LTC participants who have partipated in the implementation of this research

References

The Implementation of Hybrid Learning Strategies to Improve Students Learning Outcomes of Introduction to Microeconomics Subject in Economic Education Department
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Abstract. One of the implementations of information and communication technology (ICT) in teaching & learning is through hybrid learning which is a combination of face-to-face instructional methods and online learning to answer the challenges of the fourth industrial revolution. This study aims to know the differences in learning outcomes Introduction to microeconomics between groups of students who are taught with hybrid learning with groups of students who are taught by direct learning. This research uses a quasi-experimental method. Data collection is done by conducting tests after learning process. The results of this study with the t-test at α 0.05 stated that the learning outcomes of introduction to microeconomics were taught by hybrid learning is higher than the group of students who were taught by direct learning.

Keywords: hybrid learning, learning outcomes, introduction to microeconomics.

1 Introduction

Every lecturer hopes that the learning activities they carried out can achieve goals that are set effectively, efficiently, attractively and fun, in order to realize an active learning process and obtain maximum learning outcomes. To make that expectation, the lecturer must develop a learning design in accordance with experience, knowledge, skills and all available resources to support optimal achievement of each learning activity.

Introduction to microeconomics courses is part of the curriculum which is a subject of compulsory study in the Unimed economic education department with 3 credits weight. This course is very important considering that this course is a basic economic course that competence must be mastered by students as professional candidates for SMA / MA / SMK (high school and vocational school) economic teachers.

In an effort to maximize the introduction to microeconomics learning, teaching materials are available in the form of textbooks compiled by the KDBK team, but these teaching materials have not been packaged in module form and have not gone through the research and development (R & D) process, have been validated, analyzed and developed before. Besides that the introduction to microeconomics teaching materials have not been packaged in a hybrid
learning network or so that students can learn anytime and anywhere using their computers and smart phones.

The consequences of this condition have an impact on student competence that is less satisfying. This condition can be seen from the data of student learning 2017/2018 odd semester which shows that class A with 44 students only 3 people (0.06%) get the maximum grade A. For class B with the number of students 37 people only 2 people (0.05%) who get the maximum value of A. Other phenomena can be seen through discussions with lecturers of KDBK micro teaching, one of the weaknesses is the lack of students' ability to master the material to be taught. This condition is suspected that when students attend introduction to microeconomics courses, they do not have optimal competence.

Based on in-depth interviews with 10 students from different classes, information was obtained that one of the causes of this condition was the teaching materials used in lectures that had not been standardized and were not attractive because they were still conventional and had not utilized information technology. Students also said that they wanted the need for IT-based module teaching materials in the form of hybrid learning. The need for teaching materials with hybrid learning is because the competence in this course is in the form of skills in calculating, analyzing and describing curves. In order for students to master this competency to the fullest, students must learn independently about the procedures for calculating, analyzing and describing curves on microeconomic problems.

This phenomenon certainly cannot be left behind, because it is feared that as prospective teachers they do not have professional competence that is capable when becoming an economics teacher, so that the profile of economic education department alumni become professional economics teachers in SMA / MA / SMK cannot be realized.

The effort that can be done to overcome the above problem is by developing teaching materials for introduction to microeconomics learning on hybrid learning. Hybrid learning is a combination of face-to-face learning strategies and online learning strategies that students will use independently to repeat their learning whenever and wherever students are.

In the 21st century, today's students represent the first generation who grew up with new technology and are regarded as Z-generation digital natives. They spend their entire lives surrounded by and using computers, videogames, digital music players, video cameras, cell phones, and all toys and other tools from the digital age. Today, college graduates spend an average of less than 5,000 hours reading in their lives, but more than 10,000 hours of playing video game (not to mention 20,000 hours of watching TV) (Ceylan and Elitok Kesici 2017).

It was further explained that computer games, e-mail, the Internet, cell phones, and instant messaging are integral parts of their lives. Under these circumstances, policy makers of the school system must carry out renovations to educate a new generation. In connection with this phenomenon, if it is associated with learning, the teaching materials used in learning should be in line with the development of the 21st century. Teaching materials are a set of material that is systematically arranged that allows students to learn and adapt to the existing curriculum.

Teaching materials are devices that contain material or content of learning to achieve learning objectives. A teaching material contains material or content in the form of ideas, facts, concepts, rules, or theories that cover the subjects according to their discipline and other information in learning.

One of the many type of teaching material is module. Module is all forms of independent learning units designed for use by participants without the need to be guided by instructors / lecturers. So, the module is an independent learning material specifically designed so that it can be studied by itself anytime, anywhere, by participants without the presence of instructors / lecturers. (Dirjen Belmawa, 2018). Usually the module is packaged in print,
otherwise known as a print module. But, in online learning, the module can be packaged in the form of an online or hybrid module. "Hybrid" or "mix" is a name commonly used to describe courses that combine face-to-face classroom instruction with online learning. Hybrid learning based modules are learning that combines strategies for delivering learning using face-to-face activities and online (discussion / chat forums). Through hybrid learning based learning students are expected to be able to learn independently, sustainably, and develop throughout life so that learning will be more effective, more efficient, and more interesting (Tuapattinaya, 2017). Furthermore, Shea, Joaquin and Gorzycki (2015) state that hybrid learning, which combines face-to-face and online activities, is the fastest growing course in higher education.

Learning through this hybrid module has the advantage for students: (1) having greater time flexibility, freedom, and comfort by working part-time online from home (2). tend to interact more with lecturers and fellow students because there are many opportunities to do it both in class and online. (3) has access to the latest unlimited resources available via the Web. (4). can participate more in class discussions because they can choose an online or face-to-face environment where they feel more comfortable. (5). usually receive more feedback, and more frequent feedback from lecturers. (6). can acquire useful skills from using the Internet and computer technology.

Furthermore, Shea and Bidjerano (2013) explained that by using hybrid learning students have the opportunity to interact with lecturers, students with students and this interaction significantly influences learning outcomes. Online learning through hybrid is a fast-growing component of education (Means et al. 2009). Today many experts agree that mixed or hybrid learning, namely learning that combines face-to-face and online learning, is the most promising approach to increasing access to higher education and student learning outcomes (Means et al, 2010). In fact, the number of universities that use mixed courses is growing rapidly. Some estimate that between 80 and 90 percent of college and university programs will someday become hybrids and show that the number of integrated learning classrooms has increased 30 percent each year (Horn & Staker, 2011).

This hybrid module element is the same as the print module, but because it will be presented online, the elements of this module are presented in online media. These elements are: (1). Preliminary Section; contains a brief description, relevance, learning instructions and learning outcomes. All components are presented in the form of fragments of digital material such as descriptive text on the web, presentation slides (ppt), text (pdf), video, animation and others. (2) Core Section; contains a description or explanation of the material, examples, illustrations, exercises and others. The material is presented in the form of fragments of digital material such as descriptive text on the web, presentation slides (ppt), text (pdf), video, animation and others. (3) Closing Section; contains summaries / conclusions, tests, assignments, answer keys, reference lists and others. These components are presented in the form of fragments of digital material such as descriptive text on the web, presentation slides (ppt), text (pdf), video, animation and others. (Dirjen Belamawa, 2017). This hybrid module will be arranged in e-learning Moodle platform.

2 Methodology

The purpose of this study was to determine differences in introduction to microeconomics learning outcomes between groups of students taught with hybrid learning strategies and groups of students taught with direct learning strategies. This research was conducted in
Unimed Economic Education department. The population in this study were all students of semester I economic education department 2016/2017 academic year. Samples were taken by random sampling of two classes. The experimental class consisted of 24 students of each class. The data that used in this study are learning outcomes from the introduction to microeconomics. The instrument used has been tested for validity and reliability.

Analysis used to process the data in this study is t test, using SPSS 17.0 for Windows program after an analysis prerequisite test conducted.

3 Result And Discussion

Table 1. Introduction To Microeconomics Students Learning Outcomes.

<table>
<thead>
<tr>
<th>Statistic</th>
<th>HYBRID LEARNING (Experimental class)</th>
<th>Direct Learning (Control Class)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>76.37</td>
<td>71.80</td>
</tr>
<tr>
<td>Minimum</td>
<td>55.86</td>
<td>55.86</td>
</tr>
<tr>
<td>Maximum</td>
<td>94.08</td>
<td>85.26</td>
</tr>
<tr>
<td>Std.Deviation</td>
<td>10.89</td>
<td>7.612</td>
</tr>
</tbody>
</table>

Table 1 shows that the average introduction to microeconomics learning outcomes of experimental class students by applying HYBRID LEARNING strategies have an average score of 76.37, higher than the average control class with an average score of 71.80. The highest score in the experimental class is 94.08 and the control class is 85.26.

Hypothesis test results of the implementation of the HYBRID LEARNING on introduction to microeconomic student learning outcomes are presented in Table 2.

Table 2. Analysis Results Summary Of Hybrid Learning Strategy On The Results Of Introduction To Microeconomics Students.

<table>
<thead>
<tr>
<th>t-test for Equality of Means</th>
<th>t</th>
<th>Df</th>
<th>Sig</th>
<th>Mean Difference</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.31</td>
<td>78.9</td>
<td>0.023</td>
<td>4.57</td>
<td>(-6.45, 15.50)</td>
</tr>
</tbody>
</table>

From Table 2 can be seen the results of the calculation of the analysis of differences in the results of introduction to microeconomics learning groups of students taught with hybrid learning and direct learning strategies at the value of Sig = 0.023 with a significance level of 5%. This means that if the probability significance (p-value) is <0.05, the null hypothesis (Ho) is in the rejection area because of the probability significance (p-value) <α (0.05). Calculations on student economic learning outcomes, Ho was rejected so that Ha was accepted on economic introductory learning outcomes between the control group with direct learning and the experimental group with hybrid learning was significantly different so that the application of hybrid learning had an effect on student economic learning outcomes.
This finding is in line with research result of Olapiriyakul & Scher (2006) that demonstrated the majority of students who participated in the hybrid learning course are active/ sensing/sequential/visual learners. Most of them preferred visual presentations to verbal explanations.

Similar with it, the study of Hall & Davison (2007) also states blogs (online teaching) offer comparable and additional benefits to other projects designed to encourage reflective engagement with teaching material.

4 Conclusions

Based on the results of the study and discussion can be summarized as follows:

1. There are significant differences in microeconomic learning outcomes between groups of students taught with hybrid learning with groups of students taught with direct learning strategies.

2. The application of hybrid learning strategies has a significant effect on improving the learning outcomes of students taught with microeconomics.

5 Suggestions

1. Based on the average score of microeconomic learning outcomes of groups of students taught with hybrid learning strategies higher than the student groups taught with direct learning strategies, it is suggested that introduction to economic lecturers can be advised to apply this hybrid learning strategy in this subject.

2. Lecturer could be more familiar with technology so they could use this hybrid learning effectively.

References


Antibacterial Activity of Sidaguri Plant Extracts 
(*Sidarbhibofilia L.*) against Oral and Dental Bacteria

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**Abstract.** Dental and oral diseases can be caused by *Staphylococcus aureus*, *Enterococcus faecalis* and *Streptococcus mutans*. This study was aimed to determine the potential of Sidaguri (*Sidarbhibofilia L.*) plant extract against some bacteria, i.e., *Staphylococcus aureus*, *Enterococcus faecalis* and *Streptococcus mutans*. The methods used in determining the inhibition zone and MIC were paper disc diffusion and MIC using dilution methods. Phytochemical test results indicated that the Sidaguri plant was contained alkaloids, flavonoids, tannins and saponins. The inhibition zones of antibacterial activity of Sidaguri plant extract against those bacteria were found to be 7.9; 6.8; and 10.3 mm, respectively for *S. aureus*, *E. faecalis* and *S. mutans*. However, the MIC and MBC values for *S. aureus* were found to be 625 (µg/mL) and MIC values for *E. faecalis* were of 625 (µg/mL) with MBC values > 5000 (µg/mL). The MIC and MBC for *S. Mutans* were up to 1250 (µg/mL) and 5000 (µg/mL). This study concluded that *S. Rhombifolia* was a bactericidal to *S. aureus* and *S. mutans*. In addition, it was a bacteriostatic to *E. faecalis*.

**Keywords:** Antibacterial Activity, Sidaguri, (*Sidarbhibofilia L.*), Oral and Dental Bacteria.

1 **Introduction**

The oral cavity is the first gate in the digestive system. The oral cavity also plays a major role in one’s health and well-being. One effort to improve health is to maintain oral and dental hygiene (Nonong, 2014). Based National Basic Health Research in 2013 year, the prevalence of dental and oral health problems in Indonesia was of 25.9%. It might due to the lack of awareness and knowledge of the public about the importance of dental and oral health, so that disease in the oral cavity could be happened (Tampubolon, 2016). People in Indonesia have not considered dental and oral health. People were tended to ignore toothache, even though dental disease was the first type of disease complained by the community and children (Nurhidayat et al, 2012). Dental and oral diseases were also could be caused by *Staphylococcus aureus*, *Enterococcus faecalis* and *Streptococcus mutans*.

Plant of Sidaguri was belonged to the genus *Sida Malvaceae* family, which has been used as a traditional medicine, including to treat rheumatism, asthma, influenza, toothache and reduce pain in swelling due to toothache (Kinho et al, 2012; Sari, 2012). Therefore, this study was aimed to report a class of secondary metabolites from Sidaguri (*Sidarbhibofilia L.*) plant in the North Sumatra and antibacterial activity that causes oral and dental diseases.
2 Materials And Methods

2.1 Apparatus and Chemicals

Apparatus used in this study were included analytical balance, a set of glassware, blender, vacuum pump, Buchner funnel, rotary evaporator (Heidolph), vortex, incubator Memmert, autoclave (Tomy), and laminar (B-One). In addition, some chemicals used were acetone (technical), FeCl₃ 10%, acetic acid, amyl alcohol, concentrated HCl, and distilled water. Some reagents such as Mayer, Wagner, and Dragendorff reagents. Other chemicals needed were concentrated H₂SO₄, NaOH 10%, Mg powder, chloroform, Mueller-Hinton Agar (MHA) (Oxoid), Mueller-Hinton Broth (MHB) (Himedia), dimethylsulfoxide (DMSO) p.a (Sigma Aldrich), chloramphenicol disc paper (Oxoid), 0.9% NaCl bacterial culture Enterococcusfaecalis ATCC49619, Staphylococcus aureus ATCC25923 and Streptococcus mutans ATCC 35668.

2.2 Plant Extraction

Preparation of materials and sample extraction
The dried sample was obtained from the store called Herbal Sempurna Sambu. It was blended into a powder to 200 grams in weight, then macerated with acetone for 3 x 24 hours. The macerated sample was filtered using a buchner funnel. Furthermore, the filtrate was evaporated using a rotary evaporator to produce an extract.

2.3 Phytochemical Test

Alkaloid Test
Test with Mayer reagents. 2 mg of the extract was dissolved in acetone. Than 4-5 drops of Mayer reagent were added. The results were called positive if white precipitate was formed. Test with Wagner reagents. Two mg of the extract was dissolved in acetone. Drops of Wagner reagents as the amount of 4-5 If a brown precipitate appeared, it meant positive results. Test with dragendorff reagent. A two mg of the extract was dissolved in acetone. Then add 4-5 drops of dragendorff reagent. Positive results are marked as they were red/orange deposits.

Test for Flavonoids
Wastewater test. A twenty mg of acetone extract. Rhombifolia L. was added to 1000mL of hot water, boiled for five minutes and filtered with filter paper. The filtrate was put into a test tube and then added with enough magnesium powder with one ml of concentrated hydrochloric acid and five ml of amyl alcohol. It has strongly shaken, then and allowed to separate. The formation of red in the amyl alcohol layer indicated the presence of flavonoid compounds. Test with NaOH10%. A two to four mL of 10% NaOH was added to extract S. rhombifolia L. Positive results were indicated by a yellow change.

SteroideTriterpene
Test (Liebermann-Buchard test). A 50-100mg of S. rhombifolia L. extract was placed on a drop plate and acetic acid was added until all the samples were submerged. It was left for 15 minutes, then 6 drops of the solution were transferred into a test tube. After that, a 2-3 drops of concentrated sulphuric acid were added. The colour changes that occur were observed. The
resulting colour intensity was used as a relative measure of the content of triterpenoids and steroids in the sample. The presence of triterpenoids was indicated by the occurrence of orange or purple red, while the presence of steroids was indicated by the formation of blue.

**Tanin**

Test. A 2gr of extract *S. rhombifolia* L. was put into a test tube and diluted with acetone. After that, 3 drops of FeCl₃ 10% was added. A positive result when a blackish green precipitate was formed.

**Saponin**

Test. A 2gr of *S. rhombifolia* L. extract was put in a test tube and diluted with 70% ethanol. After that, a 10 mL warm water was added, then shaken for 30 minutes. It was left for 10 minutes and if the foam was not lost, it was added with concentrated HCl. If there was a constant foam, then it showed positive results.

**Antibacterial Activity Test (CLSI, 2012).**

Sample Preparation. Before the antibacterial test, a test solution (sample) was prepared by weighing 100mg of *S. rhombifolia* L. leaf extract and dissolved in DMSO 100%. Dilution amounted 10 times to obtain a 1% solution in DMSO in 10%. If the sample was not dissolved in 10% DMSO then dilution was carried out with DMSO in 100%, which was equivalent to 1000 µg/mL.

**Preparation of Inoculum Suspension.**

The inoculum was prepared based on the growth method by taking 3-5 bacterial colonies using a sterilized *cotton bud*, then transferred into a tube which contained 4-5mL 0.9% NaCl. Furthermore turbidity was adjusted to 0.5 McFarland turbidity.

Determination of Inhibitory Zones with Paper Disc Diffusion Method (CLSI-M02-A11, 2012). It was begun by inserting 100 µL of inoculum onto the gel medium, then levelling by using a spider. Let stand for about five minutes. The disc paper which contained the chloramphenicol and empty antibiotics was placed, so that each of the disc was found to be 24mm apart on the plate surface. The paper disc was pressed firmly on the surface. It could be ascertained that the disc paper was in direct contact with the gel plate inoculum. On a blank paper disc, it dropped 20µL of test solution and another blank disc paper was dripped with 100% and 10% of DMSO solvents. The plate was closed and placed into an incubator at 37 °C for 18-24 hours. The emergence of bacterial growth inhibition zones was characterized by the presence of clear areas around the disc paper which was then measured using callipers, so that the diameter of the inhibitory zone of bacterial growth was obtained. The positive control used was a 30µg chloramphenicol antibiotic disc, while the DMSO solvent used as a negative control.

**Determination of MIC by micro dilution method** (M02-A11 CLSI,2012). Determination of MIC was carried out by inserting MHB liquid media that has been suspended with bacteria into each microplate hole from the second to the twelfth column as much as 100µL. The first column of microplate was filled with 100µL of liquid medium (negative control), while for the second column was filled with 100µL of liquid medium containing bacterial suspension (positive control). A 1000µg/mL test solution was entered starting from column twelve. The concentration of the test solution was carried out by
transferring 100µL of solution from the twelfth hole to the eleven hole. From the eleven holes, it was taken as much as 100µL and put into the ten hole. The same thing was done to the third hole. The amount of solution in each hole was of 100µL. Micro plate was then incubated at 37°C for 24 hours. Positive control used in this study was chloramphenicol with a concentration of 500mg/mL.

Determination of MBC. MBC determination was carried out by inoculating all test solutions as much as 10µL from each hole from the micro plate, then it was grow on gel MHA media and incubated at 37°C for 24 hours.

3 Results And Discussion

Extraction. The extraction of samples (200g) of Sidaguri plants were carried out by maceration technique with acetone for 3 x 24 hours. It has been produced 3.3 gr of green crude extract. Results of phytochemical test were S.rhombifolia L. plant was contained alkaloids, flavonoids, tannins and saponins.

The results of inhibitory zone test can be seen in Table 1. The method used in this determination was the paper disk diffusion method. This method was done by placing paper discs that have been dripped with a test solution on solid media those has been inoculated with bacteria. Bacterial growth was observed to see clear zones around the disc. The choice of this method was due to easy and simple in determining the antibacterial activity of the sample being tested. The disc paper used was 0.6 cm in diameter. According to Davis and Stout (1971), that the inhibitory area of >20mm or more, meant having very strong antibacterial activity. In addition, the resistance area was of 10-20mm (strong antibacterial activity), 5-10mm (moderate activity), and below 5mm (weak activity).

Table 1. Inhibitory Zone Results of S. Hombifolia L. Extract.

<table>
<thead>
<tr>
<th></th>
<th>S.aureus</th>
<th>E.faecalis</th>
<th>S.mutans</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMSO 10%</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Kloramfenik</td>
<td>33.8</td>
<td>9.3</td>
<td>26</td>
</tr>
<tr>
<td>S. rhombifolia L.extract</td>
<td>7.9</td>
<td>6.8</td>
<td>10.3</td>
</tr>
<tr>
<td>DMSO 10%</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Determination of the Inhibitory Zone.** Fig.1 (a) shows the inhibitory zone, whereas in the medium category to inhibit the growth of S. Aureus bacteria. Likewise for E. faecalis bacteria which have an inhibition zone of 6.8 mm as Fig.1 (b). While in S. mutans bacteria, the inhibitory zone was formed in 10.3mm (Fig.1c) indicated that it has strong potential to inhibit bacterial growth. A positive control was chloramphenicol. Inhibitory zone against the bacteria were S. aureus, and S. Mutans E. faecalis of 33.8mm (Fig.1a); 9.3mm (Fig.1b), and 26mm (Fig.1c), respectively. The difference in diameter of the inhibitory zone between extracts with chloramphenicol standard used was likely because the extract was still a crude extract, so affected to its ability to inhibit bacterial growth.
Fig. 1. The Results of inhibition zone test on:
(a) *S. aurens*, (b) *E. faecalis*, and (c) *S. mutans*

Determination of MIC and MBC. Based on Table 3, acetone extract in all parts of the sidaguri plant with a concentration of 10,000µg/mL has an inhibitory zone of 7.8mm. An extract was categorized as active, if the MIC value was<100µg/mL, medium (100<MIC<625µg/mL), and was not active if the MIC value was>625 µg/mL. (Dzyoymet al, 2012). Based on Table 3, the MIC value of *S. rhombifolia L* extract was of 625 µg/mL in the medium category against *S. Aureus* and *E. faecalis*. However, it has been found that 1250 bacteria against *S. Mutans* with inactive category.

According to Pankey and Sabbath (2004), the ways of antibacterial working were bacteriostatic and bactericidal. The results of the determination of MIC and MBC of sidaguri plants can be seen in Table 2.

**Table 2.** MIC and MBC values of *S. rhombifolia L*. extract against test bacteria

<table>
<thead>
<tr>
<th></th>
<th>S. aureus</th>
<th>E. faecalis</th>
<th>S. mutans</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIC</td>
<td>MBC</td>
<td>MIC</td>
<td>MBC</td>
</tr>
<tr>
<td>µg/mL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>0.48</td>
<td>7.8</td>
<td>7.8</td>
</tr>
<tr>
<td><em>S. rhombifolia L.</em></td>
<td>625</td>
<td>625</td>
<td>&gt;5000</td>
</tr>
</tbody>
</table>

Value of MBC extract of *S. rhombifolia L.* was amounted to 625µg/mL against *S. aureus* bacteria which meant at 625µg/mL could not only inhibit but also could be killed (bactericidal). As for the *E. faecalis* bacteria, the MBC value was extracted *S. rhombifolia L.* to be> 5000µg/mL meant sidaguri was only inhibitory (bacteriostatic).

The values of MBC extract of *S. rhombifolia L.* was found to be 5000 mcg/mL against *S. Mutans* bacteria, which means rhombifolia *S. L.* extract was a bactericidal with two fold-killing ability of the ability to block it. Based on the phytochemical screening results, all parts of the *S. rhombifolia L.* plant contained alkaloids, flavonoids, tannins and saponins. Based on literature studies, Sidaguri plants contain alkaloid alkaloid indoquinolin compounds that were isolated from the plant Sidaguri, namely quindolinone;11-methoxy-quindoline; quindoline[10], so that the possibility of these compounds acting as antibacterials. The alkaloid mechanism that was suspected by disrupting the constituent components of peptidoglycan in bacterial cells, so that the cell wall layer was not formed intact and causes the cell death (Ajizah, 2004). However, *S. rhombifolia L.* also contained flavonoid compounds namely flavonol-3-O-Galactose (Jubahar et al, 2013). Kaempferol; kaempferol-3-O-β-D-
glycosyl-6"-α-D-rhamnose (Ajizah, 2004), were likely to act as an antibacterial. The mechanism of action of flavonoids in inhibiting bacterial growth, namely flavonoids, causes damage to the permeability of bacterial cell walls (Kurniawan, 2015).

S. rhombifolia L. also contained tannins and saponins (Wake et al, 2013; Heinichen et al, 2017; Azad et al, 2017). The mechanism of action of saponins was included in the antibacterial group which disrupts the permeability of bacterial cell membranes, which results in damage to cell membranes. It could be caused the release of various important components in bacterial cells namely: proteins, nucleic acids and nucleotides Based on research (Nurhidayat et al, 2012). The mechanism of the action of tannin as an antibacterial by causing the cell would become lysis (Ngajow et al, 2012).

![Fig. 2. MBC test results: (a) Chloramphenicol; (b) Sidaguri extract against S.aureus bacteria; (c) Chloramphenicol; (d) Sidaguri extract against E.faecalis; (e) Chloramphenicol; (f) Sidaguri extract against S.mutans.](image)

4 Conclusions

Based on phytochemical tests that have been carried out, the secondary metabolites found in plants of S.rhombifolia L. was an alkaloid, flavonoid, tannin and saponin. Extracts of S.rhombifolia L. have the potential as an antibacterial agents. The best activity against S.aureus and E.faecalis MIC values were found to be 625µg/mL and 625µg/mL. Extract of S.rhombifolia L. was a bactericidal action against S.aureus and bacteriostatic to E.faecalis.

ACKNOWLEDGEMENT. Thanks to the Directorate General of Research and Development Strengthening, Ministry of Research Technology and Higher Education, Republic of Indonesia, which has provided funding for this research through "Basic Higher Education Research (PTUPT)" in 2018 year.
References


Fluorescent Property of Carbon Nanodots Synthesized by Microwave Method from Crystal Nanocellulose as Precursor

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Abstract. Carbon nanodots (CDots) are nanoparticles that can be synthesized from various carbon sources. In synthesizing the Dots by using carbon source from oil palm empty fruit as raw material, cellulose could become a potential source. Cellulose nanocrystals were utilized as precursors, and the CDots were obtained by using microwave method. In this study, CDots synthesis using microwave method has been successfully done. From FTIR analysis, cellulose isolated from oil palm empty fruit showed functional groups which corresponded to neat cellulose. And for TEM analysis showed rod forms needles arranged variously, and they have diameter length about 10, 9nm. The physical properties of CDots were obtained in the most optimum parameters during the conditions of 1000 watts for 20 minutes. The obtained results were dark brown colour with green-to-blue fluorescent under UV light source. From this study, it can be concluded that CDots can be synthesized from cellulose nanocrystals.

Keywords: Carbon Nanodots, Cellulose Nanocrystals, Fluorescent.

1 Introduction

Oil palm, \textit{Elaisguineensis} is one of the most economical perennial oil crops that have 36 million tons (odmt) per year of fronds from pruning and replanting (Wan et al., 2004) and 5.2 million tons (odmt) per annum of empty fruit bunches (EFB) in 2002 (Tanaka and Yamamoto, 2004). Each ton of CPO produces 1.1 ton of Oil Palm Empty- Fruit- Bunches (OPEFB) and causes serious adverse environmental impacts (Law et al., 2007; Sudiyani et al., 2013). OPEFB which consists of 44, 4\% cellulose, 30, 9\% hemicellulose and 14, 2\% lignin has big potential as raw material in synthesizing carbonaceous material. These three components can be converted into various chemical material and valuable products.

Cellulose nanocrystals are 100-250 nm long and 2-6 nm wide. Consist of highly crystalline nanosize segments is obtained from cellulose fibres when the amorphous regions are eliminated by acid hydrolysis (Eichhorn, 2011).However, in removing the lignin, mechanical and chemical properties are essentially needed. Strong acid like sulphuric acid, nitric acid and chloric acid have been used selectively to hydrolyse amorphous forms from cellulose (Tang et al., 2011), while the steam explosion supported with alkaline treatment have been successfully obtained in nano-scale (Gea et al., 2018b).
Carbon nanodots belong to a new class of carbon-based nanomaterial with size less than 10 nm (Baker and Baker, 2010; Sahu et al., 2012). These materials were accidentally discovered during the electrophoretic purification of single-walled carbon nanotubes (SWCNTs) in 2004 (Xu et al., 2004). Carbon nanodots have outstanding water solubility, high sensitivity and selectivity to target analytes, low toxicity, favourable biocompatibility, and excellent photo stability, and their existence is abundant in nature (Li et al., 2012). Nowadays, carbon nanodots have been attracted researcher widely because of their strong fluorescence emission in the visible and near-infrared (Bourlinos et al., 2008; Cao et al., 2007). With their excellent properties, carbon nanodots still develop rapidly these days.

Like synthesizing carbon nanotubes (CNT) by using temperature process, the carbon nanodots are obtained with similar process. It has been reported that the coffee waste was used to synthesize carbon nanodots with high temperature over 500°C with 12 hour of oxidation process (Gea et al., 2018a). Carbon chain bond as main source for fabrication of carbon nanodots becomes focus experimental that has been researched in recent years. Various improvements had been achieved about the study of carbon nanodots synthesis or properties, and applications have been reported by researchers.

Therefore, this study is conducted to investigate the effect of time temperature in microwave to reduce the high consumption of energy.

2 Materials And Methods

2.1 Materials

Oil Palm Empty Fruit Bunches (OPFEB), distilled water, and dialysis membrane, nitric acid, sulphate acid, sodium hydroxide, sodium hypochlorite 12%, acetate acid.

2.2 Nanocrystals Cellulose Isolation

2.2.1 Alkaline Treatment

As many as 50 g powders of OPEFB were put in beaker glass; the sieved fibres were dispersed in distilled water. Then the suspension was stirred for 2 hours at 50°C and filtered, and this procedure was repeated once more. The residue was dispersed in a 100ml of 2% NaOH solution and the suspension was stirred for 2 hours at 80°C, filtered and washed with water. This alkaline treatment was repeated once more and the fibres were dried at 50°C for 24 hours.

2.2.2 Bleaching Treatment

This process is also referred as “Delignification process”. The alkali pretreated fibers were undergone bleaching treatment using sodium chlorite solution and 8 to 10 drops of glacial acetic acid while being heated at 60°C to 70°C so that the lignin content was removed in this process. The mixture was stirred at frequent intervals for 1 hour, cooled in ice bath, filtered quantitatively and washed with cold water. At the end, the bleached pulps were treated with 0.05 N nitric acid solutions for 1 hour at 70°C and washed extensively with water. The pulps were heated for 1 hour by using NaOH 17, 5%, and then they were filtered and washed until
the pH neutral. Bleaching treatment using NaOCl 5% were applied and they were dried to produce alpha cellulose. FTIR was used to analyze cellulose.

2.2.3 Preparation of Nanocrystals

As many as 1 g cellulose hydrolysis was carried out using 45 (w/w) concentrated sulphate acid adding drop by drop until desired concentration is reached. The acid treated fibres were stirred constantly using mechanical stirrer, heating it simultaneously for 45 minutes. In these processes the hydrogen bonds break forming complexes and sulphate esters, de-polymerization of macromolecular chains, finally change in crystallinity. The suspension was centrifuged at 10000rpm for 15 minutes and ultra-sonicated for well dispersion of nanomaterial preventing agglomeration. Then, inserted into dialysis membrane then stirred for 4 days in 100 ml of distilled water then evaporated at 70oC to produce nanocrystal cellulose. TEM was used to analyse nanocrystal cellulose.

2.2.4 Preparation of Carbon Nanodots

The microwave treatment was applied to produce C-Dots. As many as 200 mg nanocrystal cellulose was placed into microwave with various times i.e. 10 minutes, 15 minutes, and 20 minutes. After being treated, the samples were performed under UV light and they were placed under UV light to investigate the fluorescence properties.

2.3 Characterization

2.3.1 Characterization with FTIR Spectroscopy

The samples were placed on plate to direction of infrared rays then clamped. The results were obtained infrared absorption peaks from samples in wave number and transmittance plot on the monitor with range of wave number 4000-5000 cm⁻¹.

2.3.2 Characterization with TEM

The samples were dripped by ammonium molibdate 2%, and then the solution was trapped in resin. Forward, cut with micro cutting to obtain single nanocrystals. Cellulose morphology analysis was carried out using a JEOL 1400 with an acceleration voltage of 120 kV.

2.3.3 Characterization with UV light

The samples were dissolved with distilled water and then put under UV light and observed fluorescent formed.
3 Result And Discussion

3.1 FTIR Studies

FTIR studies confirmed the successful isolation of alpha cellulose from Oil Palm Empty Fruit Bunches (OPEFB) and displayed in Figure 1. The peak at 3363,86 cm$^{-1}$ showed vibration of $-\text{O-H-}$ from alpha cellulose. The absorption band at the wave number 2900, 94 cm$^{-1}$ is the C-H group, 1620, 21cm is the $-\text{C-O-}$ group. Then, wave number of 1319,31cm$^{-1}$ which is a stretching C-O-C group and 1056,99 is the $-\text{C-O-}$ group, vibration of 894,97 showed of $-\text{C-H-}$ group. From the results obtained can be said that alpha cellulose isolated from oil palm empty fruit has been successfully carried out. Based on specific groups for cellulose are $-\text{OH}$, $-\text{CH}_{2}$, $-\text{O}$, which repeatedly appears at FT-IR spectrum, and the $-\text{OH}$ at 3363, 66cm$^{-1}$ are stretching vibration of $-\text{OH}$.

![FTIR alpha cellulose.](image)

3.2 Nanocrystal Morphology

TEM analysis was used to determine surface morphology and can also enlarge objects in small sizes. From TEM results obtained in cellulose nanocrystals is displayed in Figure 2, where rod-like forms from cellulose nanocrystals were arranged variously, like needles.

![TEM Nanocrystal](image)

Cellulose nanocrystals are cellulose produced from nanotechnology which is a dimensional material from 0, 2-100 nm. From TEM results obtained can be known the diameter size of cellulose nanocrystals with ImageJ application. Based on calculations performed, obtained the diameter size of cellulose nanocrystals range between 10, 9 nm. With particle size distribution shown in Figure 3.
The result that was obtained provided that time affects the fluorescence of C-dots. Heating for 20 minutes showed greater result than others and displayed in figure 4. Heating for 20 minutes showed the fluorescence of C-dots under visible light showed colourless transparent and under UV light showed green- to- blue fluorescence. This shows that CDots can be synthesized from cellulose nanocrystals with fluorescent on them.

![Particle Size Distribution](image)

**Fig. 3.** Particle Size Distribution

![Fluorescence images](image)

**Fig. 4.** Fluorescence images under visible light and under UV light (a) The samples heated with 20 minutes (b) The samples heated with 15 minutes (c) with 10 minutes. While the (d), (e), and (f), are the fluorescent images of previous samples respectively.
4 Conclusion

The experimental results of C-Dots showed that nanocrystal cellulose as precursor produced from empty bunch of palm oil were able to be synthesized by using microwave treatment. Based on microwave treatment at 20 minutes heating showed the green fluorescence. Microwave heating provides a fast, reliable, and high-yield procedure for producing fluorescent carbon nanoparticles facilitating research on various synthetic schemes based on single or precursor material.

Acknowledgement. Acknowledgements are given to Universitas Sumatera Utara and Ministry of Research, Technology and Higher Education for its research grants throughout program PDUPT 2018 with given contract No. 2590/UN5.1.R/PPM/2018.

References

Factors Influence GLUT-4 Levels of Type 2 Diabetes Mellitus Patients in Medan City, Indonesia

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Faculty of Sport Sciences, State University of Medan 2

Abstract. The resistance of insulin in type 2 Diabetes mellitus patients (T2DM) will have a significant impact on glucose regulation with Glucose transporter-4 (GLUT-4) translocation. Glucose transporter-4 plays an essential role in the transport of glucose to most cells. The study design was analytic with a cross sectional approach. The study population was T2DM patient in Medan City with the number of people who have fulfilled the inclusion and exclusion criteria amount 83 patients. Data collection is done by interviewing and patient blood test. Assessment of physical activity of diabetic patients using a global questionnaire physical activity (GPAQ). GLUT-4 levels were assessed using Human Glut-4 with ELISA Method. The nutritional status and history of drug use by direct measurement and interviews. Data analysis using independent T-test with SPSS computer program. The results showed there was a relationship between physical activity and obesity with levels of GLUT-4 (p <0.05), and there was no relationship between consumption of drugs with levels of GLUT4 (p <0.05). By increasing physical activity, proper nutrition management and weight control will help improve insulin sensitivity so that it can control blood sugar levels in T2DM patients

Keywords: GLUT4, physical activity, obesity, blood glucose level.

1 Introduction

Diabetes mellitus refers to a group of common metabolic disorders that share a hyperglycemic phenotype, which is characterized by an increase in circulating glucose concentrations associated with abnormalities in fat, carbohydrate and protein metabolism. Type 2 diabetes is a complex disorder due to peripheral insulin resistance, combined with relative insulin deficiency (Alam et al., 2016). Resistance or insulin deficiency will have a significant impact on glucose regulation with GLUT-4 translocation. Insulin works through a second intermediate system to cause increased transport of glucose outside the cell membrane. Glucose transporter molecules called GLUT-4 glucose transporters to play an essential role in the transport of glucose to most cells. Glucose can be used immediately to produce energy through the Krebs cycle or can store in cells as glycogen. Glucose that enters the cell causes blood glucose levels to decrease, thereby reducing the stimulation of further insulin release (Sayem et al., 2018). Glucose Transporter Type-4 (GLUT-4) is insulin-sensitive GLUT and is expressed on the plasma membrane and organelles of skeletal muscle, heart muscle and adipose tissue for glucose upregulated by insulin (Murray et al, 2014)
GLUT-4 reacts to an increase in plasma insulin levels rapidly by producing an increase in glucose transport 20-30 times. Without insulin or exercise stimulation, 90% GLUT-4 is sequestering in skeletal and adipose muscle tissue cells in the form of double-layered lipid membranous vesicles. On the cell surface, GLUT-4 facilitates passive diffusion of circulating glucose if glucose concentration in skeletal and adipose muscle tissue decreases (Alam et al., 2016). Several things can influence GLUT-4 levels in the body. Its formation can increase and decrease depending on what influences it. Diet, exercise and medication interventions can increase the formation of GLUT-4 while obesity, chronic disease, and some inflammatory mediators can inhibit its formation. Therefore, GLUT-4 can use as a potential therapeutic target in the management of type 2 DM. (Alam et al., 2016). This study aimed to analyse factors that influence GLUT-4 Levels of Type 2 Diabetes Mellitus Patients in Medan City, Indonesia.

2 Material And Method

The study design was analytic with a cross-sectional approach. The collection of data has conducted in April-May 2018. The population study was Type 2 Diabetes Mellitus patient (T2DM) in Medan City that collected from several community health centres and general practice doctors serving outpatient diabetes patients in Medan City. The sample size is about 83 patients with the inclusion criteria were: Patients with type 2 diabetes aged 35-55 years, had no contraindication to doing physical exercise, willing to follow the research and the patient Came Independently to the place of service and independent in performing daily activities. While Exclusion Criteria are: Patients with severe complications, type 1 diabetes mellitus patients, another type, and gestational, type 2 diabetes mellitus patients accompanied by other comorbidities.

The research ethics committee has approved the research protocol at the Faculty of Medicine, Universitas Sumatera Utara and all participants who are willing to participate in the research have signed written informed consent. Research data sources are primary data. Body Mass Index patients do to the determination of nutritional status, the determination of treatment done by treatment history anamneses (crosscheck with the patient's status), physical activity assessment done by using the instrument Global Physical Activity Questionnaire (GPAQ). The Global Physical Activity Questionnaire assessed the activities carried out by diabetic patients (in the last seven days) and stated with MET (Metabolic Equivalent). For examination of GLUT4 using inspection with ELISA technique with Human Instrument GLUT4 (Glucose Transporter 4) ELISA Kit instrument Human GLUT4 (Glucose Transporter 4) ELISA Kit. The kit was based on sandwich enzyme-linked immune-sorbent assay technology. Anti- GLUT4 antibody was pre-coated onto 96-well plates. And the biotin-conjugated anti- GLUT4 antibody was used as detection antibodies.Data analysis using Independent T-Test using SPSS computer program.
3 Result And Discussion

3.1 Baseline Characteristics of T2DM patients In Medan City

Table 1. Basic Characteristics of Diabetes Melitus Type 2 patients in Medan City.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency (n)</th>
<th>Characteristics (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Man</td>
<td>16</td>
<td>19.3</td>
</tr>
<tr>
<td>Woman</td>
<td>67</td>
<td>80.7</td>
</tr>
<tr>
<td>Age Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36-45 years old</td>
<td>12</td>
<td>14.5</td>
</tr>
<tr>
<td>46-55 years old</td>
<td>71</td>
<td>83.5</td>
</tr>
<tr>
<td>Duration of Illness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-5 years</td>
<td>50</td>
<td>60.2</td>
</tr>
<tr>
<td>6-10 years</td>
<td>20</td>
<td>24.1</td>
</tr>
<tr>
<td>11-15 years</td>
<td>11</td>
<td>13.3</td>
</tr>
<tr>
<td>&gt; 15 years</td>
<td>2</td>
<td>2.4</td>
</tr>
<tr>
<td>Diabetes History</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Father</td>
<td>15</td>
<td>18.1</td>
</tr>
<tr>
<td>Mother</td>
<td>15</td>
<td>18.1</td>
</tr>
<tr>
<td>Father and Mother</td>
<td>8</td>
<td>9.6</td>
</tr>
<tr>
<td>None</td>
<td>45</td>
<td>54.2</td>
</tr>
<tr>
<td>Use of Anti-Diabetic Drugs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glibenclamide</td>
<td>66</td>
<td>79.5</td>
</tr>
<tr>
<td>Metformin</td>
<td>17</td>
<td>20.5</td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obesity</td>
<td>49</td>
<td>59.0</td>
</tr>
<tr>
<td>Non Obesity</td>
<td>34</td>
<td>41.0</td>
</tr>
<tr>
<td>Blood Pressure (Systole)</td>
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<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>66</td>
<td>79.5</td>
</tr>
<tr>
<td>Not Hypertension</td>
<td>17</td>
<td>20.5</td>
</tr>
<tr>
<td>Physical Activity (PA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good PA</td>
<td>32</td>
<td>38.6</td>
</tr>
<tr>
<td>Less PA</td>
<td>51</td>
<td>61.4</td>
</tr>
</tbody>
</table>

Table 1 shows that many diabetic patients in this study were 67 women (80.7%), most elderly patients about 71 elderly (83.5%), the duration of diabetes known to most of the diabetes for 1-5 years as many as 50 people (60.2%), the family history known have a family history of diabetes suffered by the mother as much as 45 people (54.2%). The majority of diabetic patients consume glibenclamide as an anti-diabetic drug as much as 66 people (79.5%). Nutritional status of diabetes patients most with obese as many as 41 people (49.4%), about 66 people (79.5%) with hypertension and majority has less physical activity 51 people.
mellitus patients, another type, and gestational, type 2 diabetes mellitus patients accompanied by other comorbidities.

3.2 Relation of Physical Activity, Obesity and Consumption of Drugs with GLUT4 in Type 2 Diabetes Mellitus Patients in Medan City

<table>
<thead>
<tr>
<th>Parameter</th>
<th>GLUT4 (ng/ml)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>2.7</td>
<td>0.04</td>
</tr>
<tr>
<td>Less</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td>Medical Treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metformin</td>
<td>2.3</td>
<td>0.44</td>
</tr>
<tr>
<td>Non Metformin (Glibenclamide)</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>2.2</td>
<td>0.03</td>
</tr>
<tr>
<td>Non Obese</td>
<td>2.6</td>
<td></td>
</tr>
</tbody>
</table>

shows that patients who have good physical activity have an average GLUT4 level higher than those who do not have good physical activity. Patients who received Metformin and not Metformin (Glibenclamide) therapy there was no average difference significant between the two in a sound manner, for the nutritional status it is known that there are differences in the average levels of GLUT4 based on obese and non-obese patients. In conclusion, there is a difference in average GLUT4 based on physical activity and nutritional status (p>0.05), while there is no difference in drug use (p>0.05).

The results of the study stated that there was a relationship between physical activity and levels of GLUT4, the more physical activity carried out would increase the secretion of GLUT4. This study is in line with the research conducted by Guelfi (2012) that there is a positive correlation between the total work done and the number of GLUT-4 translocations in recorded subjects. Physical activity or exercise is believed to control blood sugar in T2DM patients. Some things that need to consider in physical activity or exercise are the type and intensity, physical fitness level, nutritional status, meal schedule, medications used and degree of glucose control (Sinaga, 2016; Kennedy, 2012).

Physical exercise coupled with dietary modifications and drugs have recommended for one of the four components for diabetes therapy, in a study found that exercise can reduce hyperglycemia and body fat and improve protection against the development of cardiovascular complications. Regular physical exercise reduces dyslipidemia and increases insulin sensitivity. By increasing the concentration of GLUT-4 receptors on the plasma membrane or sarcoma, insulin resistance affects the transport of glucose into cells. The glycemic control, visceral fat reduction, and decreased plasma triglycerides can be achieved without drastic weight loss (Aggarwala et al., 2016). Physical exercise plays a vital role in the prevention and control of T2DM, insulin resistance, prediabetes, diabetes gestational Mellitus and health complications related to diabetes. Both aerobic exercise and endurance increase insulin work
and also help in the management of blood glucose levels, lipids, and blood pressure. Most people with T2DM can exercise safely as long as certain precautions (Syed Shakil, 2017). Moderate intensity exercise can increase temporary GLUT-4 gene expression. GLUT-4 protein increase can occur after 1.5 hours to 24 hours after exercise. GLUT-4 protein enhancement and mediated by myocyte enhancer factor-2 (MEF-2) (Kranio et al., 2006; Richter and Hargreaves, 2013; Handoko and Purwanto, 2017). In people with T2DM, there is a decrease in GLUT-4 levels which can see an increase in postprandial blood glucose. Management of diabetes continues to develop until now, and one of them is with exercise that can potentially increase muscle GLUT-4 levels (Handoko and Purwanto, 2017). During glycogen activity is the most significant source of fuel for muscle movement when glycogen begins to decrease, muscles increase blood glucose intake and use along with the release of free fatty acids from fat tissue. The transport of glucose to muscle tissue is carried out by GLUT-4, insulin activates GLUT-4 translocation to complex cascade signals. Contraction stimulate GLUT-4 translocation by activating 5-AMP-protein kinase. Insulin stimulation of GLUT-4 translocation is disrupted generally in patients with T2DM. Aerobic physical exercise and endurance can increase GLUT-4 and blood glucose retrieval even in the condition of type 2 diabetes mellitus. In T2DM patients who do moderate activity, the use of blood glucose by muscle tissue increases which results in decreased blood glucose levels (Alam et al., 2016). Research conducted by Richter and Hargreaves (2013) states that muscle contraction can trigger the insertion of GLUT-4 into the plasma of active muscle cells. During physical exercise, coordinated increase in skeletal muscle blood flow, capillary recruitment, GLUT-4 translocation to sarcolemma and T-tubule, and membranes are all critical for the absorption of glucose and oxidation. GLUT-4 translocation to sarcomata and tubules is the basis for the absorption of skeletal muscle glucose and includes the retrieval of GLUT-4 from intracellular storage. For absorption of glucose during exercise depends on exercise conditions which are determined primarily by the intensity and duration of the exercise. Research conducted by Richter and Hargreaves (2013) also mentioned that transient activity could increase GLUT-4 mRNA rapidly while after activity and last up to 24 hours this is related to MEF-2 which activates GLUT-4 promoter and increases GLUT-4 protein, but the effect of GLUT-protein levels increases 4 This is only temporary when compared to regular training. The results showed that there was no effect of consumption of oral anti-diabetic drugs (Metformin) with levels of GLUT4. One of the antidiabetic drugs that can affect GLUT-4 levels is metformin. This metformin is a biguanide drug that comes from Galegaofficinalis. This drug has many effects on insulin sensitivity in the muscles and in the liver, including stimulating GLUT-4 translocation by increasing Casitas B-lineage Lymphoma (Cbl) phosphorylation in Adenosine Monophosphate Dependent Protein Kinase (AMPK). Adenosine Monophosphate Dependent Protein KinaseActivated Protein Kinase (AMPK) is an enzyme that plays a role in cellular energy homeostasis. AMPK is activated when cellular energy has to reduce. When phosphorylation of Threonine residue (thr), AMPK will increase the catabolic pathway that produces ATP, namely glycolysis and fatty acid oxidation, thereby increasing the translocation of GLUT-4. (Garabadu , 2017; Yagasaki, 2014). Metformin also increases the production and secretion of adiponectin, so that ultimately it will improve insulin resistance and prevent the conversion of prediabetes to diabetes type 2 (Woods 2003; Manaf et al., 2008). With the increased sensitivity of insulin receptors, of course, GLUT4 secretion will also increase. Research conducted by Manaf et al. (2008) found that administration of metformin for 12 weeks increased levels of adiponectin in the obese group with prediabetes and increased levels of adiponectin after metformin administration, moderately correlated with
decreased triglyceride levels, and weakly correlated with increased HDL cholesterol levels and decreased LDL cholesterol levels (Amelia et al., 2017). This study found no relationship, this can be caused by more patients who were given Glibenclamide drugs compared to metformin, then from patients who received OAD there were still many of them who did not regularly take medication there were some patients who had not eaten drugs for a long time. Only consume traditional medicines such as decoction of leaves.

This study showed that there was a relationship between obesity and GLUT4 levels, the increase in body weight would disrupt the sensitivity of insulin receptors, and this would cause a decrease in secretion from GLUT4. Overweight and obesity are an excessive accumulation of adipose tissue that can interfere with both physical health and psychosocial health (Al-Goblan et al., 2014). Obesity and T2DM have a connection with to insulin resistance. Adipose tissue affects metabolism by secreting hormones, glycerol, and other substances such as leptin, cytokines, adiponectin, and proinflammatory substances, and by secreting NEFAs. In obese people, the secretion of all these substances increases. The inflammatory substances produced will participate in causing insulin resistance. The resulting inflammatory substances include IL-1 and TNF-α. (Al-Goblan et al., 2014; Ali, 2014; Van der Heijden et al., 2018; Amelia, 2017)

TNF-α can interfere with GLUT-4 translocation to the plasma membrane by damaging the insulin signaling pathway. The increase in TNF-α will cause cessation of phosphorylation of tyrosine residues in IRS1 but phosphorylation of serine (nonfunctional) residues that inhibit the work of IRS1. That way the translocation process from GLUT-4 will disrupt (Mohd-Radzman et al., 2013; Ali, 2014).

In obese people, there will be a slow but sure resistance to the cellular action of insulin which is manifested by reduced insulin ability to inhibit glucose secretion from the liver and its ability to support glucose uptake in fat and muscle (Park, 2006). Insulin-related insulin resistance is a complex disorder involving various mechanisms. Progress in molecular biology research has made it immense to find many things related to insulin resistance compared to ten years ago. Many mechanism pathways are simultaneously interrupted, and when one pathway is interrupted, the interconnection with another line will result in changes to other systems. The mechanism that occurs is related to many pathways and mediators. The weight control is closely related to blood sugar control and will ultimately prevent complications and improve quality of life (Amelia et al., 2018).

4 Conclusions

Physical activity and nutritional status are factors has strong related to lifestyle and affect GLUT4 secretion, by improving lifestyles T2DM patients can control their blood sugar levels so that they avoid complications and have a good quality of life.

Acknowledgements. The authors gratefully acknowledge that the present research was support by the Directorate of Research and Community Service of the Directorate General for Research and Development of the Ministry of Research, Technology and Higher Education by the agreement of Funding Research and Community Service for the Fiscal Year 2018 with the contract number: 117/UN5.2.3.1/PPM/KP-DRPM/2018
References


Language Choice by the Student of the French Department, UNIMED

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Abstract. The objective of this research is to describe language choice by the Student of the French Department, FBS, UNIMED. To know the role relationships and speech situations in using appropriate language choice, to know the dominant language in use in the French Student Community at Unimed. In collecting the language choice data, the writer use questionnaires given to the French Students Department at Unimed. Language choice data was analysed based on the value scale used by previous researches, i.e. Fishman (1972), Siregar (1998) in the form of M (mean) and SD (standard deviations). The findings of the research are : The role relationships between student-Lecturer has criteria BI-BP (Indonesian=French), the speech situations “greeting” has criteria LBBP (more French than Indonesian), the most dominant language use in LBBI (more Indonesian than French), that this behaviour is very sensitive to cause code switching among the students.

Keywords: language choice, french, relationship.

1 Introduction

The usage of one language with another in a communication event often occurs. For example Indonesian is used interchangeably with French. Events like this are often in the case of the speaker and the other person conveying ideas, feelings, desires, and so on. The transition of language in such communication allows easier and smoother communication so that the expected goals can be achieved. In addition, the language transition is used by speakers and interlocutors with the aim that the use of language is more varied, interesting, and easily accepted.

French as a foreign language learned in Unimed requires students to communicate in that language as an endless community, the symptoms of code switching and choosing language are common symptoms that occur. The emergence of these symptoms is physically caused by the familiarity of the users in the foreign language, so that there is language contact here and there in them intentionally or not.

Basically the language used daily by UNIMED French students is Indonesian, but the reality is that as students learn French when they make communication, students often exchange code in their conversation by tucking between French and Indonesian in utterances they are in words, phrases, clauses, or sentences. In communicating between fellow students, both with classmates, classmates, seniors and lecturers determine which language choice to use and the code switching that occurs in conversations between them. Language events such
as chatting, telling something, asking for help, greeting and discussing are explained in the realm of education among French students, UNIMED.

1.1 Theoretical Bilingualism

The concept of bilingualism has always undergone change and expansion since its introduction in the 20th century. Bloomfield (1993: 56) provides limits on bilingualism as two languages mastery like native speakers. Weinreich (1968: 1) interpreted it as the practice of using two or more languages alternately by the same individual. Haugen (1953: 7) says that bilingualism is the ability to issue meanings in other languages. Every time the concept of bilingualism is further softened so that it often only means passive mastery of written language only. Mackey (1970: 555) himself explained it as alternating use of two languages or more by the same person.

1.2 Language Choice

Language choice is a manifestation and use of a particular language by a bilingual person after he decides to choose one language to respond to a particular event. In language selection, many factors influence it. Some of them are the factors of participants, situation, domain, topic of conversation, place, language that is mastered, the form of language and others (ancient, 1997). Holmes (1992: 23) member example, namely; anahina a Tongan New Zealander bilingual speaker lives in Auckland. At home, he used Tongan to his parents and grandmother, but with his brother, he used English when talking about school and their schoolwork.

1.3 Domain and Role Relations

According to Siregar (1995: 38) the realm is a cluster of situations or interaction horizons where one language is used in the domain associated with a particular variation, where the variations are compared to the social situation and are abstractions of the cross between the relationship of roles and status, environment and certain subjects. The domain is bounded by Fishman (1972: 24) as an institutional context and appropriate behavioral events that occur together. The realm will explain to us why the language chosen by the speaker is in accordance with the topic, the role of each speaker and the place where the incident happened. The suitability between language choices and the three factors above is then linked to the social cultural norms prevailing in the speaking community. Fishman (1972: 22) cites Greenfield's (1968) proposition which proposes five kinds of domains that encourage speakers to choose languages according to topics, roles and places, namely family, domain, friendship, religious domain, education domain, and job domain. Holmes (1992: 225) member example: maria is a teenager, her parents are Portuguese dating to London. He uses Portuguese at home and in the Portuguese church to an older person, but he uses English at school and at café with his friend.

1.4 Code Switching

Scotton (1970) also summarizes the opinions of previous sociolinguists about the causes of code switching, namely:

1) Lack of knowledge or lack of ease in using certain languages to discuss a topic causes someone to switch code from one language to another.
2) Speech participants want to hide what they are talking about from the third person present.

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3) Used as a tool to show changes in the tone of conversation from a familiar tone to an official tone.
4) To give an impression to the person he is talking to that he is capable of using various languages, or at least one prestige language.

Code switching can come from language skills, it can also come from the ability to communicate. If the code switching is not yet working properly, then the symptoms come from language skills, but if he is present because the speaker has become accustomed to using mixed language for mere convenience, then the symptoms clearly originate from the ability to communicate. Lance described it as if the words were at the end of the tongue to say. Lance (Haugen, 1978: 33) ruled out the notion that code switching was caused by insufficient language skills of a bilingual person. He is more inclined to justify the opinion that bilingualists switch code in a relaxed conversation, where any speech elements closer to the tip of the tongue will be spoken more easily. The ease of speaking of speakers as a source of code switching when speakers speak in A, is tucked away. phrases like words, phrases or clauses in language B as well as vice versa. This is usually caused solely because the mastery of the language of the speaker is less than perfect. Any language that is easiest because it is used to being spoken is what will be said.

2 Research Method

This type of research is a combination of qualitative and quantitative. Quantitative research according to Moleong (Djadjasudarma, 1993: 9) involves calculations or numbers. Qualitative research according to Djadjasudarma (1993: 10) is a procedure that produces descriptive data in the form of written or oral data in the language community. Regarding the method used by the author is a descriptive method according to Surakhmad (1980: 139) that researchers try to describe and analyze data starting from the collection stage, data compilation is accompanied by analysis and interpretation of the data. This research was conducted in the field involving students who were learning French as an informant. This research was conducted at the Medan State University, the Indonesian Education University and the Jakarta State University. In this study, the authors conducted data collection techniques using questionnaire distribution. Respondents were given twenty questions about the use of the language they use when interacting on role relationships, for example between student-lecturers and language events such as chatting in the realm of the Unimed French student community.

2.1 Data Analysis

After the data has been collected and analyzed, the results of the study are obtained from the chosen language and the UNIMED French student code expert as follows:

2.2 Language Choice

In the data select this language, the results obtained from the relationship of language roles and events are obtained. In table 1 shows the mean and standard deviation for each role relationship of UNIMED French students as follows:
### Table 1. The mean and standard revisions for each role relationship.

<table>
<thead>
<tr>
<th>Role relationships</th>
<th>M</th>
<th>SD</th>
<th>Usage of Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classmate</td>
<td>2.84</td>
<td>0.19</td>
<td>LBBI</td>
</tr>
<tr>
<td>Lecturer</td>
<td>3.08</td>
<td>0.21</td>
<td>BI = BP</td>
</tr>
<tr>
<td>Juniors</td>
<td>2.33</td>
<td>0.16</td>
<td>LBBI</td>
</tr>
<tr>
<td>Seniors</td>
<td>2.54</td>
<td>0.17</td>
<td>LBBI</td>
</tr>
</tbody>
</table>

LBBI = More Indonesian than French  
BI = BP = Indonesian=French

From the results of this study, it was obtained a role relationship with lecturers (student-lecturers) who have Mean = 3.08 while the other role relationships have almost the same mean. While the Standard Deviation is statistical information. The higher the elementary school, the more spread the data and the lower the elementary school, the more uniform the data. Among these choices, the role relationship with the lecturer seems to have the highest SD of other role relationships indicates that the spread of variation in data in the role relationship with the highest lecturers of other role relationships.

### Table 2. Shows the mean and standard deviation for the following language events:

<table>
<thead>
<tr>
<th>Language Events</th>
<th>M</th>
<th>SD</th>
<th>Usage of language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chatting</td>
<td>2.32</td>
<td>0.17</td>
<td>LBBI</td>
</tr>
<tr>
<td>Tell something</td>
<td>2.36</td>
<td>0.18</td>
<td>LBBI</td>
</tr>
<tr>
<td>Ask for help</td>
<td>2.44</td>
<td>0.18</td>
<td>LBBI</td>
</tr>
<tr>
<td>Greeting</td>
<td>4.01</td>
<td>0.30</td>
<td>LBBP</td>
</tr>
<tr>
<td>Discuss</td>
<td>2.36</td>
<td>0.18</td>
<td>LBBI</td>
</tr>
</tbody>
</table>

LBBI = More Indonesian than French  
LBBP = More French than Indonesian

Table 2 shows the mean and standard deviation in language events with the highest value 4.01 to greet and the lowest with a value of 2.32 to mingle. Tell something and discuss gets a value of 2.44. Among these choices, the language event greeting has the highest elementary school than others indicating that the spread of data variations in language events addresses the highest of other language events.

Table 3 shows the mean and standard deviation for each role relationship in each language event are as follows:
Table 3. Mean and standard deviation for each role relationship in each language event.

<table>
<thead>
<tr>
<th>LANGUAGE EVENTS</th>
<th>Role relationships</th>
<th>Chatting M</th>
<th>Tell something M</th>
<th>Ask for help M</th>
<th>Greeting M</th>
<th>Discuss M SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SD</td>
<td>SD</td>
<td>SD</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Classmate</td>
<td>2.32</td>
<td>0.34</td>
<td>2.66</td>
<td>0.40</td>
<td>4.07</td>
<td>2.52</td>
</tr>
<tr>
<td>Lecturer</td>
<td>2.77</td>
<td>0.41</td>
<td>2.52</td>
<td>0.40</td>
<td>4.60</td>
<td>2.84</td>
</tr>
<tr>
<td>Juniors</td>
<td>1.93</td>
<td>0.29</td>
<td>2.02</td>
<td>0.30</td>
<td>3.73</td>
<td>1.95</td>
</tr>
<tr>
<td>Seniors</td>
<td>2.30</td>
<td>0.34</td>
<td>2.23</td>
<td>0.36</td>
<td>3.64</td>
<td>2.14</td>
</tr>
</tbody>
</table>

The mean value from table 3 above, the lowest is the relationship between the role of classmates in chatting with a score of 1.93 and the highest value is the role relationship with the lecturer who greets a value of 4.60.

Table 4 below, is the range of the most dominant language use by UNIMED French students as follows:

<table>
<thead>
<tr>
<th>Usage of language</th>
<th>Value</th>
<th>Amount</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always Indonesian</td>
<td>1</td>
<td>141</td>
<td>16.02</td>
</tr>
<tr>
<td>More Indonesian</td>
<td>2</td>
<td>294</td>
<td>33.41</td>
</tr>
<tr>
<td>Indonesian and</td>
<td>3</td>
<td>232</td>
<td>26.36</td>
</tr>
<tr>
<td>French are the same</td>
<td>4</td>
<td>115</td>
<td>13.07</td>
</tr>
<tr>
<td>Always French</td>
<td>5</td>
<td>98</td>
<td>11.14</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>880</td>
<td>100</td>
</tr>
</tbody>
</table>

In the table above, obtained the use of languages (more languages of Indonesia) with the highest value 33.41%, Indonesia and French language just as much that amounted to 26.36%, while the lowest value is the use of a language (always a language France) with a value of 11.41%. So there are relationships that are the most prominent is LBBI, this corresponds to the behavior of select language above, with behavior like this, the symptoms instead of the code is very vulnerable. Select the language of patterns such as these are the most prominent matrix is the language of Indonesia.
3 Discussion

3.1 Language Choice

Table 1 shows the mean role relationship with the lecturer who got a mean value of 3.08 is the highest value which means BI = BP (the use of Indonesian-French is the same). As for the role relationships with classmates, classmates, and seniors who get an average score of 2, which means LBBI (more Indonesian than French) so there is no prominent difference between the three relationships above. So the behavior of choosing BI = BP language is the existence of coercion or fear of the lecturer to require students to speak French and Indonesian in the same language.

Table 2 shows the mean language event greeting is the highest number, 4.01 which means LBBP (more French than Indonesian), while other language events such as chatting, telling something, asking for help and discussing get an average score of 2, which means LBBI (more Indonesian) so that there are no prominent differences between the four language events. The event of language greeting is considered to be a conversation that has been attached and is more familiar or easy to say by Unimed French students.

Table 3 shows the mean in each role relationship in each language event is the role relationship with the lecturer in the greeting language event gets a score of 4.60, which means LBBI (more French), while for the role relationship with the younger class in a language communication event is 1.93, which means SBI (always Indonesian).

Table 4 shows the tendency of students to use LBBI (more Indonesian than French) which amounted to 33.41%, followed by BI = BP (as many as Indonesian with French) totaling 26.36%, SBI (always Indonesian) totaling 16.2%, LBBP (more French than Indonesian) 13.07% and the lowest is SBP (always in French) which amounts to 11.14%. LBBI's behavior is caused by a lack of vocabulary, less supportive motivation and laziness to speak French. So LBBI's behavior has the potential to create code switching symptoms in Indonesian-language conversations. So, French students in UNIMED tend to use more Indonesian in everyday conversation.

4 Conclusion

Based on the results of the analysis and discussion in this study, conclusions can be drawn, namely:

1. The results of the questionnaire using select language are that: In terms of the role relationship, the role relationship with the lecturer is the highest mean value that amounts to 3.08, which means BI = BP (Indonesian and French) as much, this indicates that the role relationship with the lecturer determines which language to use. Whereas the other role relationships are with classmates, younger siblings, seniors having an average value that is almost the same, which is 2 which means LBBI (more Indonesian), so these three role relationships do not have very significant differences. The role relationship with the lecturer indicates that there is coercion and fear of the lecturer so that it requires students to speak French. In terms of language events, language events greet the highest average score of 4.01, which means LBBP (more French). While other language events such as chatting, telling something, asking for help and discussing have an average value of almost the same, which means that LBBI (more Indonesian) is used in everyday conversations in the UNIMED
environment among French students. This event of greeting language indicates that the word is already very attached, familiar and easily spoken by the speaker.

2. In terms of the percentage of language usage, the most dominant language use is LBBI (more Indonesian) which is 33.41%. So, UNIMED French language students tend to use Indonesian more. While the lowest language use is always French which amounts to 11.14%. With this LBBI behavior the symptoms of code switching are very vulnerable or prominent which occur in Indonesian language by UNIMED French students.

Reference
Effect of Red-Fleshed Pitaya (Hylocereus Polyrhizus) to Increase Glutathione Peroxidase Levels in Male Rats (Rattus Norvegicus): The Induced Oxidative Stress

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Department of Community Medicine/Public Health, Faculty of Medicine, Universitas Sumatera Utara, Medan, North Sumatera, Indonesia²,³,⁴

Abstract. High intensity physical activity requires large amounts of antioxidants. Exhausting physical activity can decrease glutathione peroxides levels in response to increasing production of free radicals. Glutathione peroxides levels to eliminated free radicals and reduce oxidative damage. This study aims to know effect antioxidant red-fleshed pitaya extract to increase glutathione peroxides. The subject of this research are 16 male rats, age 3 months with average weight of 200 gr, divided into 2 groups. Group 1 (OS-RFP) : the induced oxidative stress and given aquadest, group 2 (OS+RFP) : the induced oxidative stress and given 100 mg/kgWB of red-fleshed pitaya extract. Oxidative stress is given was swim for 20 minutes, thrice a week for 3 weeks. The glutathione peroxides levels in the group1 higher than the group 2. There were significant differences in the increasing glutathione peroxides levels (p=0.000) between group 2 and group 1. This research shows that glutathione peroxides levels have increased in oxidative stress groups given red-fleshed pitaya extract. Red-fleshed pitaya extract has to increase glutathione peroxides levels that is can eliminate oxidative stress.

Keywords: Oxidative stress, glutathione peroxides, red-fleshed pitaya, rat.

1 Introduction

Exhausting physical exercise increases oxygen needs due to the increase of metabolism in the body. The rise of oxygen uptake is contracting muscle leads to ischemia reperfusion which causes one electron to detach from respiratory chain and forms free radicals (Power et al., 2008; Sahlin et al., 2010).

In physiologist condition, the free radicals production will be balanced by the production of endogenous antioxidant in the body like glutathione peroxides (GPx). Glutathione peroxides is a natural antioxidant in the form of an enzyme, produces in the body, with a strong effect and as the first defense against attack from free radicals (Gomes et al., 2012).

The study done by Harahap et al. (2018) stated that a regular and controlled dosage of exercise, like weigh training, based on the ability of each individual can eliminate the free radicals and increase of glutathione peroxides levels, more over improve the performance of a 200-metre runner (Harahap et al., 2018).

Antioxidant activity depends on the intensity of exercise as exhausting physical exercise...
can decrease of glutathione peroxides levels in response against increasing of free radicals and to eliminated of free radicals and reduce oxidative damage. However, during high intensity physical activity, the free radicals production can be greater than glutathione peroxides which results in oxidative stress (George and Osharechiren, 2009; El Abed et al., 2014).

Actually free radicals, including ROS (Reactive Oxygen Species), important for normal body healthy in reduce inflammation, phagocytosis and regulate the muscle tone of blood vessels and organs. However, if the balance of the free radicals and antioxidant is disturbs which results in oxidative stress (Valko et al., 2007; Cooper et al., 2002; Marciniak et al., 2009; Castrogiovanni, 2012). Oxidative stress cause heavy training has damages cells, muscles fatigues and decreases antioxidant levels (George and Osharechiren, 2009; Kurkcu et al., 2010; Azizbeigi et al., 2013).

To determine whether there is an increase in oxidative stress among others by analyzing the endogenous antioxidant content namely glutathione peroxides. The increased oxygen consumption during exercise will activate glutathione peroxides enzymes to move hydrogen peroxidase (H₂O₂) from the cell. The affinity of glutathione peroxides against H₂O₂ is stronger than catalase. The location of glutathione peroxides is in mitochondria and cytosols to protect cells from free radicals that can damage lipid membranes, proteins and nucleic acids (Urso, 2013).

The body needs exogenous antioxidants to eliminate and prevent oxidative stress (Gomez et al., 2009). The sources of exogenous antioxidant are Vitamin E and C also beta-carotene. External antioxidant from food or supplement can to fight the excess of free radicals. Proanthocyanidin from grape seed was given to rats for 2 weeks. It lowers down Malondialdehyde levels, increases superoxide dismutase and glutathione peroxides activities significantly, moreover reduces fatigue after physical activities (Belviranli et al., 2006).

Red-fleshed pitaya (Hylocereus polyrhizus) is one type of fruits that is unique with a lot of benefits. The fruit is recently popular among the people in Indonesia and appears as natural antioxidant. Several invitro studies have shown that red-fleshed pitaya extract has the power as antioxidant (Sani et al., 2009; Nurul, 2014). This study aims to know effect antioxidant red-fleshed pitaya extract to increase glutathione peroxides in male rats the induced oxidative stress.

2 Methods

2.1 Animal

The subject of this research are 16 male rats, age 3 months with average weight of 200 gram. Rats were acclimatized and maintained for 1 week to adapt in a groups of 4 rats per cage made of plastic material (30 x 20 x 10 cm) which is covered with fine wire mesh.

2.2 Material and Reagents

This study using red-fleshed pitaya extract obtained from methanol extraction process. Maceration technique was used and the extract was concentrated with air-drying method. Glutathione peroxidase levels were examined using ELISA method and spectrophotometry wavelength of 450 nm with mouse Glutathione peroxidase Elisa kit, catalog E1483Mo for glutathione peroxidase levels analysis.
2.3 Statistical Analysis

Data were analyzed with statistics and presented in form of means and standard deviation, tables and figures. Each data obtained is first determined by the distribution of the Normality test. If the data is normally distributed, an independent t test is performed.

3 Results

Table 1, the results of examination the glutathione peroxides levels are normally distributed. The mean glutathione peroxides level at the OS+RFP group was higher compared to the OS-RFP group (32.24±2.43 vs 24.69±4.69) (table 2). This shows that glutathione peroxides levels an increase significant at the oxidative stress groups given red-fleshed pitaya compared to the oxidative stress group without given red-fleshed pitaya (figure 1).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Groups</th>
<th>Normality test statistic</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glutathione peroxides</td>
<td>OS-RFP</td>
<td>0.865</td>
<td>0.135*</td>
</tr>
<tr>
<td></td>
<td>OS+RFP</td>
<td>0.895</td>
<td>0.263*</td>
</tr>
</tbody>
</table>

Note: * = signifikan ( p>0.05), SD : standard deviation

Table 2. Effect of Red-fleshed Pitaya to Increase Gluthatione Peroxidase levels.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>SD</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS-RFP</td>
<td>24.69</td>
<td>4.69</td>
<td>0.000*</td>
</tr>
<tr>
<td>OS+RFP</td>
<td>32.24</td>
<td>2.43</td>
<td></td>
</tr>
</tbody>
</table>

Note: * = signifikan ( p<0.05)

Fig. 1. Glutathione peroxides levels in OS-RFP group and OS+RFP group
4 Discussion

The results of this study are found that exhausting physical exercise as a cause of oxidative stress when combined with giving red fleshed pitaya extract every day during exercise can increase glutathione peroxidase levels. Red fleshed pitaya extract with a dose of 100 mg/kgBW is better in increasing glutathione peroxidase levels. The study showed that red fleshed pitaya extract has the potential as an exogenous antioxidant which can eliminate free radicals those formed during exhausting physical exercise are evidenced by increased glutathione peroxidase levels.

Free radicals are compounds or atoms where the outer orbitals have unpaired electrons so that they are highly reactive to surrounding cells. Reactive compounds look for pairs, by attacking and binding to the molecular electrons around them and if these compounds meet new radicals, new radicals will form again and so on so that a chain reaction will occur (Kelsey and Bloomer, 2009).

Damage in biological molecules is affected by this oxidative stress (Finaud et al., 2006; Andersson et al., 2009; Kothari et al., 2010). Phosphorylation oxidation due to exhausting physical exercise is the main internal factor causing oxidative stress (Kurkcu et al., 2010).

Despite the effects of exercise on health benefits, many studies reported during exhausting physical exercise there is an ischemia-reperfusion process that causes the production of oxidative due to release it of electrons from the respiration chain. During exhausting physical exercise, the release of free radicals can increase in mitochondria and cause oxidative stress (Daniel et al., 2010; Escribano et al., 2010). Oxidative stress causes DNA damage, loss of protein structure function such as membrane enzymes and receptors, and structural damage from the lipid cell layer (Guzel et al., 2007; Abruzzo et al., 2013; Liu et al., 2013). The research by Norouziyan et al. in active women it has been found that Total Anti-Oxidant Capacity and Glutathione after exercise can be increase. This shows that exercise can be stimulating the body's ability to increase antioxidant (Norouziyan et al., 2014).

Glutathione peroxides is an endogenous antioxidant that functions as free radicals catcher by releasing its own electrons to prevent oxidation from occurring and destroying other molecules. Glutathione peroxides is called as scavenger enzyme to hydrogen peroxide, found especially in mitochondria.

The high and low glutathione peroxides levels determine its activities as antioxidant. The higher of glutathione peroxides levels is, the higher the activities of endogenous antioxidant are. On the other hand, when there is a decline in the level, there is also a decrease in the activity (Gomes et al., 2012).

Effectiveness of antioxidant systems in offset free radical production reaches saturated conditions in physical activity with a 70% load of maximal heart rate (Castro et al., 2009), because higher intensity exercise will produce more free radicals (Guzel et al., 2007). In this study, glutathione peroxides levels is observed to have the tendency to increase in the group given heavy physical training and red-fleshed pitaya extract. This happens as a result of red-fleshed pitaya to have the potential as antioxidant that is able to balance the increase of free radicals from heavy workouts.

Therefore, glutathione peroxides level is higher in the group that received red dragon fruit extract than the group that did not. The result from this study aligns with the study done by Bing & Wang (2010) in which stated that Ginkgo Biloba can increase the glutathione peroxidase levels in liver tissue and improve recovering process after a maximum physical activity (Bing & Wang, 2010).
Another research by Suarsana et al. (2013), the application of isoflavone is able to handle SOD decrease and to prevent MDA level from increasing at heart tissues of rats in oxidative stress condition.

5 Conclusions

The conclusion of this study is that red-fleshed pitaya has the potential as antioxidant that is able to eliminate oxidative stress due to exhausting physical exercise. Red fleshed pitaya extract as an antioxidant has an effect on increasing glutathione peroxides in rats induced by oxidative stress.

Acknowledgements. We are gratefully to Ministry of Research and Technology and Higher Education Republic of Indonesia under the research grant UNIMED of Year 2018 with the Research Contract Number: 027/UN33.8/LL/2018.

References


Abstract. Erbium (Er\(^{3+}\)) doped phosphate glasses with chemical formula \(x(70-x)\) \(\text{P}_2\text{O}_5 - 10 \text{Bi}_2\text{O}_3 - 10 \text{Na}_2\text{O} - 10 \text{Gd}_2\text{O}_3 : x \text{Er}_2\text{O}_3\) \((x = 0.05 ; 0.1 ; 0.5 ; 1.0 ; 3.0\) mol\%) were prepared by a melted-quenching process. Glass samples are cut to the optimum shape and size: 15 x 10 x 4 mm\(^3\). Furthermore, glasses were smoothed to obtain a flat surface and high transparency. The physical properties like density, molar volume, and refractive molar of the glasses have been investigated by using Archimedes principle. The absorption and emission spectra have been obtained by utilize UV-Vis-NIR spectrophotometer and PTI Thoriba Spectrofluorophotometer respectively. From the measurements could be known that an increase in the concentration of Erbium ions provides a linear relationship to density and the strength value of the glass material field. In the measurement of optical absorption there are six absorption bands which are around wavelengths 379, 488, 521, 652, 803, and 978 nm. Each in sequence corresponds to the energy level: \(4G_{11/2}, 4F_{7/2}, 2H_{11/2}, 4F_{9/2}, 4I_{9/2}, \text{dan } 4I_{11/2}\). From the calculation results, it is found that the most probabilities occur at the transition 978 nm or \(4I_{15/2} \rightarrow 4I_{11/2}\) on the measurements at a wavelength of 200 nm to 2500 nm so that the glass has the potential as a laser glass material.

Keywords: Optical properties, Erbium, Phosphate glasses.

1 Introduction

Glasses have a role in doping rare earth ions that can be applied in the fields of lasers, optical amplifiers, wave guides, optical fibers, and optical data storage systems. Glass Phosphate is an attractive host because it can accommodate active ions without losing their properties. In addition, Phosphate glass has other interesting properties, namely having high thermal expansion, high refractive index, low dispersion, low melting point, high electrical conductivity, and various structures to accept some cation or anion exchange (Permana, Budi, Marpaung, Sahar, & Buchori, 2016; Rajagukguk, 2017; Sdiri, Elhouichet, Barthou, & Ferid, 2012). The effect of Phosphate doped Er\(^{3+}\) concentration was used to study the cooling effect
of concentration on luminescence performance as an evaluation of rare earth content that is most suitable for laser development (Pugliese et al., 2016).

2 Method

Chemical formula used in making glass samples Er: This phosphate is (70-x) P₂O₅ – 10Bi₂O₃ – 10Na₂O – 10Gd₂O₃ – xEr₂O₃. There are 5 samples with x = 0.05; 0.1; 0.5; 1; 3 (%mol). The material is then mixed and mashed in the alumina crucible. The material is then melted in the furnace electric at 1200 °C for 3 hours until it is liquid. To avoid a drastic temperature drop, the fused material is then poured into stainless steel molds on other electric furnaces at a temperature of 500 °C in the annealing process.

After obtaining the glass material with good transparency, the sample is then cut to a size of 15 × 10 × 4mm³ to obtain the optimum dimensions in measuring the physical and optical properties of the glass material. The samples that have been cut are then polished to obtain a flat surface and high transparency. The polished glass has an average thickness of 0.413 cm.

![Fig. 1. Medium glass after the process of forming size and smoothing](image)

3 Results

In Figure 1 there is a color change in the five samples which shows each difference in Er³⁺ ion concentration. The color change of the glass shows a pink color that matches the color characteristics of the Erbium ion.

The sample with an ion concentration of 3 %mol appears to have a darker color than the other glass because the number of Er³⁺ ions that occupy the glass host is tighter. Also seen at a concentration of 3 %mol of glass composition material which results in the glass not having good transparency, because the furnace process and the glass material do not melt completely.

Physical properties observed in this study are: density, molar volume, refractive index, ion concentration and polar radius. Molar density and volume are obtained from measurements using Archimedes principles. Table 1 shows the parameters of the physical properties of glass Er: Phosphate. From these measurements it can be seen that the value of Erbium ion concentration has a linear relationship to the density and field strength values of glass material.

Glass density is considered an important property for controlling glass quality. Changes in glass density are directly affected by differences in glass composition. These changes affect the structure of the glass tissue. Figure 2 shows an increase in glass density from a
concentration of 0.05 to 3 %mol, this is due to an increase in the inter atomic average distance followed by the greater concentration of Er$^{3+}$ ions inserted into the glass structure.

Table 1. Measurement results and calculation of physical properties of glass material (70-x)P$_2$O$_5$-10Bi$_2$O$_3$-10Na$_2$O-10Gd$_2$O$_3$-xEr$_2$O$_3$.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Inisial Gelas Er:Fosfat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molar mass</td>
<td>Er1</td>
</tr>
<tr>
<td>Density (g/cm$^3$)</td>
<td>3.57</td>
</tr>
<tr>
<td>Molar volume (cm$^3$/mol)</td>
<td>52.87</td>
</tr>
<tr>
<td>Ion concentration of Er$^{3+}$ (N x 10$^{22}$/cm$^2$)</td>
<td>0.06</td>
</tr>
<tr>
<td>Polaron radius (Å)</td>
<td>1.04</td>
</tr>
<tr>
<td>Ions distance (Å)</td>
<td>2.57</td>
</tr>
<tr>
<td>Field strength (F x 10$^{17}$/cm$^5$)</td>
<td>6.07</td>
</tr>
<tr>
<td>Refractive index</td>
<td>1.66</td>
</tr>
<tr>
<td>Dielectric constant (ε)</td>
<td>2.74</td>
</tr>
<tr>
<td>Molar refraction, Rm (cm$^3$)</td>
<td>224.94</td>
</tr>
<tr>
<td>Electrical susceptibility, χ</td>
<td>0.05</td>
</tr>
<tr>
<td>Reflection loss, R(%)</td>
<td>29.45</td>
</tr>
<tr>
<td>Polarization of oxide ions (αm x 10$^{-24}$ cm$^3$)</td>
<td>0.89</td>
</tr>
</tbody>
</table>

Fig. 2. Graph of density and molar volume of glass material Er: Phosphate
The ions from Er\(^{3+}\) that enter the phosphate tissue cause a rearrangement of the atomic structure. The properties possessed by glass network structures when there is a role for the modifying element in glass tissue that causes a decline in molar volume or decrease when the modifier's molecular weight is increased.

Glass X-ray diffraction spectrum Er: Phosphate is shown in Figure 3. The glass spectrum pattern shows a sharp peak in the diffraction angle (2\(\theta\)) observation area, at a diffraction angle of 21.46\(^{\circ}\) for Er5 or a glass material with a concentration of 3 mol%. The sharp peak that occurs indicates that there is a crystal characteristic in the glass material so that it can be stated that the glass is not amorphous. The shape of the mound that has a sharp peak is the result of the irregular atomic distance between the closest glass molecules.

![XRD spectrum of glass material Er: Phosphate with a concentration of 3 %mol.](image)

**Fig. 3.** XRD spectrum of glass material Er: Phosphate with a concentration of 3 %mol.

![FTIR spectra of glass material Er: Phosphate](image)

**Fig. 4.** FTIR spectra of glass material Er: Phosphate.
In this study we can see two peaks that appear in the absorption band area of 600-1400 cm\(^{-1}\) in Figure 4. Both of these peaks are peak spectral positions that are not shifted. Both peaks were identified in this band at around 865 and 1212 cm\(^{-1}\). Then at the top of the absorption band 865 cm\(^{-1}\) is associated with a different high intensity and in accordance with the harmonic vibration mode/ deformation P-O-P of PO\(^-\). The peak increases with increasing vibration symmetrical intensity stretching P-O-P to \(Q^2\) units. Whereas the 1212 cm\(^{-1}\) absorption band is associated with stretching asymmetric PO\(_4\) groups (Maheswari et al., 2018).

![Fig. 5. Spectrum absorption glass measured by Shimadzu 3600 NIR UV-VIS](image-url)

Used Shimadzu 3600 NIR UV-VIS Spectrometer for measuring glass sample absorption spectrum. Measurements were made at wavelengths of 200 nm to 2500 nm with a range of wavelength increases of 0.1 nm. The glass absorption spectrum is shown in Figure 5 in the wavelength region 320 nm to 1100 nm. From these glass samples there are six peaks which are around wavelengths 379, 488, 521, 652, 803, and 978 nm. Each sequentially corresponds to energy levels: \(^4G_{11/2}, ^4F_{7/2}, ^2H_{15/2}, ^4F_{9/2}, ^4I_{9/2}, \text{ dan } ^4I_{11/2}\). This energy level will make it easier to explain the process of transition between energy levels. It is known that Er\(^{3+}\) ions work in wavelength regions around 1550 nm (\(^4I_{13/2} \rightarrow ^4I_{15/2}\)) and 980 nm (\(^4I_{11/2} \rightarrow ^4I_{13/2}\)) for telecommunications applications that are useful as optical amplifiers (Susanto, 2012).

The energy level for each transition from each glass Er: Phosphate is shown in Table 2. In the table it appears that most of the same glass transition is in the same wavelength position. During the \(^4I_{15/2} \rightarrow ^2G_{9/2}\) and \(^4I_{15/2} \rightarrow ^2G_{11/2}\) transitions that have different wavelength positions for the Er1 and Er4 glass medium, which will also affect the energy level. The difference in the position of the wavelength arises from the partial expansion of the skin caused by the shift of the charge from the ligand to the nucleus of the ion center (nephelauxetic effect) which can directly affect the molar volume of the glass medium (Rajagukguk, 2017).

In Table 3 the oscillator strength value of the glass Er: Phosphate. The standard deviation (\(\Delta f_{\text{rms}}\)) of the oscillator strength in this study shows the best value in the Er5 glass medium
with a concentration of 3 %mol is ± 0.19. The smaller the strength of the oscillator produced by the glass medium, the better the glass produced, which affects the optical quality of the medium. The position of the absorption band and the level of energy produced by a glass are related to the strength value of the medium oscillator. Where the Judd Ofelt Analysis is used to determine the strength of the glass medium oscillator Er: Phosphate.

Calculation of transition parameters is done using Judd Ofelt analysis and line strength calculation with equations.

\[ f_{\text{meas}} = \frac{3ch(2J + 1) - 9n^2}{8m^2e^2N} \frac{2.3}{\lambda} \int_{\lambda}^{\infty} [J_{\lambda} - J_{\lambda_{\text{avg}}}] \text{OD}(\lambda) d\lambda \]

Where \( J \) and \( J' \) are the total angular moments of quantum numbers, \( \lambda \) is the average wavelength of the absorption, \( n \) is the refractive index of the glass, \( c \) is the speed of light, \( e \) is the electron charge, \( h \) is the plank constant, \( N \) is the number of Er\(^{3+} \) ions, \( t \) is glass thickness, and \( \text{OD} \) is optical density.

**Table 3.** The value of oscillator strength (\( f \times 10^{-6} \)) glass Er: Phosphate

<table>
<thead>
<tr>
<th>Transition</th>
<th>Er1</th>
<th>Er2</th>
<th>Er3</th>
<th>Er4</th>
<th>Er5</th>
</tr>
</thead>
<tbody>
<tr>
<td>( ^4I_{15/2} \rightarrow ^4I_{11/2} )</td>
<td>3.78</td>
<td>5.57</td>
<td>1.72</td>
<td>1.93</td>
<td>7.91</td>
</tr>
<tr>
<td>( ^4G_{9/2} )</td>
<td>1.77</td>
<td>3.75</td>
<td>1.43</td>
<td>4.41</td>
<td>3.32</td>
</tr>
<tr>
<td>( ^2H_{9/2} )</td>
<td>1.39</td>
<td>1.20</td>
<td>3.30</td>
<td>1.18</td>
<td>5.08</td>
</tr>
<tr>
<td>( ^2H_{11/2} )</td>
<td>1.06</td>
<td>3.97</td>
<td>8.03</td>
<td>3.00</td>
<td>2.62</td>
</tr>
<tr>
<td>( ^4S_{3/2} )</td>
<td>1.73</td>
<td>2.00</td>
<td>1.10</td>
<td>1.43</td>
<td>5.88</td>
</tr>
<tr>
<td>( ^4I_{9/2} )</td>
<td>7.03</td>
<td>4.46</td>
<td>2.65</td>
<td>8.56</td>
<td>1.08</td>
</tr>
<tr>
<td>( ^4F_{5/2} )</td>
<td>2.34</td>
<td>2.99</td>
<td>1.81</td>
<td>1.25</td>
<td>8.41</td>
</tr>
<tr>
<td>( ^4I_{11/2} )</td>
<td>6.03</td>
<td>7.03</td>
<td>1.59</td>
<td>3.00</td>
<td>8.04</td>
</tr>
</tbody>
</table>

The Judd Ofelt parameter which states the spectroscopic intensity for Er: phosphate samples is shown in Table 4. The values of each \( \Omega \) in this study have not been consistent to increase. But the covalence bond produced by the glass of Er: phosphate is smaller than
previous studies (Susanto, 2012). The relationship between $\omega$ produced for glass medium in this study was to follow the pattern $\Omega_2 > \Omega_4 > \Omega_6$.

Table 4. Parameters $\Omega_2, \Omega_4, \Omega_6 (x10^{-20} \text{ cm}^2)$ for Er$^{3+}$ ions

<table>
<thead>
<tr>
<th>Glass</th>
<th>$\Omega_2$</th>
<th>$\Omega_4$</th>
<th>$\Omega_6$</th>
<th>$\chi(\Omega_4/\Omega_6)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Er1</td>
<td>1.63</td>
<td>1.99</td>
<td>4.47</td>
<td>0.45</td>
</tr>
<tr>
<td>Er2</td>
<td>1.38</td>
<td>1.16</td>
<td>6.24</td>
<td>0.19</td>
</tr>
<tr>
<td>Er3</td>
<td>4.38</td>
<td>4.71</td>
<td>2.70</td>
<td>1.75</td>
</tr>
<tr>
<td>Er4</td>
<td>1.76</td>
<td>2.14</td>
<td>1.42</td>
<td>1.51</td>
</tr>
<tr>
<td>Er5</td>
<td>2.47</td>
<td>2.44</td>
<td>1.18</td>
<td>2.07</td>
</tr>
</tbody>
</table>

In Figure 6 shows the changes in the edge edge of optical absorption and baseline position of the glass medium spectrum can affect the energy band gap value. The Er3 Chart has a higher absorption band width. This causes the value of the medium band energy gap for indirect transition to be greater than the other samples, is 3.25 eV.

Fig. 6. Energy band gap of indirect glass Er: Phosphate

For the direct transition shown in Figure 7, the Er3 glass medium also produces a higher absorption band gap than the other glass, which is 3.5 eV. but large Eg the average for indirect transition is greater than the direct transition. This is because the baseline spectrum of indirect transitions is lower than the indirect transition.
To see the suitability of the absorption spectrum that has been obtained, monitoring of the glass excitation spectrum is carried out Er: Phosphate. Figure 8 shows the Er5 excitation spectrum monitored using a 1543 nm emission wavelength. Overall, the emission spectrum produced by all of Er:Phosphate has the same pattern and excitation area.

There are twelve wavelength regions that can be used to excite active ions in the glass medium as shown in Figure 8. The hypersensitive transition $^2\text{H}_{11/2}$ in the glass is at a
wavelength of 521 nm. Drastically increased excitation band intensity was obtained at $^4F_{7/2}$ at the peak of the 488 nm wave. This indicates that the correlation between 488 nm excitation wavelength and 1543 nm emission spectrum is very strong.

Figure 10 shows Er: Phosphate glass emission spectrum which is excited by light with a wavelength of 488 nm. The emission spectrum produced by the glass Er: Phosphate has a peak of $^4I_{13/2}$ which is 1543 nm. Transition of the emission band can be consistently produced by each type of glass. The emission value in the approaching infrared range produces the maximum intensity. So it can be stated that the glass medium is Er: This phosphate is very potential to be used as a laser material of 1543 nm wavelength.

![Glass emission spectrum Er: Phosphate](image)

The $^4F_{3/2} \rightarrow ^4I_{13/2}$ transition type whose peak is at a wavelength of 1545 nm is the most active luminescence among the other transitions observed in the Er$^{3+}$ ion. So that the glass medium doped by Er$^{3+}$ ion has the potential to be used as a laser producer in the 1545 nm waveform. This result is also supported by the highest probability value of radiation transition ($A_R$) for the $^4F_{3/2} \rightarrow ^4I_{13/2}$ transition in each glass. As for the large latitude of stimulated emission ($\sigma_e$) in the glass medium Er: Phosphate gets smaller with the increasing Er$^{3+}$ ion. The biggest $\sigma_e$ value is produced by Er1 medium while the lowest is obtained by Er5 medium. The magnitude of the $\sigma_e$ value is influenced by the radiative transition probability ($A_R$) and the effective line width ($\Delta \lambda_{eff}$) of light fluorescence.
Table 5. Wavelength of emission peak $\lambda_p$ (nm), effective line width $\Delta\lambda_{\text{eff}}$ (nm), stimulated latitude $\sigma_e (\lambda_p \times 10^{-20})$ (cm$^2$), branching ratio $\beta_R$ (%), probability of AR radiation transition (s$^{-1}$) glass system Er: Phosphate

<table>
<thead>
<tr>
<th>Gelas</th>
<th>Transisi</th>
<th>$\lambda_p$ (nm)</th>
<th>$\Delta\lambda_{\text{eff}}$ (nm)</th>
<th>$A_R$ ($s^{-1}$)</th>
<th>$\beta_R$ (%)</th>
<th>$\sigma_e (\lambda_p \times 10^{-20})$ (cm$^2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Er1</td>
<td>$4I_{13/2}$</td>
<td>1545</td>
<td>74.8751</td>
<td>251.08</td>
<td>0.2154</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9.7813</td>
</tr>
<tr>
<td>Er2</td>
<td>$4I_{13/2}$</td>
<td>1544</td>
<td>78.0426</td>
<td>20.02</td>
<td>0.2124</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7.4633</td>
</tr>
<tr>
<td>Er3</td>
<td>$4I_{13/2}$</td>
<td>1542</td>
<td>74.8751</td>
<td>251.08</td>
<td>0.2048</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.1612</td>
</tr>
<tr>
<td>Er4</td>
<td>$4I_{13/2}$</td>
<td>1542</td>
<td>73.8131</td>
<td>10.14</td>
<td>0.2063</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.9760</td>
</tr>
<tr>
<td>Er5</td>
<td>$4I_{13/2}$</td>
<td>1543</td>
<td>74.3598</td>
<td>9.96</td>
<td>0.2048</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.8868</td>
</tr>
</tbody>
</table>

Table 6. Lifetime value in theory $\tau_R$ (μs) glass system Er: Phosphate

<table>
<thead>
<tr>
<th>Glass</th>
<th>$\tau_R$ (μs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Er1</td>
<td>3982</td>
</tr>
<tr>
<td>Er2</td>
<td>49947</td>
</tr>
<tr>
<td>Er3</td>
<td>75390</td>
</tr>
<tr>
<td>Er4</td>
<td>98653</td>
</tr>
<tr>
<td>Er5</td>
<td>100446</td>
</tr>
</tbody>
</table>

Radiative lifetime represents a mean effectiveness through levels between states in the environment around Er$^{3+}$ ions. Table 6 shows the lifetime value in theory. In this study, the measurement of lifetime lifetime values could not be produced due to poor medium glass conditions for luminescence processes. Lifetime at $^4I_{13/2}$ transition shows an increasing trend in glass that has a low $A_R$

4 Conclusions

Development of optical and laser-based optical fields in glass materials is currently being studied and studied. In this study the manufacture of glass laser medium with active Er$^{3+}$ ion was applied in the range of near infrared surgery.

By using the composition $(70-x)P_2O_5 - 10Bi_2O_3 - 10Na_2O - 10Gd_2O_3$ doped with active ion $xEr_2O_3$ where $x = 0.05; 0.1; 0.5; 1; 3 ($%mol) can be fabricated into glass with the melt-quenching method with a high level of transparency. Through measurements and calculations performed, several physical properties and structures such as refractive index, density, field strength, infrared absorption properties and crystal bonds in glass. The addition of Erbium ions provides a linear relationship with density, ion concentration, and field strength.
There are six transitions and the top position of the glass medium absorption band Er: Phosphate occurs at 379, 488, 521, 652, 803, and 978 nm, where each energy level corresponds to: $^4\text{G}_{11/2}$, $^4\text{F}_{7/2}$, $^2\text{H}_{11/2}$, $^4\text{F}_{9/2}$, $^4\text{I}_{9/2}$, dan $^4\text{I}_{11/2}$. The greatest absorption probability occurs at a wavelength of 978 nm or $^4\text{I}_{15/2} \rightarrow ^4\text{I}_{11/2}$ with a wavelength range of 320 nm to 1100 nm. The emission spectrum obtained produces emissions at the infrared wavelength of 1543 nm or $^4\text{I}_{13/2} \rightarrow ^4\text{I}_{15/2}$.

The lifetime value obtained based on Judd Ofelt calculations on the Er: Phosphate glass system is increasing according to the increase in glass concentration value. Where the lifetime $\tau_R$ (μs) values are 3982, 49947, 75390, and 100446. Lifetime at $^4\text{I}_{11/2}$ transition shows an increasing trend in glass that has a low $A_R$. This effect reinforces that the concentration of quenching is between glasses that have almost the same lifetime and quantum efficiency.

Acknowledgements. This work is supported by Center of Excellence in Glass Technology and Materials Science (CEGM), Nakhon Pathom Rajabhat University, Thailand and grant Penelitian Unggulan Strategis Nasional (PUSNAS) from Directorate of Higher Education, Ministry of National Education, Indonesia.

References


The Relation between Anxiety and Aggressivity Toward Karate Martial Arts Achievement in Male Athletes Kumite

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Pendidikan Kepelatihan Olahraga, Universitas Negeri Medan, Jl. Willem Iskandar Psr V, Medan, Indonesia¹,²

Abstract. The study aim to examine (1) The relationship directly of the anxiety to sport performance in competitive male’s karateka kumite, (2) The relationship directly of the aggressivity to sport performance in competitive male’s karateka kumite, (3) The relationship indirect of the anxiety to sport performance in competitive male’s karateka kumite. One hundred and three males karateka kumite (20 ± 2 years) participated in this study. Karateka were taken in Kejuaraan Nasional Antar Mahasiswa Sebelas Maret Cup VII in Surakarta. The research of methodology is the correlation descriptive. The results of study are (1) there is the relationship directly between the anxiety to sport performance in competitive male’s karateka kumite. (2) there is the relationship directly between the aggressivity to sport performance in competitive male’s karateka kumite. (3) there is the relationship indirectly between the anxiety to sport performance in competitive male’s karateka kumite. The conclusion of this study, to achieve the anxiety and aggressivity exercises. Thus, hopefully the male karateka kumite can able to develop aggressivity and to control the behaviour of themself.

Keywords: Anxiety, Aggressivity, Sport Performance.

1 Introduction

In sport martial art “karate” the kumite event is need courage to attacking the opponents. The victory is not achieved of purely technical factor, but non-technical factors very influential by the mental aspects such as motivation, confidence, emotional, anxiety and aggressify. The sport with full body contact requires courage to attack (Husdarta; 2010,76). Aggressiveness is absolutely necessary for every martial arts sport especially Karate. Sports performance is not only determined by physical aspects, techniques and tactics are also influenced by psychological factors (Bompa ;1994). Indonesia performance karateka In the championship of Cadets and Juniors Asian Karatedo Federation 10th in Hong Kong is bad while the other southeast asia countries get better result. Indonesia karateka contingent finished sixth, the winner is Iran, Japan in second, Kazakhstan third, Vietnam fourth and Malaysia in fifth. “A few years ago Indonesian was complacent and did nothing” said Hendardji Soepandji General Chairman of PB. Sports federation of Karate-Do Indonesia (FORKI), in 1970s to 1980s karate indonesian ever successful.
Some of the national level coaches said Indonesia karateka is good as physical conditioning, technic, and tactics. But the ability is not supported by a strong mental so the highest performance will not be achieved. The mental make karateka better. The failure of the karateka caused of high level anxiety and low aggressiveness. During the fight, aggressive behavior is makes karateka get more courage to attack especially in the kumite event.

Rita Subowo, The Chairman KONI/KOI said the high level of anxiety Indonesia Karateka become one of the failure factors to achieve gold medal in the Asian Games XVI/2010 in Guangzhou. The level of competition affect the mental of athletes and build of high levels of anxiety and loss of confidence. High anxiety make athletes to be not optimal, and it is very reasonable because they want to offer the best performance for Indonesia. The study aim to examine (1) The relationship directly of the anxiety to sport performance in competitive male’s karateka kumite, (2) The relationship directly of the aggressivity to sport performance in competitive male’s karateka kumite, (3) The relationship Indirect of the anxiety to sport performance in competitive male’s karateka kumite. The purpose of this study are (1) To find out the relationship directly of the anxiety to sport performance in competitive male’s karateka kumite, (2) To find out the relationship directly of the aggressivity to sport performance in competitive male’s karateka kumite, (3) To find out the relationship Indirect of the anxiety to sport performance in competitive male’s karateka kumite.

There are three important elements in the karate curriculum namely kihon (basics), kata (forms) and kumite (fight). However these three elements should not be considered separately, because they are a unity and bind strongly one another (Bustami Syam, 2007:14). The karate have two types of competition, they are kumite and kata (Nakayama, 1990:163). Each karateka must taking a part in the nasional or international competition by FORKI (Federasi Olahraga Karate-Do Indonesia) and WKF (World Karate Federation) to get a performance rating. The performance is the result of exercise and learning (Sugiyanto, 1999:83). The maximum achievement can be generated through a long process. Exercise early or starting at a young age is one of the right decision to achieve the maximum performance.

The actualization of three factors (physical, technical and psychological) will show the performance karateka (Pesurnay 2000:172). The mind and mental is more important than the muscle strength. it is proved that the sports performance is not only determined by strength of muscle, but brains and mental also included (Intan Sugih, 2001:1). Readiness of mind and mental turned out to be very beneficial for achieving the higest performance. One of the indicators of stronger mentality is low level anxiety during the fight. Anxiety is the feelings and thoughts associated with doubt and worries. The anxiety indicated by panic, worry, high tension, shortness of breath, nervous, restless, confused, depressed and hasty(Nideffer, 1992: 127). Anxiety is a state of understanding the situation as something that is scary and stress, sometimes the reason can be understood but sometimes not.

The research conducted on athletes in the Olympic Games 1968 shows athletes who have the desire to achieve high performance but have high anxiety will show the decreased performance, but athlete who low anxiety and high achievement motives will show increased performance (Setyobroto, 2009:99). Anxiety divided into two aspects, they are the psychological aspect and physiological aspect. The psychological aspect is anxiety manifests in psychiatric symptoms such as high tense, confused, worried, difficult to concentrate, uncertain feelings, scare, sneaking, easy to get angry, sensitive and so on. Physiological aspects are anxiety that has affected physiological abilities, especially in central nervous system functions such as insomnia, heart palpitations, cold sweat, frequent shaking, queasy stomach, headache, dizziness, tip of finger feels cold, neck muscles rigid and tense, the appetite is lost and so on (Kurniastuti Y, 2004).
The aggressiveness is a behavior injuring or the intent of someone to hurt (Minarni, 2006:8). (Berkowitz, 1995) said the aggressiveness is who states that aggression as behavior intended to hurt someone either physically or mentally. Many sports require aggressive behavior and it is permitted to certain level. The sports competitions often triggers aggressive behavior. This behavior at the certain level is necessary for sport player to achieve performance like boxing, karate, football, pencak silat, taekwondo etc. But if it is excessive and cannot be controlled can cause dangerous action, hurt the other person, unsportman, and the other that are not disciplined. The level of aggressive action is different for each sport and also athlete.

R. H. Cox classifies in two categories; hostility aggression and instrumental aggression. Hostility aggression is the aggressive action that is accompanied by hostility and feeling angry and intending to hurt other people. Instrumental aggression is aggressive behavior who used as a tool to win the game, without intending to injure another person. Aggression instrumental aims to obtain the victory, money and prestige.

2 Research Methodology

One hundred and three males karateka fighters (20 ± 2 years) participated in this study and they were taken in Kejuaraan Nasional Antar Mahasiswa Sebelas Maret Cup VII in Surakarta. The research of methodology is the correlation descriptive. There are two exogenous variables; anxiety (X1) aggressiveness (X2) and endogenous variable is performance (Y). The anxiety and aggressiveness developed by researchers and tested for their validity and reliability. Performance instruments will calculated by the number of wins karateka. The data will analized with path analysis.

3 Discussion

<table>
<thead>
<tr>
<th>Interval</th>
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<th>%</th>
</tr>
</thead>
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<td>5</td>
<td>5</td>
</tr>
<tr>
<td>17-31</td>
<td>Medium</td>
<td>70</td>
<td>68</td>
</tr>
<tr>
<td>32-47</td>
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<td></td>
<td>103</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2. Frekuency Distribution of The Level Aggressiveness Karateka Fighter.

<table>
<thead>
<tr>
<th>Interval</th>
<th>Criteria</th>
<th>f</th>
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<tbody>
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<td>33-58</td>
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<tr>
<td>69-83</td>
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<td>High</td>
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<td>Sum</td>
<td></td>
<td>103</td>
<td>100</td>
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</table>
The study showed 5 athletes (5%) had low anxiety levels, 70 athletes (68%) had moderate anxiety levels and 28 athletes (27%) had high levels of anxiety. While the level of aggressiveness, there are 98 karateka fighter have a very high level of aggressiveness and only 5 athletes (4.9%) are high level, while in the medium and low categories is none at all. Data from athletes performance showed is 51 athletes (50%) did not win, 28 athletes (27%) won only one, 11 athletes (11%) won two times, 6% won three times, 6 % won four times and one athlete won five times.

The first hypothesis analysis is obtained the coefficient $\beta = -0.274$ and $|t_{test}| = 2.483$ while $|t_{critical}| = 1.98$. It can be concluded that there is a direct relationship of anxiety to performance karateka fighter. The regression coefficient marked negative indicates that anxiety is inversely proportional to the performance, the meaning is the high anxiety level make the athlete get lower performance.

The second hypothesis analysis is obtained the coefficient $\beta = 0.479$ and $|t_{test}| = 4.332$ while $|t_{critical}| = 1.98$. It can be concluded that there is a direct relationship of aggressivity to performance karateka fighter. The regression coefficient marked positive indicates that aggressivity is inversely proportional to the performance, the meaning is the high aggressivity level make the athlete get highest performance. It can be concluded that there is a relationship of direct aggressiveness against the performance of karateka fighter. The regression coefficient is positive shows that the aggressiveness is directly proportional to the achievements, the meaning is the higher the level of aggressiveness of the performance karateka fightrer.

Before analyzing the indirect relationship between anxiety and performance karateka fighter, previously the relationship analysis of aggressiveness and anxiety completed. The regression model is $X_2 = 141,091 - 0.727X_1$ with the value $|t_{test}| = 12.225$ and $|t_{critical}| = 1.98$. It can be concluded there is a significant relationship of anxiety to aggressiveness. The negative regression coefficients indicating that if karateka fighter have the high the anxiety then the the karateka fighter hav lowe the aggressivity. The contribution is 0.597 the mean change in aggressiveness because of the anxiety factor of of 59.7%. The value of the residual of the regression analysis for the regression model is obtained from the formula $e = 0.403$. The results of path analysis showed that the contribution of anxiety to the aggressiveness of -0.772.
Table 4. The result of path analysis significance test.

<table>
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<tr>
<th>Relations</th>
<th>( \beta )</th>
<th>( t_{score} )</th>
<th>( p_{value} )</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>( X_1 \rightarrow X_2 )</td>
<td>-0.772</td>
<td>-12.225</td>
<td>0.000</td>
<td>Signifikan</td>
</tr>
<tr>
<td>( X_2 \rightarrow Y )</td>
<td>0.479</td>
<td>4.322</td>
<td>0.000</td>
<td>Signifikan</td>
</tr>
<tr>
<td>( X_1 \rightarrow Y )</td>
<td>-0.274</td>
<td>-2.483</td>
<td>0.015</td>
<td>Signifikan</td>
</tr>
</tbody>
</table>

The results of path analysis shows that anxiety is directly related to the male karateka fighter is -77.2%. Indirectly also relates to performance through aggressiveness as an intervening variable. The anxiety is indirectly related to karateka performance of \(-0.72 \times 0.479 = -0.3698\) or -36.98%. So if karateka fighter fall on high anxiety directly followed by the low performance of athletes and directly the higher the anxiety the lower the aggressiveness and then associated with low performance.

The results of first regression analysis is \( R \) square value 50.7%. It is mean 50.7% the performance karateka fighter can be affected by anxiety and aggressiveness. This means that the change in performance achieved by karateka fighter is 50.7% because of anxiety and aggressiveness, both of which are psychological factors. This data concludes that psychological factors need to be considered. Playing with muscles alone will not achieve good results, playing with the brain is also useless. Physical and psychological factors need to get attention in the framework of systematic and scheduled athlete coaching.

Based on the data obtained, most of the karateka fighter who competed in the national karate championship between students had medium levels of anxiety which reached 68% and only 27% were in the high category. This data shows that most athletes are able to control themselves against the anxiety that arises, before competing. RukmiKusningsih, et al (1994: 43), anxiety is a term that is very familiar with everyday life, which describes the state of worry, anxiety, fear, insecurity and so on accompanied by various physical complaints. In general, anxiety is related to threatening and dangerous situations. Usually over time, these conditions will be resolved on their own.

The results of second regression analysis showed that anxiety was directly negatively related to athlete's performance. Every change in anxiety that arises will be followed by a
decrease in achievement of 27.4%. The data shows that anxiety directly contributes to the achievements. Anxiety as a part of psychological factors that often appear every time the competition directly contributes to victory and defeat when competing. Therefore, it is necessary to manage themselves against the emergence of anxiety so that it becomes positive energy to achieve victory when competing.

The results of regression analysis also obtained an illustration that the aggressiveness that appears in athletes is directly proportional to the performance achieved. Every change in aggressiveness towards a higher direction was followed by an increase in achievement achieved with a contribution of 47.9%. Associated with aggressive behavior in this research is instrumental aggressive action with the main goal is to win the match, and not to hurt the opponent. Intention to attack aggressively is not accompanied by anger. Such aggressive action is clearly not caused by frustration. Based on the results of descriptive analysis shows that the level of instrumental aggressiveness is very good, because it is characterized by aggressive behavior to obtain victory and is usually not accompanied by anger. Instrumental aggression is an action that intends to cause pain or damage to others, but where the main goal is not to cause suffering, but to achieve the leading (dominance) or a point/goal to be able to win the match. With the existence of aggressive behavior that is very good tends to win in the competition.

Based on the results of regression analysis, it shows that anxiety is negatively related to the aggressiveness of the athlete. Every increase in anxiety in the athlete is one unit, followed by a decrease in aggressiveness Aggressiveness decreases because 77.2% of anxiety factors appear. Looking at this data, it is necessary to foster efforts for athletes to be able to control the anxiety that arises when it will emerge, because it can reduce the aggressiveness of the athlete when competing.

Based on the results of path analysis, it is obtained an illustration that anxiety is indirectly related to achievement, namely through aggressiveness as an intervening variable with a contribution of 36.98%, while the direct contribution is 27.4%. Thus, anxiety contributes to achievement due to indirect factors. Increasing anxiety arises, followed by a decrease in aggressiveness and finally contributing to the achievement of karate martial arts in male kumite athletes.

5 Conclusion

The results of the research and discussion by conclusions are as follows: (1) There is a direct negative relationship to Karate martial arts achievements in male kumite athletes. The higher achievement is followed by the decrease in the right performance, so that the invert (2) There is a positive direct relation between the level of aggressiveness toward Karate martial arts achievements in male kumite athletes, more and more high the aggressiveness of the athlete, followed by increasing the achievement. (3) There is an indirect relationship between the level of achievement towards Karate martial arts achievements male kumite athletes of negative aggressiveness. The higher the anxiety of the athlete means that the lower the aggressiveness and lower the achievement.

Based on the results of data analysis and research conclusions, suggestions can be made as follows: (1) For the trainer of karate fighter, to improve maximum performance is expected to train and foster athletes who are the main task, not only physical training, technical and tactics, but also pay more attention to the athlete's psychological factors related to anxiety and
aggressiveness. Because no matter how perfect physical development, technique, and tactics of athletes, if the mentality does not participate develop high achievement will not be possible. Because mental functions as a driver, driver and stabilizer for athletes to embody physical abilities and techniques in achieving prime performance. (2) For the kumite athlete, you should often consult with the trainers when facing problems that can cause anxiety. Athletes should try to suppress anxiety as low as possible by promoting reason and putting aside emotions. Athletes must learn to describe experiences when experiencing anxiety so that the athlete in question understands the symptoms of anxiety and cause and effect they experience. (3) For the Kumite athlete, because aggressive behavior plays an important role in the success of a match, the athlete must understand how to develop and improve aggressive behavior, the athlete must be understand the ways to develop and improve aggressively, keeping it under control so that it cannot be controlled.

References

Liver Function Test Elevation in Moderate Intensity Physical Exercise

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Abstract: Liver enzymes can be used as a sign of liver injury include Serum Alanine Amino Transferase (ALT) also called Serum Glutamic Pyruvic Transaminase (SGPT) and Serum Amino Transferase Aspartate (AST) also called Serum Glutamic Oxaloacetic Transaminase (SGOT). Elevation of liver transaminase is generally caused by liver injury due to liver diseases and also may be elevated by extra hepatic process such as physical exercise. However, there is no consensus on what type of exercise can cause liver function test elevation. Moderate intensity of physical activity was being carried out by running on a treadmill with an intensity of 70% - 80% of the maximum heart rate for one hour. Then, blood sample was taken to measure SGOT and SGPT. Data obtained were statistically analyzed using paired t-test with a significance level of below 0.05 (p<0.05) and 95% confidence level (α=0.05). Serum SGOT was increased 1.8 times, mean 39.54 u/L, p<0.001. Serum SGPT was increased 1.7 times, mean 49.4 u/L, p=0.002. Moderate intensity of physical activity could increase significantly liver function tests. However, more research is needed to compare the liver function test elevation among mild, moderate, higher intensity physical exercise.

Keywords: Liver function test, moderate intensity, physical exercise

1 Introduction

The liver is the largest organ in abdominal cavity weighing 1.2-1.8 kg, or approximately 25% of adult body weight which occupy most right upper quadrant of the abdomen and is the body’s metabolic center with very complex function (Amiruddin, 2009). Liver is very potential to get damage because it is the first organ after the digestion channel which exposed by toxic ingredients. Metabolic process of the liver will detoxify toxic ingredients, but this process can produce metabolites that are more toxic to liver.

Liver cells contain various enzymes, some of which are important for diagnostic damage to liver function. Enzyme activity can be measured in the blood so that it can indicate liver disease. Liver enzymes that can be used as a sign of liver damage include serum Alanine Amino Transferase (ALT), also called Serum Glutamic Pyruvic Transaminase (SGPT) and serum Aspartate Amino Transferase (AST), also called (Serum Glutamic Oxaloacetic Transaminase (SGOT) (Guyton & Hall, 2008).

Damage to the liver is characterized by increased liver function or with increased liver enzymes. Increased liver function during clinical trials may be drug-related, but other factors, such as exercise (Giboney, 2005) and diet (Purkiset al., 2004), may also have this effect. Plasma liver enzyme activities, is influenced by the duration, intensity, type and mode of exercise training changes (De Lemoset al., 2012).
Physical activity that affects the increase in health status and is recommended is the intensity of moderate-medium exercise with a dose ranging from 40-60% of maximum work capacity (Bompa, 1994). Based on the statement that has been submitted, it is important to carry out this study which aims to determine the effect of moderate intensity physical activity on changes in liver function characterized by changes in AST, ALT levels and Alkaline phosphatase.

2 Methods

This research is a pre-experimental study with one group pretest-posttest research design. Sample used in this study were 16 untrained male students, aged 19-22 years, the average age of 20.5 years. Before starting, the sample must first fill out the consent form for participation in the research. The sample in this study was not using drugs, alcohol, not having metabolic disease or infection, and was in a healthy condition that had been tested by a doctor.

Intensity of physical activity is being carried out by running on a Treadmill with Intensity of 70% - 80% of maximum pulse for one hour. Blood is taken before and after physical activity and then measured in a laboratory using a Spectrophotometer Micro Lab 300 for examination of SGOT and SGPT. Data obtained from the study were statistically analyzed using t-test with a significance level below 0.05 (p<0.05) and 95% confidence level (α = 0.05).

3 Results

Data were analyzed first by normality test, it was found that SGOT and SGPT data were normally distributed (p>0.05). The mean SGOT level before exercise was 24.71 ± 11.66 u / L and after exercise was 39.54 ± 10.47 u / L. This data shows there is an increase in SGOT level of 1.8 times after physical exercise. The results of paired t-test showed a significant increase in SGOT levels, p <0.001, after moderate intensity physical activity.

While, the mean level of SGPT before exercise was 30.80 ± 13.22 u / L and after exercise was 49.41 ± 12.90 u / L. This data shows there is an increase in SGPT of 1.7 times after physical exercise. Paired t-test results showed a significant increase in SGOT levels, p=0.002, after moderate intensity physical activity.

4 Discussion

Liver function test is conducted by measuring the levels of different biological indicators (proteins). These proteins show different aspects of normal function of liver (Rahmioglu et al., 2009). For example, the amount of Alanine Aminotransferase (ALT or SGPT) and Aspartate Aminotransferase (AST or SGOT) indicates healthy liver cells, although the serum activity of both enzymes will be increased whenever the integrity of liver cells are affected by the diseases.

The most widely used liver enzyme is aminotransferase. Aspartate aminotransferase is an enzyme that exists in many cells of the body, especially the heart and liver. Lower amounts are in the kidneys and muscles. This enzyme is in the transaminase group; aspartate
aminotransferase transfers amino factors from amino acids to alpha acids; which means catalyzing the transfer of one amino group from alpha-ketoglutaric acid and vice versa; and that's why it's called aminotransferase (Nazarali, 2015).

Aminotransferases have low activity in natural serum and their activity increases based on the trainings and endurance activities, short-term and high intensity, eccentric sports and even sports where no weight is endured (Cordova et al., 2006; Kalyaniet al., 2006). Increased levels of transaminases that are mild in physical activity are often temporary (Lazo, 2009). More than 30% of adults with AST and ALT levels initially increase, if retested then normal results are obtained (Lazo, 2009). It is known that an increase in liver function tests (LFT) is usually caused by liver injury due to alcohol, non-alcoholic fatty liver disease, hemochromatosis, hepatitis B, hepatitis C, illegal drugs, dietary supplements, and over-the-counter and prescription medications medicine, including many psychiatric drugs (Oh, 2011). Transaminase levels sometimes forget that they can increase due to extrahepatic causes (Chalasani, 2008).

Although AST levels are highly concentrated in the liver, AST can also be found in muscles, heart, kidneys, red blood cells, brain and small intestine, while ALT can be found in the liver, muscles and kidneys (Chalasani, 2008). In fact, AST and ALT levels in the muscles are greater than those in the liver because of the larger mass of tissue. As a result, transaminase levels can increase due to various types of muscle disorders or injuries (eg, heart attack, surgery, and strenuous exercise), hemolysis, and small intestinal ischemia (Chalasani, 2008).

Changes occur in metabolism depending on duration, intensity, type and mode of exercise; possible changes in blood values before and after exercise (Sonmez, 2002; Delemos, 2012). Variations were found between athletes and non-athletes in several parameters in a study conducted to see the effects of chronic exercise on several hematological and liver enzyme parameters (Bijeh, 2013). However, there is no consensus on what forms of exercise can cause changes in clinical chemical parameters, which may be influenced by parameters, or to what extent (Pettersson, 2007).

Skeletal muscle damage in healthy individuals after high intensity exercises are well established and could be the consequences of free radicals produced after exercise. If the muscle damage, enzymes such as aspartate aminotransferase level, alanine aminotransferase level, lactate dehydrogenase level, will increase in blood serum (Sarengsirisuwan, 1998). A significant increase at AST and ALT levels after exercise was found statistically by Nie et al., (2011), also in other study, it was reported a significant increase at AST and ALT values of athletes running ultra-marathon after and before competition (Wu et al., 2004). In excessive muscle forced exercise-induced, AST and ALT levels in blood can raise in muscle damages (Brancaccio et al., 2010).

On the other hand, research has shown that inappropriate recovery periods can also worsen injured muscle fibers so that liver enzyme levels can be increased. Intense and prolonged exercise without proper recovery time causes damage to muscle fibers during contraction, skeletal muscle and connective tissue (Valizadeh, 2016). In addition, factors such as age, sex, fitness, season and exercise are associated with increased volatility of these enzymes (Williams, 2004).

From existing research, improvements in liver function occur in almost all sports. Kawano et al., (2017) reported elevated liver function test in ultra-long distance running athletes, increase in liver enzyme AST in football exercise (Ekunet al., 2017), elevated AST and ALT in weightlifting (Petterssonet al., 2007), boxing (Giuseppe et al., 2010), and treadmills (Suzuki etal., 2006). This is consistent with the results of this study, which obtained
a significant increase in AST levels (p <0.001) and ALT levels (p = 0.002) after doing an hour treadmill or moderate intensity physical activity. However, Bijeh et al., (2013) reported the opposite, AST and ALT levels after 8 weeks of swimming exercise were investigated among healthy women, and no significant changes were observed. Small differences in this observation can be the result of differences in the type of exercise, the intensity of exercise, and the duration of this activity.

5 Conclusions

Physical activity that is useful for body fitness and keeping the body healthy is moderate physical activity (40-60%) of the maximum capacity of a person's pulse. However, if the physical activity is excessive and not accompanied by adequate rest, it can cause damage to the liver. This is characterized by increased liver function or liver enzyme levels in blood serum. The enzymes that increase significantly are ALT and AST.

Acknowledgements. The authors gratefully acknowledge Ministry of Research and Technology and Higher Education Republic of Indonesia under the research grant UNIMED of year 2018 for supporting this research.

References


The Effect of Massage to Decrease Lactic Acid Levels after Anaerobic Physical Activity

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Abstract. Anaerobic physical activity is a high physical activity because the muscles contract in anaerobic conditions. The energy used by ATP through the process of anaerobic glycolysis tends to produce more lactic acid. This study aims to determine the effect of massage in reducing lactic acid levels after anaerobic exercise. Research on experimental studies using the Experimental Pre and Post-test design. Student subjects, male, aged 19-20 years, amounted to 16 people, divided into 2 groups, anaerobic exercise group without massage and a anaerobic group treat with combine massage. Examination of lactic acid is carried out after anaerobic physical activity which is 200 m run. Data were analyzed statistically using t test. We found that lactic acid levels after anaerobic physical activity were lower in the combination massage anaerobic exercise group than the non-massage anaerobic exercise group. Massage can reduce lactic acid levels after anaerobic physical activity.

Keywords: Anaerobic exercise, massage, lactic acid.

1 Introduction

Physical exercise is a body movement that is carried out in a planned and repetitive manner that causes an increase in energy use with the aim of improving physical fitness. Anaerobic physical exercise is a high intensity activity that requires energy quickly in a short time, but cannot be carried out continuously for a long time.

Anaerobic exercise is classified as a high intensity physical exercise so the muscles contract in anaerobic conditions so that the supply of ATP is through the process of anaerobic glycolysis. As a result, muscle glycogen during anaerobic physical exercise is reduced, while blood lactic acid levels increase, increased levels of lactic acid can interfere with performance (Powers, 2001; Powers 2008).

Lactic acid levels that accumulate, cause decreased ability of muscle contraction, performance and accelerate fatigue. Continued fatigue will result in pain with symptoms such as muscle spasms, swelling and decreased muscle strength which can affect performance (Chung et al., 2003). Recovery by eliminating accumulating lactic acid must be immediate because of crucial factors to improve athlete performance (Pinar et al. 2012).

Improved performance can be described by decreasing or rapid travel distance of 200 m runners. The recovery process in the muscles can be done by improving the microcirculation so that the elimination of lactic acid will increase. Massage is a method that can eliminate lactic acid from tissues by improving microcirculation, so that lactic acid can diffuse out of the...
muscle and enter the blood (Mika et al. 2007). This study aims to determine the effect of massage on decreased lactic acid runner 200 m.

2 Methods

2.1 Subjects

The subjects were 16 people, male sex, age 20-22 years old, had a good VO2 max level, no smoker, did not consume supplements and antioxidants 2 weeks before and during the study.

2.2 Research Design

This study used an Experimental Pre and Post-test design. The study was conducted at the UNIMED Faculty of Sport Science and Physical Physiology Laboratory. Research subjects were 16 people, divided into 2 groups randomly, namely group 1 (AN-SM) : anaerobic physical exercise without massage; group 2 (AN + SM): anaerobic physical exercise and massage. Anaerobic physical exercise was done for 3 weeks, frequency 3 times a week. Massage on the right and left lower limbs is given after anaerobic exercise, for 12 minutes. In the pre-test and post-test each group measured lactic acid levels and runner travel time is 200m.

2.3 Statistical Analysis

Data were analyzed with statistics and presented in form of means and standard deviation, tables and figures. Each data obtained is first determined by the distribution of the Normality test. If the data is normally distributed, an independent t test is performed.

2.4 Measurement of Lactic Acid Levels

The research tools used were accutrend lactate and lactic acid strips, lotions and stopwatches. Blood lactic acid levels measured using accutrend lactate, 10 minutes after running 200meters, were stated in millimoles per liter (mmol / L).

2.5 Data Analysis

Data analysis with normality test and t test with a significance level of p <0.05 and 95% confidence level (α = 0.05).

3 Results

Data were analyzed first by normality test, it was found that the data of lactic acid levels were normally distributed (p <0.05), as listed in table 1. Table 2, showed that the difference in mean lactic acid levels after anaerobic physical exercise in each group was smaller than before anaerobic physical exercise, namely the AN-SM group (10.81 ± 1.99 vs. 10.19 ± 1.37; p = 0.343) and AN + SM group (13.97 ± 1.85 vs 11.35 ± 2.17; p = 0.003). The results of the t-paired test showed that there was a significant treatment effect on the decrease in lactic acid
levels in the anaerobic physical exercise group with massage (AN + SM). Figure 1 shows that the mean level of lactic acid after anaerobic physical exercise in the AN + SM group was lower than in the AN-SM group. Based on independent t test, it was found that there was a significant difference of $p=0.000$, to a decrease in lactic acid levels.

Table 1. Normality test of the lactic acid

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Groups</th>
<th>Normality test statistic</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lactic acid</td>
<td>Pre test</td>
<td>0.194</td>
<td>0.110*</td>
</tr>
<tr>
<td></td>
<td>Post test</td>
<td>0.137</td>
<td>0.200*</td>
</tr>
</tbody>
</table>

Note: * = signifikan ($p>0.05$), SD : standard deviation

Table 2. Means of lactic acid

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean±SD</th>
<th>Group AN-SM</th>
<th>Group AN+SM</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lactic acid</td>
<td>Pre-test</td>
<td>10.81±1.99</td>
<td>13.97±1.85</td>
<td>0.055</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td>10.19±1.37</td>
<td>11.35±2.17</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>t-paired</td>
<td>0.343</td>
<td>0.003</td>
<td></td>
</tr>
</tbody>
</table>

Note: signifikan ($p<0.05$)

Figure 1. Average levels of lactic acid after anaerobic physical exercise in the AN-SM group and AN + SM group.
4 Discussion

The results of this study found that lactic acid levels after running 200 m were lower in the anaerobic physical exercise group given massage after each exercise in the legs compared to the group without massage. The results of this study are in line with the research of Harahap et al. (2018) which states that combination weight training with massage is better to reduce lactic acid levels compared to non-massage weight training on runners.

Massage is a mechanical manipulation of soft body parts with rhythmic pressure in order to produce physiological effects and can calm and reduce psychological stress by increasing endogenous morphine hormones such as endorphins, enkephalin and dinorphine while reducing stress levels of hormones such as the hormones cortisol, norepinephrine and dopamine (Best et al, 2008). Massage is an engineering recovery effort that activates the activation of venous pump and lymph pump mechanisms artificially, the purpose of which is to accelerate circulation. Recovery is the recovery of normal homeostasis conditions, which are the best physiological conditions for body cells (Giriwijoyo and Sidik, 2012).

Massage is physical manipulation consisting of body rubbing (effleurage), squeezing (petrissage), scouring (friction) in soft tissues throughout the body, which is carried out on the face, body, upper and lower limbs (Salvano, 1999). Physiological benefits for eliminating lactic acid have been widely used by athletes both to support physical performance and for other purposes such as prevention, therapy and rehabilitation of injuries and the negative effects of exercise (Wiltshire, 2009).

Lactic acid is the result of metabolism of glucose through the reaction of lactaside anaerobic glycolysis. Lactic acid produced from the reduction of pyruvic acid occurs in muscle tissue that lacks oxygen or hypoxia, for example when exercising with relatively heavy intensity (Guyton & Hall, 2008). Lactic acid builds up in the muscles due to hypoxic muscle tissue (Farenia et al, 2010).

In hypoxia there is an increase in the process of cell respiration because Adenosine Triphospat (ATP) decreases and the number of free radicals formed increases. In mitochondrial hypoxia is more susceptible, it cannot maintain the Krebs cycle and the oxidative phosphorylation process. The respiratory chain in the mitochondrial membrane will also be damaged, so that ATP is not produced. Energy sources during anaerobic physical exercise or during sprints are only obtained from the metabolism of anaerobic glycolysis. The metabolism of anaerobic glycolysis results in very fast lactate accumulation and can disrupt the physical condition (Rosidi et al., 2013).

Anaerobic physical exercise is classified as high intensity exercise so that high amounts of lactic acid will be produced. Increased levels of high lactic acid occur during exercise. Furthermore, lactic acid in the muscle dissociates into H+ ions and lactate ions. Increased H+ ions cause a decrease in pH in extra and intracellular fluids. This decrease in pH will inhibit the binding of oxygen by Hemoglobin in the lungs, and can inhibit the activity of the enzyme phosphofructokinase and the myofibril ATP-ase enzyme in the muscles that play a role in ATP synthesis, so that the supply of energy becomes disrupted. Disruption of the supply of energy will reduce the ability of muscle contraction. (Wittenberg, 2003; Foss, 2006; Guyton & Hall, 2008; Farenia et al, 2010).

The study conducted by Bahartresna (2005) on untrained individuals concluded that sports massage during recovery reduced blood lactic acid levels better than passive rest after 200 meters of running activity. Similarly, research conducted by Jones and Mondero proved that sports massage can increase the elimination of lactic acid during recovery after high intensity exercise. Similarly, the results of David's research, et al. sports massage for 20
minutes causes a decrease in blood lactic acid by 36, 21%, and according to David et al. Sport massage for 45 minutes causes a decrease in blood lactic acid by 72.4% (David et al, 2005).

5 Conclusions

The conclusion of this study is that Massage given after anaerobic physical exercise has an effect on decreasing lactic acid levels after 200 m run.

Acknowledgements. We are gratefully to Ministry of Research and Technology and Higher Education Republic of Indonesia under the research grant UNIMED of Year 2018 with the Research Contract Number: 027/UN33.8/ LL /2018.

References

Mechanical Properties Optimization of Cellulose Nanofiber/Graphene Oxide Nanocomposite Produced by Mixing Method

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Abstract. This research implemented a green route to multifunctional nanocomposite materials composed by cellulose nanofiber (CNF) and graphene oxide (GO). Aqueous solutions with different ratio of GO (prepared with LiCl/DMAc 8%(w/v)) were mixed with cellulose nanofiber by using magnetic stirrer at the temperature of 70 °C for 30 minutes. The mixture obtained was dried in room temperature for 24 hours. The nanocomposite were characterized with several analysis such as; Fourier Transform Infrared (FTIR), mechanical properties testing, Transmission Electron Microscope (TEM), and Scanning Electron Microscope (SEM) analysis. The characteristic of cellulose nanofiber functional groups was exhibited through FTIR spectra. The CNF/GO with 0.06wt% indicated a higher mechanical properties compared to the CNF. Its tensile strength increased drastically from 26.36 MPa to 49.69 MPa while its young’s modulus also showed an extreme increase from 1.379381 GPa to 6.973478 GPa respectively. Moreover, cellulose nanofiber diameter had been examined through TEM and its morphology was analyzed with SEM. Finally, it can be concluded that the cellulose nanofiber mechanical properties can be optimized by graphene oxide through the mixing process.

Keywords: Cellulose Nanofiber, Graphene Oxide, Nanocomposites, Mechanical Properties, Mixing Method.

1 Introduction

Oil palm empty fruit bunches (OPEFB) is by-product of steam sterilization process of oil palm plantations (Or, Putra and Selamat, 2017), which can be used as a source of cellulosic fibers, while cellulose nanofibers or cellulose nanofibrils (CNFs) are obtained from OPEFB (Ferrer et al., 2012), which has at least one dimension in nanometer range and low thermal expansion, high specific area, good mechanical, optical properties are had them(Feng et al., 2018), obtained from the steam explosive method. Steam explosive method in alkali medium followed by hydrochloric acid treatment and high shear homogenization is an effective method to be used in the separation of cellulose nanofiber from lignin and hemicellulose (Saelee et al., 2016), (Kaushik and Singh, 2011).

Thus, the development of nanocomposites based on CNF is widely used in various regions as reinforcement and CNF has the ability to absorb more energy than synthetic fibers (Kalia et al., 2011) and usually be applied for sensors, cosmetics and biomedicine (Feng et al.,...
Graphene oxide (GO) is a material where the electronegative oxygen atom is bound to the graphite structure (Lu, Ocola and Chen, 2009). GO can be generated by the Hummers method. The Hummers method is one of the methods used to oxidize strongly graphite using K2Cr2O7 or KMnO4 (Sitko et al., 2013) (Alam, Sharma and Kumar, 2017). The electrical, mechanical, and thermal properties of polymeric material could be improved by GO (Amaturrahim et al., 2018).

Improvement transitional behavior of mechanical and thermal properties of material composite using blending method with modify cellulose in solvent. Enhancing properties of cellulose can be greatly enhanced by inorganic fillers (Zhang et al., 2012). Nanocomposite materials based on renewable and natural polymer which was fabricated from functional graphene is important. The comparing of filler and polymer matrix can lead to enhance functional properties and can be used potentially wide-ranging applications (Phiri et al., 2018).

In this studying, GO was fabricated from strong oxidation of graphite which was blended with LiCl/DMAc 8% via ultrasonicator resulting GO activated of LiCl/DMAc. The purpose of this research is to make regenerated films from cellulose nanofiber/graphene oxide nanocomposites in the solvent LiCl/DMAc 8% and evaluated its mechanical properties. Functional groups spectra, dimension of CNF, morphology and mechanical properties (tensile strength) were characterized in this work as well.

2 Materials And Methods

2.1 Materials

Oil palm empty fruit bunches (OPEFB) as raw material was collected from PTPN IV Adolina, Serdang Berdagai, Indonesia. Sodium hydroxide (NaOH), sodium hypochloride (NaOCl), hydrogen peroxide (H2O2) 30%, hydrochloric acid (HCl) 37%, aceton, lithium chloride (LiCl), N,N dimethyl acetamide (DMAc) were purchased from Sigma Aldrich Singapore. Graphene oxide was prepared via a modified Hummers Method through an acid oxidation towards the graphite.

2.2 Isolation of α-Cellulose from Oil Palm Empty Fruit Bunches (OPEFB)

OPEFB was cutted into 3 cm length and washed with tap water to clean up the dirt. After being cleaned, it was soaked into water overnight and oven dried at 80°C. About 75 gr of dried OPEFB treated with 1 L of 2% NaOH and stirred for 4 hours at 50°C to remove the major part of the lignin and hemicellulose (Julie Chandra, George and Narayanankutty, 2016). Next, they were prepared by steam explosion in autoclave and NaOH 2% at 130 °C and the pressure was 180 kPa for 2 hours. Then, fibers were washed with distilled water until the neutral pH was reached (Saelee et al., 2016) (Salehudin et al., 2014). After that, bleaching process was conducted using sodium hypochloride solution with 6-14% of concentration (Salehudin et al., 2014).

To separate α-cellulose from β and γ-cellulose, a dried bleached OPEFB was soaked into 17.5% NaOH at 70 °C for 2 hours. This mixture was then filtered, washed with distilled water until its pH was neutral. The bleaching process was performed one more time with 10%
H$_2$O$_2$ for 2 hours at 70 °C to remove the remaining lignin and hemicellulose. Finally, it was dried in an oven at 50°C and after that was kept in vacuum desicator (Kaushik and Singh, 2011)(Ohwoavworhua and Adelakun, 2005),(Sinaga et al., 2018).

2.3 Treatment for Isolating Cellulose Nanofibers (CNFs)

The α-cellulose that had dried was hydrolyzed with 10% hydrochloric acid (HCl) via ultrasonication for 3 hours and washed with distilled water until its pH reached neutral. After that, it was homogenized with high shear homogenizer at 8000 rpm for 4 hours and the resulted suspension was filtered and dried in an oven at 50 °C (Feng et al., 2018),(Julie Chandra, George and Narayanankutty, 2016),(Lee et al., 2009).

2.4 Synthesis of Graphene Oxides from Commercial Graphite

As much as 2 g of graphite were putted into a beaker glass. Then, an amount of 2 g of NaNO$_3$ and 150 ml of H$_2$SO$_4$(c) were added while the mixture was stirred for 2 hours in ice bath. Then, 10 grams of KMnO$_4$ (s) was gradually added and stirred for 4 hours at 20 °C. After that, it was transferred from ice bath and stirred for 20 hours at 35 °C. Then, 200 mL 5% H$_2$SO$_4$ and 10 mL 30% H$_2$O$_2$ were added and stirred for 1 hour. The centrifugation was conducted at 7200 rpm for 10 minutes until the supernatant and sediment were clearly separated. The sediment obtained was washed with warm distilled water until the pH approached 7. Then, it was ultrasound at 5060 Hz for 5 hours. The centrifugation was conducted again at 7200 rpm for 10 minutes to obtain sediment. Then, the precipitate was dried in an oven at a temperature of 105°C to obtain graphene oxide powder. Graphene oxide powder was characterized by XRD and FTIR(Song et al., 2014).

2.5 Fabrication of CNF/GO Nanocomposites

Firstly, cellulose nanofibers (CNFs) were activated while stirred using distilled water, acetone and DMAc each for 1 hour and filtered. The activated sample was put into 8% LiCl/DMAc (w/v) solution. The solution was heated at 70°C for 30 mins until it formed the gel. Transparent solution was obtained after 24 hours. Colloid of graphene oxide (GO) in 8% LiCl/DMAc (w/v) was prepared by adding 20 mg GO into 40 ml 8% LiCl/DMAc (w/v) solution with mild ultrasound sonication for 24 hours. The CNF/GO composites were prepared by putting the obtained two solutions together according to mass ratios of CNF to GO: 100/0 (RC), 99,8/0,2 (RC0,2), 99,6/0,4 (RC0,4), 99,4/0,6 (RC),6). The mixture solutions were stirred at 70°C for 30 minutes and then spread over a glass plate. The glass plate covered with the mixed solution was coagulated in the air and the film was detached in distilled water. The detached film was soaked in running water for overnight. The mixture film was finally dried and stored. The CNF/GO nanocomposite films were characterized by mechanical properties testing and scanning electron microscope (SEM) analysis(Zhang et al., 2012).

2.6 Characterization

The CNF/GO nanocomposites characterized by Fourier transform infrared (FTIR) spectroscopy of cellulose nanofiber (CNF) were recorded with Shimadzu IR Prestige-21 spectrometer using KBr pellet. All FTIR spectra were recorded in the wave number with range of 4000-500 cm$^{-1}$. The dimension of CNF were observed under high resolution TEM using a
JEM-1400 electron microscope with an accelerating of 100 V. Mechanical properties of CNF/GO nanocomposites were measured by Instron 5567 testing machine at 1 mm/min of speed at room temperature. The rectangular specimen (50 mm x 15 mm x 0.4 mm). The morphology of CNF/GO nanocomposites were exhibited by scanning electron microscope (SEM) HITACHI S3400N Japan and operated at 10.0 kV). Samples were recorded at a magnification between 200 to 1000x. All measurements were performed for at least three samples and the average value was recorded.

3 Result And Discussion

3.1 FTIR Analysis

The FTIR spectrum of cellulose nanofiber is shown in Figure 1. The peak in area of 3387 cm\(^{-1}\) shows -OH stretching band, that is, due to vibrations hydrogen bonded hydroxyl group in the cellulose structure. The peak at 2916 cm\(^{-1}\) corresponds to the aliphatic saturated C-H stretching vibration of cellulose and hemicellulose(Kaushik and Singh, 2011). The sharp peak at 1627 cm\(^{-1}\) shows the deformation vibration of the OH band on the intercalated water molecule. The peak at 1427 cm\(^{-1}\) indicates the curve of the HCH and O-CH bonds. The peaks at 1165, 1111, 1056 cm\(^{-1}\) show the asymmetric bridge stretching of C\(_1\)-O-C\(_4\),C\(_2\)-O\(_2\)H, and C\(_1\)-O-C\(_3\) pyranose ring skeletal stretching and C\(_6\)H\(_2\)O\(_6\)H respectively(Amaturrahim et al., 2018).

![Figure 1. FTIR spectrum of 2% cellulose nanofiber (CNF).](image)
3.2 Mechanical Properties of CNF Nanocomposites

To evaluate the reinforcing effect of graphene oxide in CNF/GO nanocomposites, tensile strength test of pure cellulose nanofiber and three CNF/BC films with a graphene oxide content of 0.02, 0.04, 0.06 wt%, respectively was conducted. The representative stress-strain curves are shown in Figure 2 and mechanical properties of the film are summarized in Table 1. Tensile strength of cellulose nanofiber from mixing method was drastically increased comparing without graphene oxide.

Mechanical properties of the CNF/GO nanocomposite films are not depend on fibril modulus but also interaction between cellulose nanofiber and graphene oxide. Mechanical properties of CNF/GO nanocomposites have improved with the increasing of graphene oxide loadings. Incorporation of 0.06 wt%, graphene oxide significantly improved the mechanical properties of cellulose nanofiber (Amaturrahim et al., 2018). For example, the Young modulus of nanocomposite film with 0.06 wt% of graphene oxide was 6.97 GPa, corresponding to an increase of 505.55% compared to 1.37 GPa of pure cellulose nanofiber film. The tensile strength was increased to 49.69 MPa, corresponding to an increase of 188.5% compared to 26.36 MPa of pure cellulose nanofiber film. The elongation at break changed much with addition graphene oxide (Zhang et al., 2012), indicating that dispersion of graphene oxide nanosheet on the molecular scale in cellulose nanofiber matrix and also the interaction between cellulose nanofiber and graphene oxide made a great contribution to the mechanical enhancement. The oxygen containing groups on graphene oxide can interact with OH on cellulose nanofiber through hydrogen bonding both intra and intermolecularly. The elongation at break decreased from 20.92% (cellulose nanofiber) to 3% (cellulose nanofiber/0.06) due to the brittle nature of graphene oxide nanosheet (Amaturrahim et al., 2018).

Figure 2. Stress-strain of curves of cellulose nanofiber/graphene oxide (CNF/GO) nanocomposite films with graphene oxide content of 0.00, 0.02, 0.04 and 0.06 (%/w)
Table 1. Mechanical properties of cellulose nanofiber/graphene oxide (CNF/GO) nanocomposite films with different graphene oxide contents.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Young Modulus (GPa)</th>
<th>Tensile Strength (MPa)</th>
<th>Elongation at break (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC 0.00 wt%</td>
<td>1.379381</td>
<td>26.36</td>
<td>20.92308</td>
</tr>
<tr>
<td>RC 0.02 wt%</td>
<td>1.2911</td>
<td>28.89</td>
<td>19.88676</td>
</tr>
<tr>
<td>RC 0.04 wt%</td>
<td>2.747574</td>
<td>35.86</td>
<td>5.19988</td>
</tr>
<tr>
<td>RC 0.06 wt%</td>
<td>6.973478</td>
<td>49.69</td>
<td>3.00000</td>
</tr>
</tbody>
</table>

3.3 Morphology of CNF/GO Nanocomposites

Transmission electron microscope (TEM) was used to investigate the diameter distribution of cellulose nanofiber. Figure 3 shows TEM image of the diameter distribution of nano-fiber of cellulose nanofiber. The average fiber diameters is found in the range 20-60 nm. A tendency of agglomeration could also be observed from TEM. The particle was found least diameter at 25.612 nm and the biggest diameter at 58.82 nm (Kaushik and Singh, 2011).

Figure 3. TEM image of cellulose nanofiber (CNF)

In the other hand, scanning electron microscope (SEM) was used to investigate microstructure of the CNF/GO nanocomposite films. Fig.4. shown SEM image of the surface morphology of RC 0.00 and RC 0.06 with magnification 1000x. It indicated that graphene oxide nanosheet were dispersed within the cellulose nanofiber matrix (Amaturrahim et al., 2018) (Zhang et al., 2012). The strong adhesion between cellulose nanofiber fibers and graphene oxide nanosheet was beneficial to improve the mechanical properties of CNF/GO nanocomposites (Amaturrahim et al., 2018).
4 Conclusions

In this work, cellulose nanofiber/graphene oxide (CNF/GO) nanocomposite was successfully prepared by mixing method. During mixing process, cellulose nanofiber has very strong interaction with graphene oxide and made graphene oxide well dispersed into cellulose nanofiber matrix. The cellulose nanofiber/graphene oxide nanocomposite films exhibited a significant improvement on mechanical properties. With these enhancements, the cellulose nanofiber/graphene oxide nanocomposite films may find applications in the future.

Acknowledgement. The authors would like to acknowledge the Rector of University of Sumatera Utara, Medan, Indonesia, for the financial support via Penelitian Dasar Unggulan Universitas Talenta Project 2018 scheme.

References


Schoology Implementation in the Teaching of Production Orale Pré-Élémentaire

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Abstract. The 21st century learning process requires the integration of Information and Communication Technology (ICT) in learning activities. The development of information and communication technology now requires the rapid development of learning needs. The concept of learning could be implemented with the help of technology, such as online learning media which is often called e-learning. E-learning is developed with a multimedia format that provides text, images, and learning videos. Therefore learning becomes more effective and enjoyable. The application of e-learning will be more practical and efficient in its use by using mobile devices, then mobile learning came up as a learning medium to make better education. The obstacles that often arise in the learning process are expected to be overcome by the existence of mobile learning. One of the media which could overcome the problem of learning in class is LMS (Learning Management System). LMS is a software for administration, documentation, online teaching and learning activities (on the network). Schoology is the right LSM to support learning activities in the teaching of Production Orale Pré-Élémentaire (Speaking for beginners). Schoology is one of the Learning Management System applications that provide multimedia, video streaming, and interactive appearance in a variety of data format sizes. The LMS application has the main character, namely users who are instructors and students both connect to the internet. The form of LMS learning can be in the form of e-books, videos, web or blogs, and social networks. This application is a newcomer in the field of online learning. Schoology has a model like Facebook and has many advanced features in the design aspect. The feature scan facilitate lecturers in making discussion questions, collaborative groups or possible assignments creation of interaction between students and lecturers. Lecturers can also participate in monitoring discussions held by students.

Keywords: E-learning, Schoology, Production Orale Pré-Élémentaire.

1 Introduction

Science development, information and communication technology that increase fast encourage renewal efforts in the utilization of technological results, especially in learning. One of the information and communication technology development characters in learning is the delivery of information increasing fast and accurate. Nowadays, the information technology development has been able to process, package, display and disseminate learning information, both audiovisual and multimedia.

This is supported by the existence of a computer as the main component and the availability of a network that is able to connect between one computer and another, even in
international reach. For the world of education the development of technology is an effective innovation in the learning process that is implemented in web-based learning media.

According to Rusman (2013), web-based learning is a learning activity that utilizes mediasites (websites) that can be accessed through the internet network. Web-based learning or also known as "web based learning" is one type of application of electronic learning (e-learning). According to Munir (2012), e-learning is an internet-based application program that contains all the information about clear, dynamic, and up-to-date education that makes it easy for learners to do online learning. The teaching and learning process that is usually done in class can be done through the internet outside the classroom without having to face to face. Currently e-Learning is increasingly known as one of the ways to overcome the problem of education, both in developed and developing countries.

E-learning implementation will be more practical and efficient in its use by using mobile devices. Then comes mobile learning as a learning medium to advance the world of education. Through mobile learning, it is expected that the obstacles that often arise in the learning process can be overcome. Mobile learning is unique learning because every student can access learning material anytime and anywhere.

One of the supporting media that can overcome the problem of learning in class is LMS (Learning Management System). The existence of LMS is expected to improve student learning outcomes as students. LMS is a software for administration, documentation, an activity report, training materials, and all teaching and learning activities are done online. One of the LMS that can be used in the Production Orale Pré Élémentaire teaching is schoology.

Schoology is an application of Learning Management System (LMS) through a combination of multimedia, video streaming, and interactive appearance in a variety of standard and smaller size data formats. The LMS application has the main character, namely users who are instructors and students both connect to the internet. The form of LMS learning can be in the form of e-books, videos, web or blogs, and social networks.

2 Teaching Of Production Orale Pré Élémentaire Using Schoology Learning Media

In the teaching and learning process, there are two important elements that are interconnected, namely learning methods and learning media. Determination of a good learning method through the lecturer will affect the determination of the learning media that will be used to fit the learning method.

According to Susilana and Riyana (2009) the media is an introduction or intermediary. Whereas according to Heinich in (Susilana and Riyana, 2009) the media is a communication channel tool. So, Media is all forms and channels used to convey information or messages.

E-learning according to Darmawan (2014) is a combination of two electronic and learning words which means electronic learning. E-learning or electronic learning was first introduced by the University of Illinois at Urbana-Campaign by using a computer-based instruction system and a computer called Plato. E-learning according to Henderson (2003), namely:

E-learning is learning at a distance that uses computer technology (usually the Internet). E-learning enables employees to learn at their work computers without traveling to a classroom. E-learning can be a scheduled session with an instructor and other students, or it can be an on-demand course that the employee can take for self-directed learning at a time when it's convenient.
Based on some of the opinions above, e-learning is an internet application that can connect between lecturers and students in online classes. E-learning with a class has the same position as conventional classes in universities. Understanding the same or equal position means that these electronic classes can replace classes in the existing universities. Not only as a complement to existing colleges. The educational process runs at any time and can shorten the learning time target and save costs that must be incurred by an educational institution (school, college).

E-learning is learning form that integrates learning processes from traditional learning, online learning, and a combination of various other learning models, one of which is blended learning. The blended learning model is a combination of online technology and face-to-face learning in class.

E-Learning has advantages and disadvantages as a learning medium. According to Soekartawi, Mulvihil, Utarini in Rusman (2013) states that the instructions on the benefits of distance education (the advantages of E-Learning), among others: (1) the availability of e-moderating facilities where lecturers and students can communicate easily through internet facilities on a regular basis or whenever the communication activity is carried out without being limited by distance, place and time, (2) lecturers and students can use structured andscheduled instructional materials or instruction through the internet, so that both can assess each other to how far the teaching material is learned, (3) students can learn or review material at any time and anywhere needed, given the teaching materials stored on the computer, (4) if the students need additional information related to the teaching material they learn, can access the internet more easily, (5) both lecturers and students can conduct discussions via the internet which can be followed by a large number of participants, thus increasing knowledge and broader insight, (6) changing the role of students from those who are usually passive to being active and more independent, and (7) relatively more efficient, for example those who live far from school or college. However, the use of the internet for learning or e-learning has disadvantages too. Some of the criticisms raised by Bullen, Beam in Rusman (2013) include (1) the lack of interaction between lecturers and students or even between students themselves. This lack of interaction can slow the formation of values in the learning process, (2) the tendency to ignore the psychomotor aspects or social aspects and instead encourage the growth of business / commercial aspects, (3) the learning process tends towards training rather than education, (4) the changing role of the lecturer from mastering conventional learning techniques, are now required to know learning techniques that use ICT, (5) students who do not have high learning motivation tend to fail, (6) not all places are available internet or network facilities, (7) lack of staff who know and have the skills to operate internet, and (8) lack of understanding about mastering computer programming languages.

In the process of learning the Production Oral Pré Élémentaire which has a weight of 3 credits, the lecturer is required to be able to use innovative and creative learning media in accordance with the development of technology and communication science. Production Oral Pré Élémentaire courses are taught to students in semester I. Therefore, one of the learning media used is e-learning media by using Schoology as a learning medium that might help an effective learning process. This media is expected to motivate students to speak French at the beginner level.

Understanding Schoology according to Aminoto and Pathoni (2014) is a website that combines e-learning and social networking. The concept is the same as Edmodo, but Schoology has many advantages. Building e-learning with Schoology is also more profitable.
when compared to using moodle, because it does not require hosting and managing Schoology (more user friendly). Of course the features are not as complete as moodle, but for e-learning learning in Higher Education is very adequate. The features that Schoology are as follows: Courses, Group, Discussion, Resources, Quiz, Attendance, and Analytics.

Schoology's home appearance can be displayed in the picture below,

![Schoology Home Appearance](https://www.schoology.com)

**Figure 1.** Home Appearance of Schoology

(www.schoology.com)

There are three ways to log in to Schoology account, including:

a. **Basic**, consists of:
   1. Instructor, sign up for Schoology account owners.
   2. Students, need an access code provided by the lecturer.
   3. Parents, need an access code provided by the lecturer.

b. **Enterprise**, for an institution or school that manages lecturers and learning with functional and administrative education.

At the login stage to schoology account, lecturers, students, and parents must log in.

The Schoology login view can be displayed in the following Figure.
The menu contained in the Schoology application include:

- Courses: through courses menu, users can create new classes, join classes that have already been there or browse through list of classes that have been set. In this feature the lecturer gives the class name Production Orale Pré Élémentaire course.

- The facilities used as learning supplements are Courses which consist of discussion, Test, and Quiz.
In this feature code access will appear. Access to the code must be informed to students as college participants and their parents so that communication between lecturers and students in the learning process can run well. Furthermore, parents can also monitor the progress of their children's lectures and communicate with the lecturer who teaches the subject. Lecturers, students and parents can discuss online (in the network) anytime and anywhere.

a. Groups, functions like wall messages where group members can also post wall messages. When joining a group, users can look for the part of the group that the user wants.

b. Resources, to maintain, track documents, files, and images that users upload in class.

In the Resources menu facility (learning source) that is discussion, as an assignment for students, Test as a matter of practice and Quiz as a test of understanding of material or competency tests. After facilitating the menu Resources, e-learning will be obtained with Schoology as a supplement learning that can take Production Orale Pré Élémentaire courses used as learning innovations for professors and students to study the “se présenter” material. If the lecturer wants to assign assignments to students then click select the type of materials Assignment.
For example, the lecturer assigns students to create dialogues with the theme "se présenter" in groups. Each group consists of 3 people. Their dialogue must be recorded in the form of a video. The dialog and video recordings that have been made by students must be uploaded to Schoology in accordance with the date and time of collection of tasks that have been determined by the lecturers. So that the lecturer can assess the discipline and responsibility of students. Then the lecturer can listen, see and assess the ability to speak French every student online. Even students' parents can also see the development of their children's ability to speak French anywhere and anytime.
a. Recent Activity, to display the latest news contained in the account Schoology. Lecturers can post and update in the account as well choose which page the user will post.

b. Calendar, to display the calendar page that has been posted previously in Recent Activity.

c. Messages, to send messages or see messages between people Schoology users. For example, the lecturer provides information to students about face-to-face meetings in class. Students must discuss and identify pronunciation of vowels and consonants in French based on the material in the learning video that they downloaded earlier.

d. People, to be able to see a list of users in a class.

Lecturers have implemented one of the e-learning learning models namely blended learning in the learning process of the Production OralePréElémentaire course. In the learning process the lecturer uses e-learning learning media "Schoology" and face to face in class. Combining the learning process between face to face and online is called blended learning. According to Darmawan (2014) blended learning is a combination of various learning models aimed at optimizing the process and learning services both distance, traditional, media, and even computer-based. Furthermore Azad (2013) argued that blended learning is:

Blended learning is a blending of different learning methods, techniques and applying them in an interactively meaningful learning environment. Learners should have easy access to different learning resources in order to apply the knowledge and skills they learn under the supervision and support of the teacher inside and outside the classroom.

According to Rovai and Jordan (2004), Blended learning is a blended learning model is basically a combination of learning excellence that is done face-to-face (face to face learning) and virtually (e-Learning).

Based on some of the opinions above, blended learning is a combination of face-to-face and online learning (in the network) to optimize the learning process. Through the blended learning model, the learning process will be more effective because the teaching and learning process that is usually done (conventional) will be assisted through e-learning (schoology) supported by information technology that has developed rapidly and can be done anytime and anywhere.

3 Conclusion

Schoology is a learning system (LMS) that has been well designed based on the web (web-based tool). This application is a newcomer in the field of online learning. Schoology has a model like Facebook and has many advanced features in the design aspect. The feature scan facilitate lecturers in making discussion questions, collaborative groups or possible assignments creation of interaction between students and lecturers. Lecturers can also participate in monitoring discussions held by students. Another aspect that Schoology has is that it can provide academic information to students. Students can access their values, attendance records, and lecturer feedback on the electronic assignments submitted. Parents can also find out directly about the development of their children's learning outcomes. Lecturers and parents can communicate through Schoology.

Lecturers must be able to use innovative and creative learning media in accordance with the development of technology and information science, for example "Schoology". The
learning process by using Schoology learning media can be carried out at any time and anywhere by using a smartphone, laptop, or computer connected to the internet network.

References


Improvisation of Mechanical Properties on Natural Rubber Latex Nanocomposites with Additioning of Cellulose Nanocrystals (CNCs) Percolated by Carbon Nanotubes (CNTs) in Various Concentrations

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Abstract. The study on enhancing mechanical properties of natural rubber-based nanocomposites which was reinforced with nanofiller has been observed for many years. In this research, cellulose nanocrystals (CNCs), which was prepared by hydrolyzing cellulose from oil palm empty fruit bunches (OPEFB), were percolated with carbon nanotubes (CNTs) using ultrasonicator to obtain CNCs@CNTs nanohybrid and utilized as the filler. Natural rubber latex/CNCs@CNTs nanocomposites were fabricated via latex mild mixing and coagulated by sulphuric acid followed by hydraulic hot-press. The mechanical properties of natural rubber latex/CNCs@CNTs nanocomposites were characterized using the tensile testing machine to evaluate the efficiency of the filler reinforcing the nanocomposites. On the other hand, the morphology of nanocomposite was observed by Scanning Electron Microscope (SEM) and its swelling index (SI) was calculated using ASTM D3616. Tensile test showed a significant increase in tensile strength of nanocomposites with the optimum number of 0.428 MPa and was achieved by nanocomposite consisting 3 phr of filler. Moreover, the least number of SI was also belonged to 3 phr filler of nanocomposites, which is 8.5. Finally, the morphology of nanocomposites exhibited the filler taking a prominent role in improving the mechanical properties.

Keywords: Natural Rubber Latex, Cellulose Nanocrystals, Carbon Nanotubes, Nanocomposites, Mechanical Properties.

1 Introduction

Natural Rubber Latex (NRL) is a milky liquid produced from rubber (Hevea brasiliensis) trees, while Natural Rubber (NR) is a polymer of isoprene (cis 1,4-polyisoprene) formed from NRL (Roberts, 1988). According to the latest statistics from International Trade Centre (ICT), Indonesia has exported over 30.7% of the world’s total rubber exports or equivalent to over USD 5.1 billion of worth in 2017, making Indonesia as the second largest NR exporter in the world.

Due to its excellent properties on elasticity, NR has been widely utilized as the main component in rubber industry, for instance, tires manufacturing. However, preparing NR-based product is banned by low tensile strength and abrasion resistance of NR. Therefore, improvement of NR should be conducted to incline the mechanical and physical properties
One of the methods is reinforcing. NR by reinforcement agents, for example, cellulose nanocrystals (CNCs) and carbon nanotubes (CNTs).

CNCs have been used as polymer reinforcing agents due to their outstanding properties, such as strong elastic modulus, low abrasion and density, abundant, and biodegradable in nature (Zhang, et al., 2014). Another nano-filler reinforcement agent used for reducing effect on NR is CNTs. CNTs, another kind of carbon nanoparticles, have attracted many researchers to put them as filler into their composite due to their distinctive nanostructures and superlative electro-mechanical properties (Meng and Zloczower, 2015).

Enhancing transitional behavior of electrical and mechanical properties of polymer-based nanocomposite using a percolation approach have been such an interesting research in recent years. In a percolation approach, the fillers, such as CNCs and CNTs, are inserted in the composite and the critical volume fraction (percolation threshold) of the fillers are required to prevail the percolating way across thematrix (Noel, et al., 2014). Wang et al. (2015) have been successfully fabricated flexible strain sensors by tailoring percolating conductive networks of NR/CNT via CNC. Those sensors presented up to 100% strain, high resistivity and sensitivity ($\sigma \approx 43.5$), yet they showed a very low electrical conductivity percolation threshold (Wang, et al., 2015). Other study reported by Noël et al. (2014) has demonstrated high electrical conductivity with 700 Sm-1, of graphene-latex nanocomposites with a low percolation threshold (0.12%vol) (Noel, et al., 2014).

Herein, CNCs isolated from oil palm empty fruit bunches (OPEFB) are mixed with CNTs via ultrasonicator resulting the CNCs@CNTs nanohybrid. These materials are studied to explain the affect of percolation approach in mechanical properties of nanocomposites. Then they are mildly mixed with NRL and the curative agents obtaining Latex/CNCs@CNTs nanocomposites. Morphology and physical properties (swelling index and crosslink density) are characterized in this work as well.

### 2 Materials And Methods

#### 2.1 Materials

High ammonia natural rubber latex (HA-NRL) was supplied by PT. Industri Karet Nusantara, Deli Serdang, Sumatera Utara, Indonesia with dry rubber content (DRC) of 60%. Sulphur, zinc oxide (ZnO), tetramethylthiuram disulfide (TMTD), and potassium hydroxide (KOH) as curative agents for prevulcanization process of NRL were purchased from Merck Indonesia. Multi-walled carbon nanotube (MWCNT) powder with ≥98% carbon basis and O.D x I.D x L 10 nm ± (1 nm x 4.5 nm ± 0.5 nm x 3 ~ 6 μm) was acquired from Sigma Aldrich Singapore. Empty fruit bunches as raw material for producing CNC was collected from PTPN IV Adolina, Serdang Bedagai, Indonesia. Sodium hydroxide (NaOH), acetic acid (CH3COOH), sodium hipochlorite (NaOCl), hydrogen peroxide (H2O2) 30%, and sulphuric acid (H2SO4) 98% used for isolating α-cellulose and CNC were bought from Merck Indonesia.

#### 2.2 Isolation of α-Cellulose from Oil Palm Empty Fruit Bunches (OPEFB)

OPEFB was cutted into 10 cm length and washed with distilled water to clean up the dirt. After being cleaned, it was soaked into water overnight and dried in an oven at 80 °C. About 75 gr of dried OPEFB was treated with 1 L of 2% NaOH and stirred for 4 h at 100 °C.
they were filtered, washed until the neutral pH was reached and bleached with 1 L of mixture solution of acetic acid buffer and 1.7% NaOCl (ratio 1:1) at 80 °C for 6 h. After that, the bleached OPEFB was filtered and washed with distilled water until neutral (Silverio, et al., 2013).

To separate α-cellulose from β and γ-cellulose, the dried bleached OPEFB was soaked into 17.5% NaOH at 80 °C for 30 min. This mixture was then filtered, washed with distilled water until pH was neutral, the bleaching process was repeated with 10% H2O2 for 15 min at 60 °C. Finally, it was dried in an oven at 60 °C and was kept in vacuum desiccators (Ohwoavworhua and Adelakun, 2005).

Do not add any text to the headers (do not set running heads) and footers, not even page numbers, because text will be added electronically.

For a best viewing experience the used font must be Times New Roman, on a Macintosh use the font named times, except on special occasions, such as program code (Section 2.3.7).

2.3 Treatment for Isolating Cellulose Nanocrystals (CNCs)

Each gram of α-cellulose was hydrolyzed using 15 mL of 48% H2SO4 at 45°C for 1 h, then 10 fold of distilled water were added to stop the hydrolysis process. This was neutralized using ultracentrifuge for 15 min at 10,000 rpm of speed and the sediment was homogenized using ultrasonic bath for 15 min. The solid was dialyzed in dialysis membrane for 8 days in distilled water to remove the exceed sulphate groups and re-homogenized using ultrasonic bath for 15 min. Finally, it was stored in refrigerator at 4°C (Silverio, et al., 2013).

2.4 Percolating CNCs with CNTs Via Ultrasonic Method

In this study, CNCs were percolated by CNT resulting CNCs@CNTs nanohybrid using ultrasonicator. 20 mg of CNTs were dispersed in CNC solution (containing 20 mg of CNCs in 100 mL distilled water) then sonicated for 12 h at room temperature to obtain CNCs@CNTs nanohybrid (Wang, et al., 2016).

2.5 Fabrication of Latex/CNCs@CNTs Nanocomposites

Prevulcanized NRL and CNCs@CNTs nanohybrid suspension were mixed on mild stirring for 2 h and demulsified with 200 mL of 1 M H2SO4. The ratio between NRL, curative agents, and CNCs@CNTs nanohybrid suspension were shown in Table 1 below. This solid was filtered and soaked into distilled water to remove the exceed H2SO4, then it was oven dried at 60°C for 24 h. Finally, it was pressed using hydraulic hot press at 150°C for 5 min [5].

<table>
<thead>
<tr>
<th>Material</th>
<th>Phr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Rubber Latex (NRL)</td>
<td>100</td>
</tr>
<tr>
<td>50% Sulphur</td>
<td>1.8</td>
</tr>
<tr>
<td>50% TMTD</td>
<td>1.8</td>
</tr>
<tr>
<td>50% KOH</td>
<td>1.8</td>
</tr>
<tr>
<td>50% ZnO</td>
<td>0.5</td>
</tr>
<tr>
<td>CNCs@CNTs Nanohybrid</td>
<td>1:2;3:4:5</td>
</tr>
</tbody>
</table>
2.6 Characterization

Mechanical properties of natural rubber latex/CNCs@CNTs nanocomposites were measured by Instron 5567 testing machine at 50 mm/min of speed at room temperature. The sample length between jaws was 20 mm and the width was 10 mm. Morphology of nanocomposites was observed by scanning electron microscopy (SEM) Hitachi S3400N Japan. Swelling index testing was determined using ASTM D3616, where the samples were weighed and immersed in pure toluene at room temperature for 24 h. Then, the solvent on swollen samples surface was removed using filter paper, and the swollen samples were weighed. Toluene was removed from swollen samples by oven drying at 80°C until constant weight was reached, and the final weight was measured. The equation of swelling index (Q) was counted as:

$$Swelling\; Index\; (SI) = \frac{W_2 - W_1}{W_1}$$

3 Result And Discussion

3.1 Mechanical Properties

Mechanical behaviour of prevulcanized NRL and NRL/CNCs@CNTs nanocomposites have been tested to determine three aspects, they were tensile strength, Young’s modulus, and elongation at break of each sample. The data could be seen on table 2 and the stress-strain curves were shown on figure 1 below as well.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Tensile Strength (MPa)</th>
<th>Young’s Modulus (MPa)</th>
<th>Elongation at Break (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevulcanized NRL</td>
<td>0.31</td>
<td>0.44</td>
<td>218.70</td>
</tr>
<tr>
<td>NRL/CNCs@CNTs (1 phr)</td>
<td>0.22</td>
<td>0.26</td>
<td>196.40</td>
</tr>
<tr>
<td>NRL/CNCs@CNTs (2 phr)</td>
<td>0.33</td>
<td>0.69</td>
<td>217.00</td>
</tr>
<tr>
<td>NRL/CNCs@CNTs (3 phr)</td>
<td>0.43</td>
<td>0.46</td>
<td>167.01</td>
</tr>
<tr>
<td>NRL/CNCs@CNTs (4 phr)</td>
<td>0.34</td>
<td>0.09</td>
<td>385.60</td>
</tr>
</tbody>
</table>

Based on the Table 2 above, NRL loaded by CNCs@CNTs nanohybrid were able to increase the number of tensile strength from 0.22 to 0.43 MPa, which the highest number of tensile strength, 0.43 MPa, was exhibited on NRL nanocomposite filled with 3 phr of CNCs@CNTs. On the other hand, Young’s modulus and elongation at break on pre-vulcanized NRL and NRL/CNCs@CNTs nanocomposites were observed fluctuate where maximum numbers of...
each category were respectively 0.69 MPa for NRL/CNCs@CNTs (3 phr) and 385% for NRL/CNCs@CNTs (4 phr).

![Figure 1. Stress-Strain Curves of Prevulcanized NRL and NRL/CNCs@CNTs Nanocomposites.](image)

Figure 1 performed the curves of stress versus strain on pre-vulcanized NRL and NRL/CNCs@CNTs nanocomposites. From the curves, it could be understood that by loading CNCs@CNTs nanohybrid into NRL, the number of stress and strain could increase significantly. The stress were increase up to 0.1 point for each sample tested and the greatest number of stress, 0.43 MPa, were belonged to NRL/CNCs@CNTs (3 phr). Move on to the strain, it could be noticed that by filling the NRL with CNCs@CNTs nanohybrid could decrease the strain number and only adding 4 phr of the fillers could raise the strain to the number of 385%.

### 3.1 Mechanical Properties

SEM analysis was measured to analyze the morphology of the surface from the material. In this work, pre-vulcanized NRL and NRL/CNCs@CNTs nanocomposites have been characterized and the result was shown on Figure 2 below.
The images exhibited the surface of pre-vulcanized NRL and NRL/CNCs@CNTs nanocomposites filled by 1 and 3 phr of fillers and it could be depicted that the most regular surface was captured on NRL/CNCs@CNTs (3 phr). This result was related to the number of tensile strength which this nanocomposite was also owned the best mechanical properties of all. The particles of the curative agents and latex were seen on those three pictures; however, distribution of the particles on pre-vulcanized NRL and NRL/CNCs@CNTs (1 phr) were not as well as NRL/CNCs@CNTs (3 phr) had. The particles were not well-distributed on the pre-vulcanized NRL surface due to the mixing time that was only 2 h, compared with the nanocomposites which had 1 h for blending with the filler after having 2 h of time mixing with the curatives. On the surface of NRL/CNCs@CNTs (1 phr), it can be noted the agglomeration of the particles was occurred and this caused the number of tensile strength declined.

3.3 Swelling Properties

Swelling test was conducted to measure the resistance of NRL-based nanocomposites immersed in a solvent. In this work, the solvent was toluene and the numbers of swelling index of the samples were illustrated on table 3 below.
Table 3. Swelling Index of NRL Filled by CNCs@CNTs.

<table>
<thead>
<tr>
<th>CNCs@CNTs Loading (phr)</th>
<th>Swelling Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>9.98</td>
</tr>
<tr>
<td>1</td>
<td>9.64</td>
</tr>
<tr>
<td>2</td>
<td>9.24</td>
</tr>
<tr>
<td>3</td>
<td>8.6</td>
</tr>
<tr>
<td>4</td>
<td>9.05</td>
</tr>
</tbody>
</table>

The table showed swelling number of NRL loaded by 0 to 4 phr of CNCs@CNTs nanohybrid. The number of swelling index consisted of 0 phr of fillers were 9.98 and it was going to decline to 8.6 for 3 phr of CNCs@CNTs which was the minimum number of whole measured samples; however, this number moved up to 9.05 at 4 phr fillers of nanocomposites.

The decline of swelling index on pre-vulcanized NRL and NRL/CNCs@CNTs nanocomposites could be also seen on figure 3 below.

Figure 3. Swelling Index Curves of Pre-vulcanized NRL and NRL/CNCs@CNTs Nanocomposites

A material could swell in a solvent due to the solvent molecules diffused into the material. This was happened to the samples in this work where they swelled after immersing in toluene, the solvent, for 24 h. For pre-vulcanized NRL which the fillers were not contained, it presented the highest number of swelling index; however, by filling the pre-vulcanized NRL with the fillers, CNCs@CNTs nanohybrid, this number was going down. From this phenomenon, it could be noticed that the fillers interacted and resisted the rubber in NRL so the molecules of the solvent could not diffused into thenanocomposites as much as pre-vulcanized NRL occurred.
4 Conclusion

The mechanical properties improvement on NRL nanocomposites filled with CNCs percolated by CNTs has been demonstrated. By using ultrasonic method, CNCs was mixed with CNTs and obtained the CNCs@CNTs nanohybrid. This nanohybrid was incorporated with pre-vulcanized NRL by mild mixing method resulting NRL/ CNCs@CNTs nanocomposites. The NRL/ CNCs@CNTs nanocomposites showed enhancement of tensile strength (0.22 to 0.43 MPa) and the regularity of particle distribution on the surface of the nanocomposites. Furthermore, the more fillers filled the nanocomposites, the lower swelling index achieved.

Acknowledgement. The authors gratefully thank to the Rector of University of Sumatera Utara, Medan, Indonesia, for the financial support via “Penelitian Dasar Unggulan Universitas Talenta Project 2018” scheme.

References
Effect of Orange Juice Consumption on Muscle Damage and Leukocytes Count of Tarung Derajat Athletes

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Department of Physical Education, Health and Recreation, UNIMED, North Sumatera, Indonesia²

Abstract. The study was conducted to determine the effect of orange juice on muscle damage and leucocytes count of Tarung Derajat Athletes. Subjects were 10 athletes of Tarung Derajat, divided two group: orange juice (OJ) and placebo (PLA), quasi experiment study. Participant were randomized to consume 300 ml OJ or 300 ml PLA and exercise of Tarung Derajat for 12 d. Blood sample were obtained at baseline and 48 post-intervention. Measurement of muscle damage (creatine kinase/CK) and leucocytes count. OJ consumption was no effect on CK level (p=0,296 > 0,05) and significantly correlated on leucocytes count (p=0,005 < 0,05). OJ have effect on exercise-induced decreases leucocytes count, but no effect on muscle damage.

Keywords: Tarung Derajat Athletes, Orange Juice, Muscle Damage, Leucocytes Count

1 Introduction

Exercise has caused muscle damage, therefore increased production of reactive oxygen species (ROS) moreover other inflammatory molecules (Aoi et al, 2004). Exercise induced muscle damage followed by reaction an auto-oxidation of hemoglobin and myoglobin, which both has an effect on production and reactivity of ROS (Cooper et al, 2002).

Maximal physical activity caused injuries that triggers inflammation, furthermore stimulates of phagocytes white blood cells to suspended inflammation (Leeuwenburgh and Heincke, 2001). Normal physical activity, antioxidant eliminating destructive molecules. However, oxidative stress causes an imbalance between free radical production and antioxidant defense. This oxidative stress is involved in aging process, cell damage, muscle damage, muscle fatigue and overtraining (associated with an inadequate recovery) (Finaud, 2006).

High intensity interval training causes an inflammatory response in blood (Belviranli et al., 2017, Fatemah et al., 2014). Furthermore, other studies conducted on trained-untrained subjects, exercise has increasing count of leukocytes in both subjects (Musa et al., 2016). Leukocytes are white blood cells that function as the body's defenses, containing the nucleus (Ganong, 2010). Therefore, peripheral leukocyte count can be a source of information for diagnosis and prognosis as well as a description of organ damage and recovery after maximal physical activity (Sodique, 2000).

Some research indicated, exercise increased free radical production, caused to increase aerobic energy production. Impact of free radicals could be inhibited by antioxidants.
Antioxidants could be delay and inhibit oxidation reactions of free radicals, therefore muscle damage, biomolecules damage, such as DNA, proteins, and lipoproteins decreased. Furthermore, the incidence of degenerative disease could be reducing (Devasagayam, et al., 2004).

Some antioxidants were protected cells from free radicals such as vitamins C and E, carotenoids and flavonoids (Janero, 1991, Packer, 1991), but most commonly used for exercise were vitamin C and E. One of the fruits that contain vitamin C is orange, which can be consumed in the form of juice. Nutrient content of orange juice per 228 grams of energy 110 cal, carbohydrate 28 g, protein 2 g, calcium 19 mg, phosphorus 16 mg, vitamin A 15 mcg, vitamin C 104 mg, vitamin D 2.5 mcg, thiamin 2 mg, riboflavin 1 mg, niacin 8 mg, vitamin B6 15 mg, folate 61 mcg (Florida Orange Juice, 2018). For this reason, this study was conducted to determine the effect of orange juice on muscle damage and leucocytes count of Tarung Derajat Athletes.

2 Methods

2.1 Subjects and Procedures

The samples consisted of 10 athletes, consequently, be ready to be the samples, to take part in exercise, did not have a smoke, did not consume vitamin C supplements during the study.

This research was a quasi-experimental study. Athletes were divided two groups, randomly, OJ and PLA group. Collecting of CK levels and leucocyte counts at the baseline. Thereafter, group 1 was given 300 ml orange juice and exercise Tarung Derajat, group 2 was given placebo 300 ml and exercise Tarung Derajat, for 12 d. Finally, the creatine kinase levels and leucocyte counts were re-collected after 48 h post-treatment.

Laboratory testing included CK levels and leucocytes count. Laboratory testing were at regional laboratory of North Sumatera. CK testing was by DGKC method and leukocyte testing were by haematology analyzer.

2.2 Statistical Analyses

Data analysis were supported by statistic software “SPSS version 17.0” IBM. Normality test was assessed by Kolmogorov-Smirnov. Mean and standard deviation parameters were calculated. Pair t test were calculated to estimate the effect result on the same group, and independent t test to estimate the effect result on different group. The level of significance was p<0.05.
3 Result and Discussion

We found significant effect of consumption OJ on leucocytes during exercise of Tarung Derajat for 12 times, but no significant effect on CK levels.

Table 1. Leucocyte counts and CK Level of OJ Group

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Leucocytes count</th>
<th>CK Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>After</td>
</tr>
<tr>
<td>Mean</td>
<td>8.478</td>
<td>7.020</td>
</tr>
<tr>
<td>SD</td>
<td>1.459</td>
<td>1.078</td>
</tr>
<tr>
<td>p value</td>
<td>0.004*</td>
<td>0.754</td>
</tr>
</tbody>
</table>

*Significant (p<0.05)

There was significant effect of consumption PLA on leucocytes and CK levels during exercise of Tarung Derajat for 12 times.

Table 2. Leucocyte counts and CK Level of PLA Group

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Leucocytes count</th>
<th>CK Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>After</td>
</tr>
<tr>
<td>Mean</td>
<td>8.73</td>
<td>9.6</td>
</tr>
<tr>
<td>SD</td>
<td>1.63</td>
<td>1.04</td>
</tr>
<tr>
<td>p value</td>
<td>0.044*</td>
<td></td>
</tr>
</tbody>
</table>

*Significant (p<0.05)

There was an effect of consumption of orange juice on counts of leukocyte athletes. The difference of mean value of leukocyte counts athletes who consumed orange juice and placebo. Athletes who consumed OJ for 12 times during training of Tarung Derajat, evidently, leucocytes count were lower than who consumed PLA. There was no effect of orange juice consumption on creatine kinase levels. There was increased CK level on both groups, the biggest on PLA group.
Table 3. Leucocyte counts and CK Level of OJ and PLA Group

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Leucocytes count</th>
<th>CK Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>-2.61 (10^9/l)</td>
<td>-8.2 (U/L)</td>
</tr>
<tr>
<td>SD</td>
<td>0.67 (10^9/l)</td>
<td>6.738 (U/L)</td>
</tr>
<tr>
<td>p value</td>
<td>0.005*</td>
<td>0.258</td>
</tr>
</tbody>
</table>

*Significant (p<0.05)

In this research, there was no effect of orange juice consumption on creatine kinase levels, therefore, both of them increased CK level. Orange juice contains vitamin C, which is one source of exogenous antioxidants. As an antioxidant, vitamin C prevents muscle damage caused by ROS production. ROS arise when oxidizing proteins, fatty acids and DNA in body (Gershoff, S.1993, Harats, et al. 1998).

The enhancement of creatine kinase is an indicator of muscle damage. Exercise-induced metabolic stress causes muscle damage. Metabolic stress occurs due to production of free radicals and excessive amounts of calcium. Increased of activity in electron transport chain, semiquinone in mitochondria and xanthine oxidase in endothelial cell capillaries increases oxygen consumption during exercise (Su Qs, et al., 2010), all of which can lead to increase of production of free radicals and muscle damage.

Consumption of vitamin E supplementation on Deep Sea Marathon athletes, there was no difference in serum creatine kinase levels between two groups (control: 5351.6 ± 1331.9 U/L-1 and Vitamin E: 5337.3 ± 1058.4 U/L-1; P> 0.05) although serum creatine levels on vitamin E group were lower. In conclusion, Vitamin E cannot protect increased muscle damage in the Marathon Athlete (Bataineh, et al., 2017).

Increased CK has not been thoroughly explained, but an enhancement CK can be due to an enhancement on muscle temperature. This causes a higher reaction on muscles by increased water loss for thermoregulation. Furthermore, increase of energy oxidation requires higher oxygen loading, which, when combined with a reduction in plasma volume creates a similar situation with a higher intensity of exercise (Cheuvront, 2001, Del Coso et al., 2013), thus causing higher muscle damage than expected.

Some studies suggest that consumption of exogenous antioxidants reduce muscle damage, although in this study orange juice was not significantly proven reduce the impact of exercise on muscle damage. This is supported by the results of other studies showing that there is no effect of supplement consumption on muscle damage. Consumption of lemon verbena extract (400 mg) after exercise did not correlate significantly from placebo group on serum creatine kinase in the first 24 hours after exercise (p = 0.0788) (Werner et al., 2018). The combination of vitamin C and E supplementation for 6 weeks did not have an impact on reducing muscle damage (Bailey, 2011).

In addition, orange juice also affects the decrease of leukocytes in athletes. Orange juice was a healthy drink that contains vitamins and minerals (Chun, 2007). Orange juice was considered one of the important sources that contain nutrients: vitamin C, folate and potassium. Vitamin C can protect endothelial cells and LDL from oxidative stress of intra-extra cells (Sabharwal, 2008).

Vitamin C in orange juice can enhance immune system and maintain an effective immune response (Wintergerst, 2007). Several studies has shown that vitamin C strengthens and protects the immune system by stimulating antibody activity and immune system cells such as phagocytes and neutrophils. Some theories state neutralizing ROS production during
high-intensity exercise by maintaining the redox integrity of immune cells (Wintergerst, 2006).

Vitamin C is a non-enzymatic antioxidant that dissolves in water. As an antioxidant, vitamin C works as an electron donor into biochemical reactions both intracellular and extracellular. Intracellular vitamin C is able to remove reactive oxygen compounds in neutrophil cells, monocytes, lens proteins and retina and react with Fe-ferritin. Outside the cell, vitamin C is able to remove reactive oxygen compounds, thus preventing oxidation of LDL, transferring electrons into tocopherol oxidized and absorbing metal in the digestive tract (Levine et al., 1995).

Vitamin C is beneficial for enhancing the immune system and has antioxidant effects. Therefore, vitamin C also increases immune system through immunological activity of leukocytes, interferon production, inflammatory reactions processes and membrane integrity. Vitamin C affect on physical performance in athletes due to the synthesis of carnitine in providing energy and enhancing immune function, especially endurance exercise athletes which tends to be more susceptible to upper respiratory infections.

Establishment of free radicals, 5% of oxygen consumption can be neutralized by endogenous antioxidants. However, if the establish of free radicals increases due to strenuous and tiring exercises, the body's defense system requires exogenous antioxidants to neutralize excess free radicals. If it was not neutralized, an imbalance causes oxidative stress that stimulates leukocyte activity (Cooper, 2000).

In this study, evidently, that consumption of 300 ml orange juice for 12 times during exercise was effective to reduce the count of leukocytes. This is also consistent with other studies which suggest consumption of antioxidant supplements can improve the antioxidant defense system, thereby reducing the impact of oxidative stress induce-exercise (Barr, 2004, Bloomer, 2006).

4 Conclusions

This study concluded, creatine kinase levels of orange juice (OJ) group was lower than placebo (PLA) group, whereas it was not significant. Consumption of OJ significantly affected on decrease count of leukocytes. Therefore, in this study, consumption of orange juice reduce the inflammatory response induce-exercise. Our result require confirmation in large study, so the result will be more accurate.

Acknowledgements

The research was supported by BOPTN of UNIMED.

References


Utilization of Landsat Satellite Imagery to Observe Environmental Change at Sinabung Mountain Area

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Abstract. Ten years long eruption at Mt. Sinabung 2009 to 2018 generated a diverse surface environment, which is located in Sumatra Island, Indonesia. In fact, most of the eruption event probably being aware to vegetation changes and temperature changes during those eruptions shown in that period. Therefore, there was abundant data of satellite imagery to support the observation of stunning eruption one of the satellite imagery is Landsat 8 OLI. Field survey is also as evidence for fluctuated of volcanic activity during the Mt. Sinabung eruption by using position tracking, scenery taking, and temperature monitoring. Scope of observation is limited around 5 km and processed by using ArcGIS 10.3 and ENVI 4.7. In particular, results indicated that the intensity of Mt. Sinabung eruption increased every year, since 2009. According to temperature and vegetation information provided by Landsat 8 OLI shows an increase in temperature (by land surface temperature index or LST) simultaneously with a decrease in vegetation index (by Normalized Difference Vegetation Index or NDVI). In accordance with that information, this results confirm Mt. Sinabung erupted influences the environment stability.

Keywords: Thermometer, GPS, Environmental change, Landsat 8 OLI, NDVI, LST.

1 Introduction

In North Sumatra there are several volcanoes, both active and inactive, one of which is Sinabung Mountain which is located in Karo District with an altitude of 2,475 amsl (above mean sea level) with currently active status (Febrianty, 2017). This mountain has not been active for a long time, since the last magmatic eruption in 1600. Society in North Sumatra was shocked by its active return on August 2010 where phreatic eruptions occurred (Sutawidjaja, 2013). The condition of temperature and lava distribution in the research area that has not been identified will cause there is an expansion possibility of damage area that can harm the local residents (Safitri, 2014). The Observation of the surrounding eruptions effects cannot be done manually, because of the danger of heat, toxic gases and larvae. How to observe the negative impacts Eruptions around 5 km from the mountain becomes the problem in this study.

Research to observe the negative impacts around this mountain can be done with remote sensing (RS). Technically RS can identify: lava deposits after eruption, temperature, NDVI and also can identify natural damage (water, soil, plants). Remote sensing techniques also can be used to monitor the negative effects of eruption. Remote sensing is the science and art of obtaining information about an object, area, or phenomenon through analysis of data obtained with a device without direct contact with objects, regions, or phenomena being studied and followed by processing, analysis, and interpretation of the data (Howard, 1996). How remote sensing can observe the environment, which is remote sensing consists of 3 main components
namely sensed objects, sensors to record objects and electro-magnetic waves reflected or emitted by the earth's surface.

Interaction when this component produces remote sensing data which then through the interpretation process can know the type of object area or phenomena that exist (Lillesand & Kiefer, 1979). This study uses Landsat TM satellite data which has the characteristics: 30 m spatial resolution for NDVI, 1 Scene image Landsat has wide 190 km x 195 km, 16-day temporal resolution (ESRI, 2001). Photograph images can theoretically capture the colours and gradations indefinitely beyond digital media that can be received by computer monitors and other output equipment (Prasetyo, 2011) whereas thermal bands are very useful for detecting differences in the earth's surface temperature with a 100 meter spatial resolution (Mulyanta, 2006) and knowing the damaged area level, and temperature due to eruptions and information on areas that are vulnerable to eruption disasters that are categorized as alert and safe in disaster mitigation (Thoha, 2008). This study focused on identification: NDVI, LST and land damage. The results of this study can be used by the government and local communities to mitigate natural disasters.

2 Research Methodology

This research methodology consists of location and time observation, tools and materials, and data analysis.

2.1 Location and Time Observation

Geographically, Karo Regency is located between 2°50 ' - 3°19' North Latitude and 97°55 ' - 98°38' East Longitude with an area of 2,127.25 km² or 2.97 percent of the area of North Sumatra Province. The study location is geographically between 3°08'45.61 north latitude and 98°20'12.54 east longitudes with 5 km of the central area of Sinabung Mountain.

2.2 Tools and Materials

This section includes:

2.2.1 Tools

For the field survey, we use GPS (Global Position System), DNS Garmin, Microsoft Office 2007, Digital Cameras, Alcohol Thermometers. For data analysis, our results supported by ArcGIS 10.3 and ENVI 4.7.

2.2.2 Materials


2.3 Data Analysis

This section will explain the research processing.

1. Firstly, we do some radiometric correction at all band of Landsat 8 OLI using an equation
2. We do mask between the data with administration map to collocate the area observation.
3. Next, we calculate the parameter such as Normalized Difference Vegetation Index (NDVI) and Land Surface Temperature (LST).

\[ NDVI = \frac{\text{BandNIR} - \text{Band Red}}{\text{BandNIR} + \text{Band Red}} \]  

\[ TI = \left( \frac{K_2}{\ln \left( \frac{K_1}{L_s} + 1 \right)} \right) \]  

Where,
NDVI is normalized difference vegetation index
TI is temperature index
K1 is first constants (774.89)
K2 is second constants (1321.08)

4. Then, we classify and count the moderate area and risk area.

3 Result and Discussion

Landsat 8 OLI image data processing requires field survey data as reference points for processing the data. On the other hand, band satellite image data is 1 to 11 USGS sources, to display surface images where on Landsat 8 OLI, true colour from RGB results to 4,3,2 where R = Band 4 (Red), G = Band 3 (Green) and B = Band 2 (Blue). On Landsat 8 OLI Digital Number that is 16 bits, \(2^{16} = 65,356\) minimum price = 0 (Black) and maximum price = 65,355 (White). Figure 1 and Figure 2 shows the distribution of Mt. Sinabung eruption in 2016 and 2018. This figures include those image of Landsat 8 OLI to indicates the area that has been damaged by the mountains, with the NDVI value and temperature in the area. This section includes:

3.1 NDVI results

Map of NDVI values calculation in the Sinabung Mountain area from 2009 to 2018 can be seen in Figure 2.a, 2.b, 2.c and 2.d below.
The figure above shows that NDVI values had a dramatically decline and it is obviously seen in Figure 1a in 2009 it still looks high at 0.8 emu with little deforested land caused by local and national tourists who climbed before Sinabung Mountain eruption, then it had a significant decrease from 2014, 2016 and 2018 with a value of 0.6 emu, 0.5 emu and 0.60 emu. It can be seen in Figure 1b, 1c and 1d. It shows the activity of Mt. Sinabung strongly influences the changes in the surrounding of NDVI, mountain activities are increasingly high by removing eruptions and bursts of hot clouds towards the south of the mountain slope which caused the diminishing green land. Thos information shown on
\begin{table}
\centering
\begin{tabular}{ll}
\hline
No. & Year & NDVI Value \\
\hline
1 & 2009 & 0.6 - 0.8 emu \\
2 & 2014 & 0.4 - 0.6 emu \\
3 & 2016 & 0.4 - 0.5 emu \\
4 & 2018 & 0.5 – 0.6 emu \\
\hline
\end{tabular}
\caption{NDVI value from Landsat 8 OLI 2009 to 2018}
\end{table}

3.2 LST results

TI maps in Mt. Sinabung from 2009-2018 can be seen in Figure 2.

\textbf{Fig 2}: Mean value of thermal index (LST) at 5 km of Mt. Sinabung in (a). 2009; (b). 2014; (c) 2016; and (d) 2018. Erupted area shown in legend from dark green to the light red.
The temperature map above can be concluded that temperature in 2009 was still low at the top of Mt. Sinabung because there was no eruption. In Figure 2.a., shows peak of increasing value causes of eruption of Mt. Sinabung in 2014, 2016, and 2018. It can be seen in red colour which has a temperature value of 24-26°C and the red colour temperature of 32-53°C at these temperatures has exceeded the normal limits of humans and plants for life and it is not feasible to live and grow crops. The temperature in 2018 looks very significant compared to the previous year. It can be seen in Table 2 below.

<table>
<thead>
<tr>
<th>No.</th>
<th>Year</th>
<th>NDVI Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2009</td>
<td>15 – 18 ºC</td>
</tr>
<tr>
<td>2</td>
<td>2014</td>
<td>34 – 46 ºC</td>
</tr>
<tr>
<td>3</td>
<td>2016</td>
<td>43 – 73 ºC</td>
</tr>
<tr>
<td>4</td>
<td>2018</td>
<td>32 – 53 ºC</td>
</tr>
</tbody>
</table>

3.3 Sinabung Mountain Environmental Changes

Before Mt. Sinabung eruption, it was still relatively green around the peak of Sinabung so there was no land damage.
Based on the information, Mt. Sinabung was a favourite tourist attraction for tourists who like climbing. However, since the activities of Mount Sinabung again in 2010 up to now there have been many impacts from the eruption of the mountain. One of them is land damage caused by lava flows and volcanic ash bursts. From the calculation of NDVI and LST on Landsat 8 OLI imagery in 2009, 2014, 2016 and 2018, it provides an overview of the spreading area and the extent of damage in the 5 km due to Sinabung Mountain activities as shown in Figure 3.a, 3.d, 3.c and 3.d below. From the figure above, it was concluded that land damage continued to increase every year due to Sinabung Mountain eruption as seen in 2014. It was very significant because the eruption in 2013, the impact was very large on the land damage around the mountain.

From the table below, it can be seen that the increase in land damage area and the most damaged was seen in 2014 due to the temperature above the surface which greatly affected the subsurface so that the extent of land damage in the area was seen. Table 3 below shows changes in land damage every year. From the table it can be stated that a decrease in NDVI values proves that land damage has increased.

**Table 3.** Risk assessment area from Landsat 8 OLI from 2009 to 2018

<table>
<thead>
<tr>
<th>No.</th>
<th>Year</th>
<th>NDVI Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2009</td>
<td>120.73</td>
</tr>
<tr>
<td>2</td>
<td>2014</td>
<td>2492.12</td>
</tr>
<tr>
<td>3</td>
<td>2016</td>
<td>1256.40</td>
</tr>
<tr>
<td>4</td>
<td>2018</td>
<td>1301.32</td>
</tr>
</tbody>
</table>
3.4 Discussion

Based on the image map 1.a, 1.b, 1.c, and 1.d, the NDVI map shows a decrease in the greenish level around Mt. Sinabung, and the value of the image in Figure 2.a, 2.b, 2.c and 2.d looks increasingly increased and it can be said that in the area of Mt. Sinabung had dramatically environmental changes. For land damage can be seen in Figure 3.a, 3.b, 3.c and 3.d, they stated that there has been an environmental change or land damage. All pictures and tables, it is proven that land damage has occurred which allows humans to not be able to live and grow crops in the area. It means that all residents living around 5 km from the top of Sinabung Mountain must be evacuated or mitigated.

4 Conclusions

When the NDVI decline is very drastic and the temperature increases, it can be concluded that environmental changes occur at these locations in the degraded land category. Because of land damage, there is population displacement or mitigation and for agricultural land, it must be 5 km from the top of Mt. Sinabung.

References

Analysis of Mathematical Concepts Understanding of College Students in the Form of Differential and Integral in Physical Mathematics Subject

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Abstract. The purpose of this study was to analyze the mathematical concepts understanding of college students in the form of differential and integral in physical mathematics subject. The method of this research was mixed methods where the quantitative and qualitative research was combined. The model of the mixed methods was sequential explanatory design. The subject of this research was college students in fourth semester of physics education study program in Education Institute of South Tapanuli. The data were collected through using observation and interviewing sheet. Based on analysis data obtained the mean of mathematical concepts understanding of college students in the form of differential and integral was 77.61 in good category. The mean sequence of the indicators from high to the low level were: (1) restate the concepts; (2) apply the concepts or algorithms to physics problem solving; (3) classify objects according to the certain characteristics in accordance with concepts; (4) use, utilize and select certain procedures; (5) present concepts in various forms of mathematical and physical representations; (6) give examples and not examples; (7) develop the necessary or sufficient terms for a concept.

Keywords: Mathematical Concepts Understanding; Differential and Integral

1 Introduction

The concepts understanding are necessary in learning physics either in the form of an understanding of the concept, completion algebra or the acquisition of a quantity, equation and physical formula. In addition, physics is very closely related to mathematics where mathematics is used as a tool to learn physics. So that mathematics has an important role in learning physics.

One kind of physics subject in Physics Education Study Program, Education Institute of South Tapanuli is Physical Mathematics subject. Physical Mathematics subject is one of the compulsory subject which is consisted of four credits in Physics Education Study Program, Education Institute of South Tapanuli. In this subject, many mathematical concepts and methods are learnt such as Series, Complex Numbers, Vectors, Matrices, Differentiation, Integrals, and other concepts. In addition, not only learning about the mathematical concepts, but also learning about the application of this mathematical concepts to solve the physical problems whether it about concepts or problems. The example of concepts and methods that are often used in Physical Mathematics subject are differential and integral concept. The
example of the application of these concepts are found in some materials such as Rectilinear Motion, Decay, Oscillation, Work and Energy, Electricity Circuit, Thermodynamics, and the other concepts. So that in learning this subject, the mathematical concepts understanding is needed.

Based on the observation result and the experience of writer, college students in Physics Education Study Program occur some difficulties in learning Physical Mathematics subject. This is caused by lack of understanding the mathematical basic concepts of college students so that lecturer should re-teach it from the basis though in reality they have learnt it in Basic Mathematics I and Basic Mathematics II subject and even at the high school level. In addition, the difficulty of understanding the mathematical concepts is generally due to the nature of mathematics which has abstract object that are difficult for students to understand (Fauziyah and Budi, 2014).

The mathematical concepts understanding of students college in the form of differential and integral is the ability of students college in mastering a number of mathematical materials in the form of differential and integral where they are not only know or remember of learned concepts but also able to present these concepts to various forms of mathematical representation so they can solve the physical problems and apply the concepts and methods. This mathematical concepts understanding is very important because through this understanding make students college be easier to understand the materials in Physical Mathematics subject so that they can solve the physical problems. This is accordance with (Nurfarihkin, 2010) which stated that there was a correlation between the ability of concepts understanding and the ability of solving problems. Some examples of these mathematical concepts are Differential and Integral. These two concepts are very important and be the basic concept in mathematics and in understanding of physics concepts especially in Mathematical Physics subject and in the other subjects such as Thermodynamics, Basic Nuclear Physics and Mechanics subject.

Differential equation is an equation containing derivatives (Boas M L, 1983). A great many applied problems involve rates, that is, derivatives. The integral equation is defined as inverse of derivative. Differential and integral have the wide application and interconnected each other especially in learning physics concepts. This is because the equations or formulas of physics are obtained through the application of the differential or integral concepts. Therefore, it is very important to understand the mathematical concepts in the form of differential and integral.

The purpose of this paper is to analyze the mathematical concepts understanding of college students in the form of differential and integral in Physical Mathematics subject.

2 Review Of Literature, Research Method And The Result Of Research
This paper is also supported by some part, namely review of literature, research method and the result of research. These are will be explained as below parts:

2.1 Review of Literature
2.1.1 Mathematical Concepts Understanding
A concept understanding is the ability of students in the form of mastering a number of learning study, where students not only know or remember the learned concepts, but also they
are able to re-disclosure in another form that is easy to understand, provides data interpretation and is able to apply concept that are in accordance with their cognitive structure (Sanjaya, 2000). So that a concept mastered by students is better if accompanied by its application.

There are seven indicators of concepts understanding, namely the ability to restate the concepts, classify objects according to certain characteristics in accordance with concepts, give examples and not examples, present concepts in various forms of mathematical and physical representations, develop the necessary or sufficient terms for a concept, use, utilize and select certain procedures, apply the concepts or algorithms to mathematical problem solving (Hamzah B Uno, 2012).

### 2.1.2 Differential Concepts

Differential equation is an equation containing derivatives (Boas, M L, 1983). A great many applied problems involve rates, that is, derivatives notated as

\[ y' = \frac{dy}{dx} \]  

The classifications of differential equations are (Anugraha, 2011):

- **Ordinary Differential Equations:**
  A great many applied problems involve rates, that is, derivatives. An equation containing derivatives is called a differential equation. If it does not contain the partial derivatives, it is called as ordinary differential equation. Ordinary differential equation is a form of equation that contains derivatives of one or more non-independent variable on a function of independent variable. Determining the order of a differential equation depends on the derivative function in the differential equation. An order or level of a differential equation is the highest rank derivative in a differential equation.

- **Partial Differentiation:**
  Partial differentiation is an equation that contains partial derivative of one or more non-independent variable on more than one independent variable of a function.

- **Linear and non Linear Ordinary Differential Equations.**

### 2.1.3 Integral Concepts

The integral equation is defined as inverse of derivative. The Integral is consisted of:

- **Definite Integral:**
  The function integration \( f(x) \) which is written as \( \int f(x) \, dx \) is called as definite integral of \( f(x) \). If \( F(x) \) is anti-derivative of \( f(x) \), so
  \[
  \int f(x) \, dx = F(x) + c
  \]  

- **Indefinite Integral:**
  If the function of \( y = f(x) \) is continue to the interval \( a \leq x \leq b \), so
Then, the integration techniques, namely:
- Substitution Integral
- Partial Integral

Partial integration rule is the rule that are related to the rule of product for derivatives (Stewart J, 2002). The formula is:

\[
\int u \, dv = uv - \int v \, du
\]  

2.2 Research Method

The research method is consisted of:

2.2.1 Stages of Research

The research method used is a combination research or mixed methods. This research combines between quantitative research steps and qualitative research steps to obtain more comprehensive, valid, reliable and objective data (Sugiyono, 2012).

2.2.2 The Location of Research

This research was conducted in Education Institute of South Tapanuli, Sutan Mhd Arif street, Padangsidimpuan, North Sumatera. This research was conducted to fourth semester of college students in even semester Academic Year 2017/2018.

2.2.3 The Model of Research

The combination research used in this research is sequential explanatory design. This model of research uses quantitative method at first and the second use qualitative method (Sugiyono, 2012).

2.2.4 The Techniques of Data Collecting and Data Analysis

Data collecting used were observation and interview. Data analysis used by two steps, namely:

- Quantitative Data Analysis;
  - Analysis of mathematical concepts understanding in the form of differential and integral calculated by:
    \[
    value = \frac{obtained \, score}{maximum \, score} \times 100
    \]  

- Qualitative Data Analysis.
The steps of analysis are data reduction, data presentation, and drawing conclusions or verification.

### 2.3 The Result of Research

The purpose of this research was to analyse mathematical concepts understanding in the form of differential and integral of college students in the form of differential and integral in Physical Mathematics subject.

#### 2.3.1 Mathematical Concepts Understanding in the Form of Differential and Integral

The mathematical concepts understanding in the form of differential and integral was analysed using test instrument in the form of observation which was consisted of seven indicators, namely: (1) restate the concepts; (2) classify objects according to certain characteristics in accordance with concepts; (3) give examples and not examples; (4) present concepts in various forms of mathematical and physical representations; (5) develop the necessary or sufficient terms for a concept; (6) use, utilize and select certain procedures; (7) apply the concepts or algorithms to physical problem solving. This understanding was observed and assessed by two observers. The observation result of the first and second observer was:

<table>
<thead>
<tr>
<th>Observer</th>
<th>Mean Value</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>78</td>
<td>Good</td>
</tr>
<tr>
<td>II</td>
<td>78</td>
<td>Good</td>
</tr>
</tbody>
</table>

The mean value of each indicator of mathematical concepts understanding in the form of differential and integral was described as below:

#### Table 1. Mathematical concepts understanding in the form of differential and integral by observer.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Mean</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicator I</td>
<td>80</td>
<td>Very Good</td>
</tr>
<tr>
<td>Indicator II</td>
<td>78</td>
<td>Good</td>
</tr>
<tr>
<td>Indicator III</td>
<td>75</td>
<td>Good</td>
</tr>
<tr>
<td>Indicator IV</td>
<td>75</td>
<td>Good</td>
</tr>
<tr>
<td>Indicator V</td>
<td>71</td>
<td>Good</td>
</tr>
<tr>
<td>Indicator VI</td>
<td>76</td>
<td>Good</td>
</tr>
<tr>
<td>Indicator VII</td>
<td>79</td>
<td>Good</td>
</tr>
</tbody>
</table>

The descriptions of indicators are:
- Indicator I = Restate the concepts
- Indicator II = Classify objects according to certain characteristics in accordance with concepts
- Indicator III = Give examples and not examples
- Indicator IV = Present concepts in various forms of mathematical and physical representations
Indicator V = Develop the necessary or sufficient terms for a concept
Indicator VI = Use, utilize and select certain procedures
Indicator VII = Apply the concepts or algorithms to physical problem solving

3 DISCUSSION

The mean value of mathematical concepts understanding of college students in the form of differential and integral by observer I was 78 in “Good” category and by Observer II was 78 in “Good” category too, so obtained the mean value of the observers was 78 in “Good” category.

The mean value of indicators the mathematical concepts understanding of college students in the form of differential and integral were, indicator “restate the concepts” was 80 in “Very good” category, indicator “classify objects according to certain characteristics in accordance with concepts” was 78 in “Good” category, indicator “give examples and not examples” was 75 in “Good” category, indicator “present concepts in various forms of mathematical and physical representations” was 75 in “Good” category, indicator “develop the necessary or sufficient terms for a concept” was 71 in “Good” category, indicator “use, utilize and select certain procedures” was 76 in “Good” category, indicator “apply the concepts or algorithms to physical problem solving” was 79 in “Good” category. These mean value described as figure below:

![Fig 1. Mathematical concepts understanding of college students in the form of differential and integral in each indicator.](image)

If the indicators are sorted from the high mean value to the low mean value are restate the concepts, apply the concepts or algorithms to mathematical problem solving, classify objects according to certain characteristics in accordance with concepts, use, utilize and select certain procedures, present concepts in various forms of mathematical and physical representations, give examples and not examples, develop the necessary or sufficient terms for a concept.
Based on the initial interview result before learning begins, found that college students feel difficult to understand the differential and integral method/concept. They only know the definition of these two methods/concepts, namely differential is derivative while integral is the opposite of the derivative. When given several examples, they still cannot distinguish which one included the example of differential and which one included the example of integral. In addition, they also forget about the formula and how to use it both differential and integral. This is causes them to not be able to distinguish the use of the methods/concept in solving physical problems contained in Physical Mathematics subject.

However, after the next meeting the mathematical concept understanding of college students in the form of differential and integral is increasing. This is evidenced by the mean value of mathematical concept understanding of college students that increase at each meeting. Therefore, concluded that they have the ability to restate the concepts, classify objects according to certain characteristics in accordance with concepts, give examples and not examples, present concepts in various forms of mathematical and physical representations, develop the necessary or sufficient terms for a concept, use, utilize and select certain procedures, apply the concepts or algorithms to physical problem solving.

4 Conclusions

Based on the result of research and data analysis obtained conclusion, namely the mean value of mathematical concept understanding of college student in the form of differential and integral analysed through seven indicators was 78 and was in “Good” category. Where the highest mean value was in the indicator “restate the concepts” with a mean value of 80 and was in “Very good” category while the lowest mean value was in the indicator “develop the necessary or sufficient terms for a concept” with a mean value of 71 and was in “Good” category.

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Developing an RME Teachers Book Using Scientific Approach of 2013 Curriculum

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Abstract. This study aims to develop a realistic mathematics teacher's book using the 2013 curriculum scientific approach for grade V elementary / MI students that can be used by teachers to help improve the quality of mathematics learning at the elementary level in North Sumatra. The specific objectives of this research are: developing a class V realistic mathematics teacher's book using the 2013 curriculum scientific approach. This study uses a developmental research oriented on product development where the development process is described as accurately as possible and the product is finally evaluated. Van den Akker (1999) called it formative research where the research activities were carried out in a cyclic process and aimed at optimizing the quality of product implementation in certain situations. The subject of this research is the public and private fifth grade students of SD / MI in North Sumatra. This research was carried out in 2 (two) stages. In the first stage an initial analysis and validation was carried out by a team of experts and experts and a draft of a realistic mathematics teacher's book model was developed using the 2013 curriculum scientific approach for grade V elementary school. 2013 scientific curriculum which is thought to be effective in analyzing knowledge and weaknesses in the mathematics of North Sumatra elementary / MI students.

Keywords: Teacher's book, PMR, scientific

1 Introduction

The 2013 curriculum is often referred to as a character-based curriculum. This curriculum is a new curriculum issued by the Ministry of Education and Culture of the Republic of Indonesia. 2013 curriculum itself is a curriculum that prioritizes understanding, skill, and character education, where students are required to understand the material, are active in the process of discussion and presentation and have good manners and discipline. This curriculum officially replaces the Education Unit Level Curriculum that has been implemented since 2006. not only that, this curriculum also has weaknesses and advantages.

In the 2013 curriculum, subjects must be followed by all students in one education unit in each unit or level of education. As for the elective subjects followed by students, chosen according to their choice. Based on Permendikbut No. 24 of 2016, it was stated that the implementation of learning in Elementary Schools / Madrasah Ibtidaiyah (SD / MI) was carried out in a thematic-integrated learning approach, except for Mathematics and Physical and Sports Physical Education (PJOK) as stand-alone subjects. for grades IV, V, and VI.

Mathematics learning is one of the subjects that students must learn in elementary school / madrasah Ibtidaiyah (SD / MI). In mathematics education, the mindset is developed
continuously because mathematics is a science that has a strong and clear structure and relationship between one concept and another. The rules and rules that apply in mathematics are arranged in strict and complete language (not containing multiple meanings) so that users can communicate their ideas in a more practical, systematic, and efficient manner. Thus it is clear that students who learn mathematics will develop not only mathematical knowledge but also the ability to communicate, reason, and solve problems, as well as their personality attitudes. Degeng States that individuals have the power to change themselves, and the task of education is to explore these potentials and give them opportunities to develop [1].

This change in learning paradigm makes the role of teachers and students change. Now, the main subject of learning is students, while the teacher is just a facilitator. But in reality based on the results of learning observations conducted in several elementary schools in North Sumatra, it shows that the focus of the school's attention in overcoming low student achievement is only on teaching method factors and curriculum problems. Especially when viewed from the results of a low national exam specifically on mathematics subjects, then that tends to be a study material and highlighted attention to how the teacher teaches and the learning model carried out, as well as the applied curriculum whether it is good or not. In addition the results of diagnostic tests that have been carried out at the sample school identify the causes of difficulties and the emergence of errors in elementary school students in solving math problems.

Many other factors cause low ability of students to work on questions and understanding mathematical concepts. If you talk about the method and the method of teaching the teacher that is still not in accordance with what is expected, of course you cannot blame the error only on a teacher who teaches in the classroom. Fulfillment of supporting facilities and facilities needed by the teacher in teaching in the classroom must also be considered. Book one of them. Since the 2013 curriculum was implemented coupled with the separation of mathematics lessons for grades IV, V and VI made the problem of this book even more complicated. The problem of the handbook for teachers, especially mathematics textbooks becomes a serious problem that must be solved immediately if the quality of mathematics learning wants to be improved.

From the explanation of the above problems, the researcher is interested in conducting a study that aims to create a teacher's book that will be used by the teacher to teach class V math using the 2013 curriculum. This needs to be done so that the mathematics learning process can run well, what becomes demands in mathematics lessons can be achieved by students and finally an increase in the competency of the students themselves.

Of the various problems described above, the focus of the problem that will be examined in this study is limited to the development of teacher books on mathematics learning based on realistic mathematics using the 2013 curriculum scientific approach. The formulation of the problem that can be developed from the limitation of the above problem is how the effectiveness and usefulness of the teacher's book of mathematics lessons based on realistic mathematics uses the 2013 scientific approach to the curriculum. This research aims to:

2 Literature Review

2.1 Books and Teaching Materials

According to Prastowo, lesson textbooks are books that contain knowledge, developed based on basic competencies in the curriculum, and used by students to study [2]. There are three ways that teachers can use in compiling textbooks, namely repackaging information, writing themselves, and rearranging. Textbooks can also come from research results. Efforts that can be made to make research-based textbooks are the way the author must first do research and report the results of his research.

Good textbooks or textbooks according to Akbar have several characteristics, namely (1) accurate, (2) appropriate, (3) communicative, (4) complete and systematic, (5) oriented to student centered, (6) siding with the ideology of the nation and state, (7) the rules of the language are correct, and (8) are legible. The existence of basic competencies (KD) and learning objectives that must be achieved by students, has forced the teacher to develop teaching materials in accordance with this. Teaching materials will be more meaningful if the material contains contextual content and is in the student's daily environment [3].

2.2 Teacher's Book

The Teacher's Book is a guide for teachers in carrying out classroom learning. The teacher's book used by the teacher will help the teacher carry out each step in the learning process for his students. Step by step activities that will be carried out by students will be contained in the teacher's book. The following is an explanation of the teacher's book function.

2.2.1 As Instructions for Using Student Books

The teacher must first learn the Teacher's Book. The teacher must find the following information.

- The order of reference material is developed from the Standards of Graduates' Competencies, Core Competencies, and Basic Competencies of each lesson content, which is then integrated into one particular theme.

- The theme network of each theme that contains basic competencies and indicators of each of the learning content that must be achieved.

- Learning disaggregation developed from sub-themes with the aim that teachers can gradually organize the learning process in accordance with the basic competencies that students must master.

2.2.2 As a Reference Learning Activity in Class

The Teacher's book presents the following.
- Explain the learning objectives that must be achieved in each lesson from each sub-theme.
• Describe learning media that can be used in carrying out the learning process so that the teacher has prepared the necessary learning media.
• Explain the steps of learning carried out in carrying out the learning process in order to assist the teacher in developing the learning plan, systematically following the learning steps.
• Explain techniques and assessment instruments that can be used in each learning choice that may have certain characteristics.
• Explain the types of worksheets that are in accordance with the lessons that are in the Student Book.

In addition to teaching and educating, a teacher is also expected to have skills in developing books that can later be used to be a reference and hold on the teacher in teaching and learning activities in the classroom. The development of the teacher's book designed by the teacher itself is believed and proven to be able to improve the ability and competence of students due to the book designed according to the conditions, characteristics of students and the needs where the book was used [4].

2.3 Realistic Mathematics

• One of the factors causing the students' lack of understanding of mate-math concepts is the learning pattern implemented by the teacher. Mathematical learning in Indonesia today, "the real world" is only used to apply concepts and less to "real world". When in class learning, everyday children's experiences are used as inspiration for the discovery and construction of concepts (memematematisasi daily experience) and reapplying to the "real world" the child will understand the concept and can see the benefits of mathematics [5].
• In realistic mathematics learning, students learn to memorize contextual problems. In other words, students identify that contextual questions must be transferred into mathematical form questions to be further understood, through scoring, formulation and visualization. This is a horizontal mathematical process. Whereas vertical mathematics, students complete mathematical forms of contextual problems using concepts, operations and mathematical procedures that are applicable and understood by [6].
• This can be in the form of realities that need to be organized mathematically and also mathematical ideas that need to be organized in a wider context. Organizing activities like this are called mathematical. Realistic mathematics learning has five characteristics, namely:
  • use real contexts for students as a starting point for learning
  • use the model as a bridge between real and abstract that helps students learn
  • mathematics at different levels of abstraction.
  • use students' own production or strategies as a result of them "doing mathematics".
  • interaction is important for learning mathematics between teachers and students, students and students.
  • the relationship between mathematical units and the problems that exist in this world.
2.4 Scientific Approach 2013 Curriculum

Nurul mentions Scientific-oriented learning is learning that uses scientific approaches and inquiry, where students play directly both individually and in groups to explore concepts and principles during learning activities, while the teacher's task is to direct the learning process carried out by students and provide corrections to concepts and principles obtained by students [8].

Learning with a scientific approach is learning that consists of observing activities (to identify the things you want to know), formulating questions (and formulating hypotheses), trying / collecting data (information) with various techniques, associating / analyzing / processing data (information) and draw conclusions and communicate results that consist of conclusions to obtain knowledge, skills and attitudes. These steps can be continued with creating activities.

The principles of learning activities with the 2013 curriculum scientific approach are: (1) students are facilitated to find out, (2) learners learn from various learning sources, (3) the learning process uses a scientific approach, (4) competency-based learning, (5) integrated learning, (6) learning that emphasizes divergent answers that have multi-dimensional truths, (7) applicative skill-based learning, (8) improved balance, continuity, and linkages between hard-skills and soft-skills, (9) learning that prioritizes civilizing and empowering students as lifelong learners, (11) learning that takes place at home, at school, and in the community, (13) recognition of individual differences and cultural backgrounds of students; and (14) the learning atmosphere is fun and challenging.

The curriculum objectives include four competencies, namely (1) spiritual attitude competencies, (2) social attitudes, (3) knowledge, and (4) skills. This competence is achieved through the process of intracurricular, co-curricular and / or extracurricular learning. Spiritual Attitude Competency Formulation is, "Receiving, carrying out, and respecting the teachings of the religion he adheres to". The formulation of Social Attitude Competence is, "Shows honesty, discipline, responsibility, courtesy, caring, and confidence in interacting with family, friends, teachers, and neighbors and love the motherland". Both of these competencies are achieved through indirect teaching, namely exemplary, habitual, and school culture with regard to the characteristics of subjects, as well as the needs and conditions of students. The growth and development of attitude competencies is carried out throughout the learning process, and can be used as a teacher's consideration in developing students' character further.

The process of learning mathematics is done through empowering the four basic pillars of education [9]. Empowering students' abilities to be willing and able to do to enrich their learning experience (learning to do) by increasing interaction with their environment both physically, socially and culturally so as to build their understanding and knowledge of the surrounding world (learning to know). It is hoped that the results of these interactions can develop knowledge and self-confidence (learning to be). The opportunity to interact with other individuals in various groups (learning to live together) will shape their personality to understand plurality and generate positive and tolerant attitudes towards diversity and differences in life.

3 Research Methods

This chapter discusses systematically the method of developing teacher books and student books based on realistic mathematics using the 2013 curriculum scientific approach.
The targeted research products in the first year of this research are limited to the initial models of teacher books and student books based on realistic mathematics using a scientific approach using the 2013 curriculum valid.

3.1 Types of Research

This study uses development research methods to identify that developmental research is oriented towards product development where the development process is described as accurately as possible and the product is finally evaluated (Richey and Nelson 1996). This research is also referred to as formative research where research activities are carried out in a cyclic process and are aimed at optimizing the quality of product implementation in certain situations [10]. In mathematics learning, this development research is applied in the repetitive activities of designing and testing the material products of mathematics learning [11]. The results of this study in the form of quality products theoretically, procedural methodology, and empirical.

This research activity was carried out in 2 (two) stages. Both stages are described as follows:

![Development Research Activities and Stages](image)

Phase I of this study is called the front-end analysis phase which is intended to analyze and determine the mathematics based teacher's book using the 2013 curriculum scientific approach. This activity is followed by developing materials that are in accordance with each basic competency in mathematical material. Through justification, analysis and evaluation of competent mathematics education experts and elementary school teachers, the Preliminary Model of the teacher's book for mathematics lessons based on realistic mathematics was developed using the 2013 scientific approach to curriculum in grade V elementary school. This study involved experts in the development of mathematics education from the North Sumatra Province Education Agency and other mathematical learning experts. Phase I activities are carried out within the first 6 months of this study.

Data for stage I development of teacher books based on realistic mathematics using the 2013 curriculum scientific approach was generated by validation conducted by teachers, principals and 3 lecturers from Medan state universities. Validation is carried out using a validation format that has been prepared by the expert team. The aspects that become references to teacher book validation and student books based on realistic mathematics using the 2013 curriculum scientific approach are:
Feasibility of content consisting of: (a) suitability of material content with SK and KD, (b) accuracy of material, (c) updating of material, (d) encouraging curiosity, (e) training and tests, and (f) enrichment

Feasibility of presentation which includes: (a) presentation techniques, (b) presentation support, (c) learning support, (d) coherence and literacy of the mindset.

Feasibility of language which includes: (a) accuracy, (b) communicative, (c) suitability of language rules, (d) suitability of students' development.

The description of the teacher book research activities based on realistic mathematics uses the 2013 scientific scientific approach. Phase 1 research activities were carried out in Medan from April to August 2018. This study involved a validator team consisting of 3 mathematics education experts and 5 teachers.

The research activity began with the objective analysis activities held on April 2, 2018. This objective analysis was carried out to establish the basic direction and main objectives of development so that it could become the main benchmark in developing the teacher's book and the fifth grade mathematics student book. Appropriate learning. In carrying out the analysis of objectives, viewed from the 2013 curriculum aspect. The subject that was developed in the teacher's book and the student's book was all the material contained in class V in the 2013 curriculum.

After the analysis of the objectives has been completed, on April 4, 2018 an analysis of the characteristics of students is carried out. Analysis of student characteristics is carried out through a study of student characteristics which include the level of cognitive development, ability, knowledge background, and socio-cultural background of students. From the results of this analysis will later be used as a reference frame in compiling textbooks and student activity sheets. In this study, the subjects were fifth grade students of all elementary schools who were given diagnostic tests in the 10-11 year age range.

The next activity in step 1 is an analysis of teacher needs. Teacher needs analysis was carried out on April 5, 2018. Teacher analysis was carried out through the study of teacher needs which included the learning tools needed to achieve the learning objectives. From the results of this analysis will later be used as a reference frame in compiling the teacher's book. Teacher needs now is a teacher's book that is in accordance with the curriculum that is being used so that the teacher is easy to convey material and concepts to students, it is necessary to develop teacher books and student books especially the mathematics material contained in class V.

The next activity carried out was the analysis of tasks and the sequencing of concepts. This activity was held on April 6, 2018. Task analysis was used to detail the contents of the subject matter in the form of outlines of the subject matter. This activity is carried out by identifying the structure of the subject chosen. In this case, the subject matter contained in the 2013 curriculum. After the task analysis was completed, it was continued by arranging the sequence of concepts that would be taught in realistic math class V teacher books using the 2013 curriculum scientific approach. The purpose of this step was to establish a concept hierarchy will be discussed in the process of learning and teaching. The concept or material must be truly considered so that all are arranged based on the knowledge or skills mastered by students in the previous lesson or at a stage earlier than the lesson.

The next stage of activity is Formulating learning objectives and developing validation instruments. This activity is carried out through the activity of analyzing the lesson concepts and indicators that have been set in the previous activities. From the results of the analysis of
the concepts and indicators, the learning objectives will be formulated. Furthermore, the preparation of validation instruments was carried out through the activity of designing a measuring instrument that would be used to assess the quality of the teacher's book based on references and input from a team of experts and mathematicians. The validation instruments that will be used are expected to become filters so that the developed teacher's books become more qualified.

The most important activity in this study is the drafting of a teacher's book based on realistic mathematics using the 2013 curriculum scientific approach (11 April - 15 July 2018). This activity is carried out step by step so that the teacher's book is designed in accordance with the references, concepts, indicators that have been developed and all the criteria that have been established in the design of this teacher book.

After the draft of the teacher's book was developed, the next activity was to validate the draft of the teacher's book, validation activities carried out by the validator team that had been appointed in this study. In validating the teacher's book, the validator team used a validation sheet that had been developed and designed in the previous activity. This validation activity aims to produce an effective teacher book draft and can help class V students to improve their competence in mathematics subjects. The validation activity of the teacher book draft was held on July 20, 2018.

4 Results And Discussion

4.1 Validation Results of the Expert Team

Validation is carried out by teachers and a team of experts from universities. The validator team validated using a validation sheet which was prepared in the mathematics teacher book development research based on realistic mathematics using the 2013 scientific approach to the curriculum. The validation results conducted by the validator team showed that the draft mathematics teacher book based on realistic mathematics using the 2013 curriculum scientific approach was good category. There are only a few in certain parts that must be revised and improved by the development team. Some input from the expert team as the validator team for teacher books and student books were developed including: (a) The use of spelling that is still not consistent, (b) Strengthening for each material taught at the end of the lesson still needs improvement, and (c) more examples to facilitate student understanding.

In general, the validation results of the validator team for the development of mathematics teacher books based on realistic mathematics using the 2013 curriculum scientific approach can be seen below:

4.1.1 Feasibility of Content

a. Compliance with material descriptions with KD
The development of the material in the teacher’s book is in accordance with the KD contained in the 2013 curriculum. In addition the depth of material outlined is in accordance with the child’s development at the elementary school level.

b. Material accuracy
The material presented is very accurate and by showing the accuracy in applying the concept of geometry in flat building in a simple, clear, easy to understand, and appropriate usage according to the subject matter, the material is presented using standard Indonesian.

c. Material update
The material presented is up to date in accordance with the latest mathematical developments. Materials, examples, and exercises are appropriate and correct reflecting current events, events, or conditions. In addition the examples given are in accordance with the development of mathematics.

d. Encourage curiosity
Descriptions, exercises or examples of cases presented encourage students to do it further and foster creativity. There are questions that can encourage students’ desire to seek further information.

e. Exercises and Tests
The exercises are presented in the form of communicative patterns and exercises to master the material being taught. Besides that, the presentation of tests is intended to assess the level of ability of students towards some material that has been taught, and given at the end of each unit.

f. Enrichment
Enrichment material contains the development of student knowledge and its application in daily life.

4.1.2 Presentation Feasibility

a. Presentation Technique
Systematics in the presentation of each chapter contains a concept map, introduction, content, cover and evaluation displayed consistently in each chapter. The description of the chapters is proportional by considering KD which is supported by several image illustrations in a balanced manner according to the needs of each subject.

b. Presentation support.
Introduction at the beginning of the book contains the purpose of writing, the way to learn that must be followed, thanks, excess books, limited books, and other things that are considered important. Delivering students to know and understand the material that will be presented so as to attract students to learn more about the contents of the book.

c. Learning support.
Presentation of the material places students as the subject of learning. Presentation of the material is interactive and participatory so that the description in the book needs to be supported by activities that are able to form independence for example through independent tasks.

d. Coherence and wrinkling of the thought path
Submission of material between chapters with adjacent sections reflects the content and relevance of the content. The material presented in one chapter must reflect the unity of meaning and show continuity of meaning so as to form a unified meaning.

4.1.3 Language Eligibility

a. Accuracy
Sentences used to present the contents of a logical text and refer to the Indonesian sentence rules. Languages that are used are straightforward in accordance with students’ thinking abilities. Examples can provide abstract concept clarity. The concept description is concrete, students can find it, and if the abstract can be imagined by students

b. Communicate
The message is presented in an interesting language, easy to understand, communicative, and encourages students to read thoroughly. The illustrations presented clarify the material described. Illustration comes from the surrounding environment in accordance with the field of science.

c. Compatibility of language rules
The sentence used to convey the message refers to the Indonesian grammar rules

d. Suitability of student participants' development
Language used in explaining a concept in accordance with the development of students and in accordance with the level of emotional maturity of students

5 Conclusion And Suggestions

5.1 Conclusion
1. This study aims to compile a realistic mathematics teacher's book using the 2013 curriculum scientific approach for fifth grade elementary / MI students that teachers can use to help improve the quality of mathematics learning at the elementary level in North Sumatra.
2. The results of the validation of the drafts of realistic mathematics teacher books using the 2013 curriculum scientific approach for SD / MI fifth grade students conducted by the validator team consisting of a team of teachers and lecturers from universities, showed that the designed teacher book was included in the good category.

5.2 Suggestions
Revise teacher books and student books based on realistic mathematics using the 2013 curriculum scientific approach in accordance with the input of the validator team.
References


Generic and Specific Relevant Soft Skills for Increasing Competence of Vocational Teachers Candidates

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Abstract. This study aims to find the attributes of soft skills both generic and specific that are relevant to be integrated in the lecture program in the Electrical Engineering Education. The soft skills attribute found is expected to be a supplement in lecture activities in order to produce graduates who have simultaneous competence between knowledge, attitudes, and skills. The data collection methods were carried out by: (1) identifying the types of attributes of soft skills based on local culture, which originated from 6 pillar of unimed character education, as well as attributes derived from the results of international studies; (2) conduct studies and groupings of all attributes that are generic and specific; (3) identify the characteristics of the course, especially those relating to the objectives and plans of lecture activities; (4) conduct a study of the relevance between the objectives and activities of lectures with attributes that can be integrated. The results show that there are 73 attributes that are generic and 56 that are specifically relevant to be mapped, distributed, and trained in each subject. Soft skills that will be trained in the first year are distributed in 22 courses, in the second year 22 courses, and in the third year are distributed in 18 courses.

Keywords: soft skills, competence, vocational teachers candidates.

1 Introduction

The perceived limitations in coaching competent teacher candidates, and teachers who have character at this time has become an urgent need. The teacher is the spearhead for quality human development, therefore repairs and improvements must be carried out immediately. In detail in the Government Regulation of the Republic of Indonesia No. 19/2005, concerning National Education Standards, specifically in article 28, emphasized that educators are learning agents who must have four types of competencies, namely pedagogic, personal, professional, and social competencies. In that context, the teacher's competence can be interpreted as the unanimity of knowledge, skills and attitudes that are realized in the form of intelligent and responsible actions that must be possessed by a teacher to assume the position of teacher as a profession [1] and [2].

The fact is that the problem of coaching vocational teacher candidates is still the actual problem faced by teacher training institutions today, especially in the education of prospective teachers in the field of electricity. Competencies of prospective teacher students tend to be more prominent in their pedagogical and professional competencies while personality and social competencies are still very lagging. To improve simultaneous competence for prospective teacher students, attributes of soft skills are needed as a supplement that is integrated in the curriculum to improve personality and social competence [3]. Soft skills attributes that are
integrated should be based on needs, so that the learning process still maintains the student's socio-cultural situation [4].

Coaching vocational teacher candidates who have only been provided with the knowledge and skills in the form of hard skills, are not effective enough in solving problems in the learning process [5], therefore debriefing soft skills for prospective teachers is also very necessary as part of from the learning process so that it happens habitually for students as prospective teachers. To do learning with soft skills, it is necessary to develop learning by integrating the attributes of soft skills in lecture activities [6]. It should be realized that the attributes of soft skills that have been identified are quite varied, so that maximum efforts are needed in selecting and sorting out relevant attributes to be developed and integrated in the learning process. To find the attributes of relevant soft skills, it is necessary to study soft skills that develop based on the needs of the place where students socialize. This study becomes a reference in approaching the learning process, so that students who take part in learning are not alienated from their social environment. This is very important to do, so that the lectures in the lecture are truly grounded for students [7].

2 Research Methods

This study uses a qualitative approach. Stages of research activities include literature study activities, exploration of data collection, and verification of the attributes of soft skills for the needs of teachers, students and stakeholders. Literature study is used to find the types of attributes of soft skills based on expert views and research results. Exploration activities are carried out to find the types of attributes of soft skills derived from the 6 pillars of unimed character, as well as the types of attributes of soft skills originating from the local culture. Further verification activities are intended to verify the suitability of soft skills that have been identified with needs.

Literature study is carried out by tracing relevant sources, so that various types of attributes of soft skills are found which are the best practices by experts, as well as the findings of researchers from various countries. Literature search is done through sharing print media such as journals, textbooks, as well as guide books on the application of character learning from various countries. Search results are identified and grouped according to their general or specific nature. Grouping results are also carried out based on similarity to be reduced, so that the types of attributes that have similarities will be chosen which are more operational.

The exploration phase of the need for soft skills is carried out to find the attributes of soft skills that must be possessed by teacher candidates when teaching in Vocational High Schools. To find the types of attributes of soft skills originating from local culture, the research was conducted by interviewing, and document study to obtain the information needed. The collection of information is obtained from stakeholders as users of graduates, community leaders, and education figures in the North Sumatra region. The interview technique is used to explore the attributes of soft skills needed by the business world, and which become the habits and expectations of graduate users, both in the form of a value system, as well as the order of social life they use. The results of the interview are translated in the form of keywords that lead to the attributes of soft skills, and then recapitulated in the form of attributes of soft skills.

At the verification stage, the research was carried out by verifying the relevance level of the attributes of soft skills for vocational teachers. Verification is performed on the types of attributes that have been identified. Verification activities are carried out through delphi techniques and Forum Group Discussion (FGD) activities. Verification activities involve subject lecturers and students in Unimed FT Electrical Engineering Education. Verification is done to determine the level of relevance of the attributes of each soft skill for the relevant teacher's needs to be integrated in each of the courses that will be taken by prospective teacher students.

3 Result And Discussion

The tabulation results of the attributes of soft skills that are found by source are 85 attributes that are generic and 59 types of attributes that are specific soft skills. However, after verification and validation, it was found
that out of 85 attributes that were generic there were 12 types of attributes that were considered irrelevant, with reasons for being less operational, and duplicating / intersecting with other types of attributes. While 59 types of attributes that are specific, three types of attributes are not relevant, so that 73 types of attributes are considered relevant. In detail the results of identification of relevant attributes are outlined in Table 1.

Table 1. Number of Soft Skills Attributes Identified by Source

<table>
<thead>
<tr>
<th>Source of Study</th>
<th>Number of Attributes based on Nature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Generic</td>
</tr>
<tr>
<td>Local Culture of North Sumatra</td>
<td>11</td>
</tr>
<tr>
<td>UNIMED Character Education Pillar</td>
<td>6</td>
</tr>
<tr>
<td>Spencer &amp; Spencer (1993)</td>
<td>15</td>
</tr>
<tr>
<td>Ramesh (2010)</td>
<td>3</td>
</tr>
<tr>
<td>Minister of Higher Education Malaysia</td>
<td>7</td>
</tr>
<tr>
<td>(2006)</td>
<td></td>
</tr>
<tr>
<td>Research Results in the United Kingdom, America and Canada</td>
<td>19</td>
</tr>
<tr>
<td>Sailah (2008)</td>
<td>12</td>
</tr>
<tr>
<td>Jumlah</td>
<td>73</td>
</tr>
</tbody>
</table>

The initial identification of the attributes of soft skills originating from the local culture of North Sumatra found 11 types of attributes that are generic and four attributes that are specific. Based on searches conducted through ethnic groups in North Sumatra formulated 11 attributes of the most relevant and generic soft skills, including: (1) religious, (2) discipline, (3) visoner, (4) cooperation, (5) leadership and organization, (6) adaptable / flexible, (7) tolerant / friendly, (8) confident, (9) caring, (10) serving, and (11) honest. Apart from the 11 attributes that are generic, four attributes of specific soft skills are obtained, namely (1) oral communication, (2) written communication, (3) problem solving, (4) work responsibilities. The four attributes are also the results of an assessment of the attributes that are relevant for vocational teacher candidates in the North Sumatra region. These results are the results of an assessment of relevant attributes for vocational teacher candidates in the North Sumatra region. Furthermore, the results of the assessment of the 11 attributes that are generic are obtained a number of 29 attributes that are specific, so that the number of attributes that are specific from the local culture amount to 33 attributes. All attributes obtained are relevant as supplements that will be integrated in each appropriate course.

The results of the assessment of the 6 pillars of the character of UNIMED obtained 6 attributes that are generic, and each has a description of specific attributes so that a number of 26 attributes are obtained. The six character pillars built by the Unimed Institute consist of: trustworthy, respect, maintain justice, care, responsibility, and citizenship. To know that a prospective teacher can be trusted, then of course must have specific soft skills such as Honesty (not cheating, copying, or stealing), reliable (doing what is said), brave (doing the right thing), maintaining a good reputation, and obedient (standing with family, friends and country). To be able to respect, of course must be able to tolerate differences, have courtesy, consider the feelings of others, and enjoy peace. Furthermore, to be able to maintain justice, it must be able to follow the rules (according to the rules), like to share with others, be able to think openly, and always try to listen to others. To be able to care for others, it must have the ability to be loving, always grateful and grateful for what you have, can forgive others, and always be able to help people in need. Then to be able to be responsible, it must be able to be disciplined, have consideration before acting, have responsibility for the duties and choices taken, and be able to do the best. All of these attributes should be reflected in the Unimed students, so that
students who study unimed should be trustworthy, able to respect others, be able to maintain justice, have care for others, be responsible for themselves and the tasks that are their responsibility.

The results of the study conducted Spencer [8] there are 19 kinds of soft skills, namely: Achievement orientation, concern for order and quality, initiative, information seeking, interpersonal understanding, customer service orientation, impact and influence, organization awareness, relationship building, developing others, directiveness, teamwork and cooperation, leadership team, analytical thinking, conceptual thinking, self control, self confidence, flexibility, organizational commitment. Furthermore, the results of Ramesh's study (2010: 5) classify soft skills into three groups which include attitude, communication, and etiquette, which is believed to be a very important three-dimensional aspect in soft skills and subsequently abbreviated as ACE. Attitude is a part related to the correct mental ownership that is used to interact with humans and the environment, as if communication is the ability to express attitudes and beliefs effectively through various forms of communication. Etiquette is a general rule that is generally accepted, in the form of noma-noma that must be followed to achieve effective communication.

Soft skills in higher education institutions in Malaysia [9] also use a number of attributes of soft skills issued by the Malaysian Ministry of Higher Education in 2006 which serves as a guide and focus on the implementation of soft skills in Malaysia including: (1) communication skills, (2) critical thinking and problem solving skills, (3) cooperation, (4) lifelong learning skills and information management, (5) entrepreneurial skills, (6) professional ethics and morals, and (7) leadership skills. Based on research conducted by British, American and Canadian countries, there are 23 dominant attributes of soft skills in employment [2]. The 23 attributes are sorted based on priority interests in the world of work, namely: (1) Initiative, (2) Ethics / integrity, (3) Critical thinking, (4) Learning willingness, (5) Commitment, (6) Motivation, (7) Enthusiastic, (8) Reliable, (9) Oral communication, (10) Creative, (11) Analytical ability, (12) Can overcome stress, (13) Self-management, (14) Resolve problems, (15) Can summarize, (16) Cooperate, (17) Flexible, (18) Work in teams, (19) Mandiri, (20) Listening, (21) Tough, (22) Logical argumentation, (23) Time management. The results of the analysis and verification of the relevance of its application to lectures for prospective teachers indicate that all attributes are relevant to be integrated in the lecture process.

Furthermore, the results of Sailah's review (2008: 19) classify various soft skills directed at interpersonal and intrapersonal grouping. Attributes belonging to interpersonal groups such as transforming character, transforming beliefs, change management, stress management, creative thinking processes, goal setting & life purpose, and accelerated learning techniques, while the attributes grouped in interpersonal skills include: communication skills, relationship building, motivation skills, leadership skills, self-marketing skills, negotiation skills, presentation skills, public speaking skills.

The results of the validation of the level of relevance of each type of attribute found that generic soft skills have 51 (91%) which are in the very relevant category, and 5 (9%) which are included in the relevant category. Furthermore, specific soft skills are 69 (95%) which are categorized as very relevant, and 4 (5%) which are included in the relevant category. This validation activity also provides information on the suitability distribution of each type of attribute to be trained in a given year, and the results found indicate that there are 54 types of attributes that are relevant for training in the first year, 52 relevant attribute types trained in the second, and 23 relevant attribute types are trained in the third year. In detail the distribution of the number of attributes that are relevant in the first to third year is shown in Figure 1. Based on Figure 1, it is seen that specific soft skills training will be more trained in the first year, and in the second year there will be more soft skills training the generic. This is certainly very relevant, because to carry out generic training must be supported by the ability of specific soft skills.

When viewed based on the level of relevance of each type of attribute, it was also found that the results of verification showed a balance between prioritias (very relevant) soft skills trained both in the first year, second and third. The detailed results of verification of the distribution of soft skills based on their level of relevance are shown in Figure 2. Based on the study of the results of identification of the teserbut soft skills verification, it appears that quite a number of attributes can be integrated and trained in prospective teacher students to produce simultaneous teacher competencies. Based on re-validation, it is seen that there are 73 types of generic attributes and 56 types of soft skills that are specific in their entirety, including in the very relevant and relevant categories. This shows that 129 types of attributes have been found to be relevant to be used as a supplement to the lecture, so that overall they are suitable to be mapped and distributed to each subject taken by students in accordance with the characteristics of the subject matter.
The many attributes of soft skills that have been identified and discussed above, it can be seen that many of these attributes have never been trained in the learning atmosphere developed in the world of higher education in Indonesia. The world of higher education in Indonesia includes the education of prospective teachers, it turns out that it focuses more on developing hard skills alone, even according to [2] that 90 percent of students get in college is hard skills and only 10 percent is in the form of soft skills, whereas based on from the discussion above, the more dominant point in determining one's success in the world of work is his soft skills. In other conditions, it shows that the world of work wants the ability of soft skills for higher education graduates. For this reason, efforts are needed to accommodate the conditions that the graduate users want through changing the curriculum or reconstructing the contents of the curriculum by accommodating the values of soft skills to be included in the current curriculum in higher education. Efforts or steps that must be done in developing the values of soft skills in universities, especially in the education of prospective teachers is to integrate soft skills in learning. This can be started from the same understanding that soft skills cannot be taught instructionally in class in the form of certain courses but soft skills can be instilled through understanding values through hidden curriculum teacher models, college visions and extra curricular activities of students who have positive values that will ultimately produce the character of students who have adequate hard skills and soft skills so that they are ready to face the world of work.

The pattern of developing soft skills in teacher education can be started from the effort to re-agree on what values (university/department values) that will be invested in students in a particular department. for example, it is agreed that the values to be instilled are discipline, honesty, cooperation, openness, high creativity, initiative and others, then there must be an effort to instill these values in the teaching and learning process and the development of an academic atmosphere that applies in the study program. These values must be mutually agreed upon and carried out jointly by the academic community. To produce the expected results there should be role models that can be used as a reference by all academics.

The process of interaction between lecturers and students in the class is the greatest opportunity to instill the values of soft skills to students, this can be done by familiarizing students to communicate more with the lecturer, discipline in obeying the rules, etc., of course this can be done by making the lecturers themselves as
teachers models that can indeed be imitated by students. Furthermore, in this interaction process the concept of student center learning (SCL) can also be applied where students are expected to be more creative and initiative in finding lecture materials, asking questions and interacting with others.

The process of assigning class assignments can also be designed in such a way that students can judge for themselves what they are doing, or students can work together in teams to work on tasks together with the division of tasks and responsibilities clearly between themselves. Besides that the process of designing rules in class can also be done in such a way that the values of soft skills can be applied in the Department.

Learning soft skills by combining the attributes of soft skills on hard skills can be done in various ways, even according to Fogarty (2009: 10) explains that there are three models of integration in one discipline, namely fragmented models, connected models, and nested models. Model connected is a curriculum model that uses the relevance of each subject and teaching material. The integration of soft skills using a fragmented model will allow the integration of many attributes, because it allows to be divided into several subject matters. The application of soft skills integration with connected models will be more meaningful for strengthening hard skills. While the nested model is oriented towards achieving multiple skills and multiple targets. With this nested model, soft skills learning will be easily achieved, because integrated soft skills are not forced. The nested model allows learning activities to be filled with soft skills and measured through learning targets.

Soft skills are not a subject matter, but a life aspect that must be possessed by students that can be obtained from experiences that have been done. Soft skills that are considered as generic skills by Muslims et al (2012, 760) are skills that give emphasis to producing human resources needed by the State. Therefore, soft skills must be able to be explored, fostered and familiarized during the implementation of learning. The results of the study by Beard, Schwieger, & Surendran (2008: 229) provide information that graduate users want the use of learning models that combine aspects of soft skills and their assessment in the curriculum of educational institutions. This is intended so that graduates have the relevant soft skills and work skills. Practically, the integration of soft skills into hard skills can be done through topics or units of material that are developed from the core of courses that are the parent of integration. Attributes that are integrated, of course, are attributes that are relevant to the findings and are possible to achieve. Soft skills learning is part of an effort to shape personality, therefore it requires an ongoing process as a process of civilization. Kapp and Hamilton (2006: 2) emphasize that soft skills learning requires organizing long-term learning in order to reach the stage of success. Each specific learning method to achieve certain competencies, so that it may be the type of attributes that are integrated and the way of learning one subject is not appropriate if applied to other courses, therefore the creativity of lecturers in motivating students greatly influences the success of lectures.

Based on this fact and study, all the attributes of soft skills found will be integrated in the student lectures for three years. Based on the results of identification and verification it was found that all types of attributes will be distributed to 22 courses in the first year, 22 subjects in the second, 18 subjects in the third year. The distribution of attribute types is based on the consideration of the subject lecturers based on the characteristics and types of lecture activities conducted by the lecturer. Distribution of attribute type training is also carried out gradually and continuously, so that the attributes that are trained in the first year will remain observed in the following year.

4 Conclusion

Based on the findings of the study, it was concluded that (1) There were 129 types of attributes that were relevant to be integrated in the prospective teacher's lecture to produce simultaneous competencies; (2) The results of verification of the types of attributes of soft skills found show that there are 120 (93%) types of attributes belonging to the very relevant category, and 9 (7%) that are categorized as relevant; (3) The verification results also show that there are 54 types of relevant attributes for training in the first year which will be distributed to 22 courses, 52 relevant attributes are trained in the second know and will be distributed to 22 courses, and 23 types of relevant attributes trained in the third year which will be distributed to 18 courses.

Acknowledgments

Thank you to the Directorate of Research and Community Service, Kemenristek Dikti which provides support, especially in the form of research funds, so that this research can be carried out well. Thanks are also conveyed
to the Chancellor of Medan State University and his staff as well as the Chair of the Medan State University Research Institute and his staff who facilitated the implementation of this research activity well.

References

The Effectiveness of the Use of Tv 5 Monde Website as a Learning Media on Increasing Vocabulary of French Language Students’ in Medan State University

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Faculty of Languages and Arts, Medan State University 1,2

Abstract. Information and computer technology are needed by students in learning foreign languages, especially French. Through TV5 Monde website aims to enable students to increase vocabulary in French. This can happen because students are easy to learn vocabulary in French through the TV5Monde website. The research was carried out through field observations and seeing the phenomenon of the quality of French vocabulary mastery of students in French language study program. It has been done the analysis of students on subject expression écrite (writing), comprehension écrite (reading), expression orale (speaking) and oral comprehension (listening). Making findings based on the phenomenon of the quality of French vocabulary mastery of students in French language study program. The use of ICT especially through the TV5Monde website for learning is to improve the quality of vocabulary mastery of students in French language study program. The method used was qualitative research, actions taken by looking, observing and analyzing seriously. The object of this research is the Effectiveness of the Use of TV5Monde WEBSITE as a learning media to increase the vocabulary of French students Medan state university. Place and Time of Research is at French language study program. The data sources to get the data in the study were done by observation, interviews, questionnaires, documentation and combination of them.

Keywords: effectiveness, media, TV5 Monde, vocabulary.

1 Introduction

In the digital era, Information and Computer Technology (ICT) becomes one of human needs. Informations can be accessed easily and quickly anywhere and anytime so that it has a big influence in the education world. This condition must be utilized as good as possible by educators because of many positive impacts in learning. One of the positive effects of ICT is able to use a website for language learning. One website that can be used for learning French is www.tv5.com. The website presents programmes (programs), information (information), émissions (events), langue française (French), divertissement (diversity) and voyage (holidays).

French Learning on this website is presented according to the level of learners, namely A1, A2, B1 and B2. The level is adjusted to the French curriculum CECR (Le Cadre européen commun de référence). The DELF level (Diplôme d'études en langue française) according to http://www.ifi-id.com consists of:
A1 (débutant) is the Introduction / Basic level. Basic level learners aim to the use of language in situations that are very common in daily life.

A2 (élémentaire) "survive" level. Learners can interact in basic social relationships, can face simple and expected situations in daily life (shopping, ordering, asking for information, writing letters, prospectuses).

B1 (intermedière) is sufficient level, learners are able to interact, can deal with all situations, including unexpected ones in daily life, and are able to understand information (bulletins, official letters).

B2 (avancé) is an independent / advanced level, learners can argue effectively, can speak easily and effectively, understand linguistic, logic, and coherence of discourse and understand globally (speech, lecture).

To follow the development of information, learning methods are also required to be creative and innovative. Because of the use of creative and innovative methods, teacher is required to master ICT (Information and Communication Technology). The learning process with the www.tv5.com website can help teachers and learners to always know the development of French. In this case, especially the development of French vocabulary.

The role of technology is very important in learning, besides the new vocabulary that learners can get through this website, learners who use this media can find out the culture, social situation, politics, and tourism spots in France and so on. Through technology, students get the latest news; listen to French radio broadcast directly, see French local television broadcasts directly. All of these are learning media that can be used to support the learning process to improve the ability and quality of mastering French students. To support the teaching and learning process at the beginner to advanced level, the use of TV5Monde website is very necessary.

Problem Formulation
From the background described above, the formulation of the problem in this study is how the effectiveness of learners’ vocabulary mastery after using TV5 Monde media is.

Research Objectives and Benefits
The purpose and benefit of research are to improve vocabulary mastery by using the tv5.com website.

Urgency (priority) of Research
The urgency of this study is of course an effort to improve the vocabulary mastery of students in French Education study program. The urgency formulations of this research are:

1. Field observations and seeing the quality phenomenon of French vocabulary mastery of French Educational study program. Do analysis on students in subject expression écrite (writing), comprehension écrite (reading), expression orale (speaking) and comprehension oral (listening).

2. Making findings based on the quality phenomenon of vocabulary mastery of French Educational study program.


From three points above, the importance of this study, of course, to improve the quality of the four French language competencies of students in French Educational study program. Four language competencies are according to European standard curriculum CECR (Cadre European Commun de Réference) (2001: 48), namely activités de production orale.
(parler) l’utilisateur de la langue produit un texte ou énoncé oral qui est reçu par un ou plusieurs auditeurs, activités de production écrite (écrit, ou expression écrite) l’utilisateur de la langue comme scripteur produit un texte écrit qui est reçu par un ou plusieurs lecteurs, activités de réception orale (écoute, ou compréhension de l’oral) l’utilisateur de la langue comme auditeur reçoit et traite un message parlé produit par un/plusieurs locuteur(s), et activités de réception visuelle (lecture, ou compréhension de l’écrit), l’utilisateur, en tant que lecteur, reçoit et traite des textes écrits produits par un ou plusieurs scripteurs. Parmi les activités de lecture on trouve.

Four language competencies in accordance with the European standard curriculum are speaking is that by using language orally by speakers of language. Writing is that by writing to create text in the form of sentences or paragraphs to be read by the reader. Listening is that learners can listen carefully and correctly to the speech or speech spoken by native speakers. The last is reading; describing how learners can read the text properly and correctly in accordance with French pronunciation.

**Literature Review Vocabulary**

According to Poerwadarminta (2007: 524) in Hikmayana (NOSI, Volume 1, Number 1 March 2013) stated that vocabulary is interpreted as words collection. In English, it is termed by Vocabulary. According to Kridalaksana (1993), the vocabulary in Prabyanthi (2011) is a component of language that provides information about the meaning and words used in language while in Webster's Ninth College Dictionary, vocabulary is formulated as follows. a. A list or collection of words and phrases that are usually arranged well and explained or given a definition. b. The amount or stock of words that a language has in a field of knowledge. c. An available list or collection of terms or codes for use.

**TV As A Learning Media**

Learning by utilizing internet media, forming learners to be independent. According to Gordin et. al., in Rusman (314: 2012) that learners can access online from various libraries, museums, databases, and get primary sources about various historical events, biographies, records, reports and statistical data. In accordance with the statistical data of the Indonesian Internet Service Providers Association (IISPA) 05 edition (2016), internet users in Indonesia jumped 14.4 percent to 132.7 million users. In this case French learners with the age range of 17 and above are the largest number of internet users. Therefore learning French by using the internet can be useful by observing and researching and analyzing information that is in accordance with the real learning of French. The internet as a learning resource is very beneficial for French learners. Learners can access the French website to study independently. By using the internet as a learning resource,
learners can listen directly to French speakers directly, see the social picture in France and French culture.

According to [https://id.wikipedia.org/wiki/TV5Monde](https://id.wikipedia.org/wiki/TV5Monde), history of TV5Monde was established in January 1984, and was under the leadership of Serge Adda until November 2004; The new director, appointed on 6 April 2005 was Jean-Jacques Aillagon, former French Minister of Culture and Communication. In 2006, TV5 underwent a major improvement that changed its brand to 'TV5MONDE' to establish its focus as a global network. Also part of the changes is the new schedule and the new program sequence. Since 2001, 'TV5 Monde' has become part of the name of this channel company. Canadian operations still use the "TV5" brand. TV5MONDE is the fourth largest global television network which are available in the worldwide after BBC, CNN and MTV.

TV as a media for language teaching, this media can be used in two ways, namely by direct and indirect methods. Directly, is to present teaching material at an event that is intended for it. Whereas indirectly is playing another broadcast program to teach French language skills.

2 Research Method

Qualitative research method is used for natural object conditions, according to Bogdan in Sugiyono (19: 2006) the qualitative research process will be known by reading various written information, images, thinking, and seeing objects and activities of people around him, conducting interviews and etc. Actions are taken by looking, observing and analyzing seriously.

The object of this research is the use of TV5Monde WEBSITE as a learning media to improve the vocabulary of French students in Medan State University.

Location of Research

This research would be done at the French Language Education Study Program Medan State University. The study was conducted for 4 months (July-October 2017).

Data Collection Techniques

There are two types of data collected in this case study, namely quantitative data and qualitative data, both primary and secondary. Quantitative data includes basic data of French Language Education Study Program, such as number of lecturers, number of students, number of classrooms, number of study groups per class. Secondary data is data that is already available in French Language Education Study Program such as statistical data of French Language Education Study Program. Primary data is data taken from this study related to the case. Primary data is mostly in the form of interviews, observation results, various documents, archival records.

Data sources

To obtain data in this case study research, researchers determined data sources such as the Chairperson of the Department, Chair of French Educational Study Program, lecturers,
students, learning process, documents related to the learning process, other documents deemed necessary, physical devices, etc.

Data Collection Procedure

According to Sugiyono (2006) conducted by observation, interview, questionnaire, documentation and the combination of the four.

Data Analysis

Data analysis techniques according to Moleong (2006), that the data analysis process begins with: (1) reviewing all available data from various sources, namely from documentation, archive records, direct observation, interviews, physical devices; (2) after being recorded and studied, and reviewed, the next step is conducting data reduction by carrying out core abstractions, processes, and key statements that need to be maintained in order to remain in it; (3) the next step is arranging in units to be categorized; (4) examining the validity of the data; and (5) Interpreting data.

3 Discussion And Research Results

3.1 Condition of Informants

The informants in this study is third semester students of the French Educational Study Program, Medan State University. The criteria for informants are determined based on results for the highest, medium and lowest scores on the test results of the production ecrité preintermediaire with the material passe compose. The names of students who became informants in this study are as follows:

a. Ilham is an informant of third semester student from North Tapanuli. He is a student of French Language Educational Study Program year 2016. He is one of the students who is quite accomplished in his class, his personality is quiet, disciplined and active bring him to be liked by his classmates and liked by lecturers.

b. Arya is an informant of third semester student from Samosir. He is a 2016 French Language Educational Study Program student. He is one of the top students in his class, his agile, disciplined and diligent personality bring him to be loved by his friends.

c. Cinta is an informant of third semester student from Karo. He is a 2016 French Language Educational Study Program student. He is an outstanding student in his class, his deft, disciplined and friendly personality bring himself accompanied by his friends.

d. Rahmi is an informant of third semester student from Medan. He is a 2016 French Language Educational Study Program student. He is a quiet student and his academic ability is mediocre.

Table 1. Data of Informant

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Status</th>
<th>Education</th>
<th>From</th>
</tr>
</thead>
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<tr>
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<td>Mahasiswa North Tapanuli</td>
<td>Third Semester in French</td>
<td>Tapanuli</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Educational</td>
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</tr>
</tbody>
</table>
3.2 Social Relation

Social relation is social interactions that exist between teacher and student in French Language Educational Study Program. Social relations are divided into three parts, namely: first, social relation of lecturers with fellow lecturers, second, the social relation of students and lecturers and the third, social relation of students with students.

1. Social Relation between Lecturers
The social relation of fellow lecturers are well established. This can be seen from the habits of lecturers who always say hello when they meet and communicate with each other face-to-face, by phone or social media. Besides that visits to friends or family who are misfortune or sick are always done.

2. Social Relation between Students and Lecturers
The social relationship between students and lecturers is quite well established, this is shown by the respectful attitude of students towards lecturers such as saying bonjour when meeting with lecturers. The social relationships between students and lecturers are divided into two, namely, formal social relation which is realized in the form of classroom learning and non-formal social relation namely rebuking greetings made by lecturers to students outside of learning hours.

3. Social Relation between Students and Students
This social relationship between fellow students is very good. This is reflected in their behavior which is always compact in carrying out group assignments and laughing out of class.

Teaching and Learning Process Using TV5 Monde

Preparation Stage
The teaching and learning process will be carried out if the Learning Implementation Plan (LIP) is used by the lecturer as a reference in learning. The Learning Implementation Plan (LIP) must be in accordance with the learning material. LIP prepared is as many as one meeting. The contents of the LIP conducted consist of: time allocation, competency standards,
basic competencies, indicators, learning objectives, learning materials, methods, learning resources, learning steps and assessment of learning outcomes.

Implementation Phase

1. Open [www.tv5 monde.com](http://www.tv5 monde.com)
2. Search apprendre le français
3. Select niveau / level (A1, A2, B1, B2)
4. Type les vocabulaires
5. Select the theme you want to learn
6. Print the transcript
7. Create exercises from transcripts
8. Prepare the answer key

Example of using TV5 Monde in class

1. Prepare the necessary devices such as internet networks, LCD, laptops and speakers
2. Play videos for 3x
3. Students listen and record every vocabulary they hear
   Students classify the vocabulary they record based on the type of word (verb, nominal, adjective)
5. Students understand the meaning of the vocabulary
6. Students speak the vocabulary they hear
7. Provide training

Effectiveness of TV5 Monde Learning Media

The effectiveness of TV5 Monde media in learning relates to many factors including:

- The method, the availability of good learning media will not provide much benefit for learning if the chosen method is not right. Students’ condition, the condition of students is also very influential in determining the results of their learning, the condition of students who are not healthy will be different from the condition of students who are healthy.

- Facilities and Infrastructure, Facilities and Infrastructure in French educational study program has been said to be quite good because there are already LCD, loudspeakers (sound), internet, seating, rooms, lighting and good air temperature. The existing facilities and infrastructure are very supportive for the use of TV5 Monde media. Time, the time used in the use of TV5 Monde must be properly conditioned. The use of the right time is very influential with learning outcomes.

- The teaching type of lecturer, teaching style also influences the success of media use. Lecturers must be able to choose teaching styles that can make students and lecturers interact in two directions. Lecturers must avoid authoritarian style because this style cannot see feedback from the learning process.
Based on the results of research conducted, the effectiveness of the use of TV5 Monde media on the success of students in the preintermediaire production écrite course can be seen from the indicators that will be mentioned in the discussion below:

1. Test Result of Learning Effectiveness

After learning is complete, then an effectiveness test is conducted to find out the learning outcomes of the effectiveness of TV5 Monde media use. The effectiveness test was carried out in the form of a written test, the questions given amounted to 20 items in essay form. The question is given after the learning is complete, while working on the questions the students seem confident. Students’ learning outcomes can be seen in the table below.

<table>
<thead>
<tr>
<th>No</th>
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<th>Score</th>
<th>Learning Score</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Andi Tambunan</td>
<td>M</td>
<td>16</td>
<td>80</td>
</tr>
<tr>
<td>2</td>
<td>Adelia Siregar</td>
<td>F</td>
<td>17</td>
<td>85</td>
</tr>
<tr>
<td>3</td>
<td>Aprilia Rahmasari</td>
<td>F</td>
<td>16</td>
<td>80</td>
</tr>
<tr>
<td>4</td>
<td>Febby Sianipar</td>
<td>F</td>
<td>16</td>
<td>80</td>
</tr>
<tr>
<td>5</td>
<td>Hotmauli Simaremare</td>
<td>F</td>
<td>16</td>
<td>80</td>
</tr>
<tr>
<td>6</td>
<td>Rahma Santuri</td>
<td>F</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>7</td>
<td>Doni</td>
<td>M</td>
<td>16</td>
<td>80</td>
</tr>
<tr>
<td>8</td>
<td>Daniel</td>
<td>M</td>
<td>18</td>
<td>90</td>
</tr>
<tr>
<td>9</td>
<td>Risa Marito</td>
<td>F</td>
<td>14</td>
<td>70</td>
</tr>
<tr>
<td>10</td>
<td>Maria Tampubolon</td>
<td>F</td>
<td>17</td>
<td>85</td>
</tr>
<tr>
<td>11</td>
<td>Rizky Arya</td>
<td>M</td>
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<tr>
<td></td>
<td>AVERAGE SCORE</td>
<td></td>
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<td>80</td>
</tr>
</tbody>
</table>

After the test, then it conducted an interview test for several students who received the highest, medium and lowest scores. This interview was conducted to find out how effective the students’ success was after using TV5 Monde media. This can be seen from the available indicators, namely:

a. The high percentage of students’ learning time is devoted to teaching and learning activities.

The results of the interviews to several students are as follows: first informant named Efraim, third semester student of French Educational Study Program who got the highest score on la recette material delivered using TV5 Monde media.

"... before starting the lesson I have opened the material that will be discussed through TV5 Monde so that I have a description when the material is presented in the classroom ...”

Likewise, the results of interviews to the second informant named Daniel who also received high marks on la recette material.

"... it's my habit, before the lesson starts, I prepare myself by reading the subject matter that will be delivered by the lecturer, with the use of TV5 Monde media makes it easy for me to learn the material ...”
b. Develop a friendly, positive and fun learning atmosphere.

The use of TV5 Monde media in learning activities can create a friendly, positive and fun atmosphere. Following are the results of interviews with informant I.

"... I really like and be excited about learning using TV5 Monde media ..."

Based on interviews with the informants, stated that students were happy with learning activities using TV5 Monde media.

c. The accuracy between the content of teaching materials and the ability of students (learning success orientation) is prioritized.

The selection of la recette and TV5 Monde material used is in accordance with the ability of students, namely A2 level so that students can easily understand the material.

d. Providing Effective Learning Experience and actively engaging students.

The use of TV5 Monde media is very appropriate in the teaching and learning process. La recette material requires real examples to be practiced by students. Through TV5 media, students can see directly the activities from preparation of ingredients, the tools used, and the process of making a food recipe. This process is very helpful for students in increasing their vocabulary.

"... I was very happy when I studied and lecturers use TV5 Monde media on la recette material because I was able to see the cooking process directly and it helped me to enrich my French vocabulary. (Interview with III (third) informant Cinta).

Based on the result of the interviews above, it showed that the material is very suitable to be delivered using TV5 Monde media. Because, besides giving direct experience it can also motivate students to study.

e. The right method is in accordance with Competency Standards (CS), Basic Competencies (BC) and indicators.

The accuracy of the method used in the delivery of material is adjusted to the competency standard (CS). Competency standards in this material are students are able to write simple texts that tell what is eaten in the morning, afternoon and night.

f. Teachers’ competency in utilizing learning media.

The effectiveness of teaching and learning activities is also determined by the ability of the lecturer in mastering the lesson and choosing the right method to convey the material to students, so that the learning process takes place smoothly and effectively. The selection of TV5 Monde media is the right step used by lecturers in delivering la recette material. The la recette material requires examples of practices that can be followed by students.

g. Successfully deliver the students to achieve instructional goals that have been set.

One indicator of the effectiveness of learning through TV5 Monde media is the achievement of predetermined instructional objectives, namely good learning outcomes as stated in the scores on the results of the la recette material (table 2 students’ learning outcomes). This cannot be separated from the students’ attention to the la recette material delivered through TV5 Monde.

4 Conclusion

Based on the results of the research that have been done, it can be concluded that learning by using TV5 Monde media is very effective. This is evidenced by the achievement of the learning objectives which had been set out in the Learning Implementation Plan (LIP). The achievement of learning objectives can be proven through the results of the test in the form of material questions and the results of interviews with students.
The *la recette* test material which was tested by students showed satisfying learning outcomes. From the results of students’ answers there were more varied vocabulary and it increased.

5 Recommendation

Based on the findings, limitations, and discussions carried out, it is recommended the next researchers to conduct more specific study regarding the use of TV5 Monde media in teaching French. For education practitioners, especially among universities, it is recommended as a teaching media.

References

The Effect of Leadership Properties Against Effectiveness of Leadership of School Heads (Case Study on Head of State 3st Vocational School, White Portrait, Riau)

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Abstract. School is an organization that requires good management. Organizational school has an organizational structure, the school administration has input-process-output elements. At the most operational level, the principal is the person at the forefront who coordinates efforts to improve quality learning. In practice in RokanHilir District, the principal is a qualified senior teacher who holds the post. Nothing is not a teacher in the adoption of a principal. So, a teacher can expect that if "lucky" one day his career will lead to the position as headmaster. The principal should be a privileged position. For one thing, the headmaster's position is not just a managerial position with all sorts of titles. Indeed, in the sense that the head of a work unit, in fact the principal's position is no different from other managerial positions. At least the function is the same, that is maximize the utilization of available resources productively to achieve the goals set for the work unit. To some extent, the principal as head of a work unit, plays the same role as the manager for other work. Management in the broad sense is: A process of achieving goals through efficient utilization of human and material resources. Leading is one of the four management functions. The theory of nature seeks to determine the list of different traits to determine leadership effectiveness. Thus the theory of leadership of nature, and the identification of six noble leadership traits of Ghiselli. Leadership theory of nature assumes that different traits determine leadership effectiveness. The characteristics of effective leadership are the ability of supervision, the need for job attainment, intelligence, assertiveness, self-assurance and initiative. In traits theory states the effectiveness of leadership depends on the character of the leader. The qualities they possess include personality, physical superiority, and social ability. A leader must have astabara, which are eight superior attributes associated with nature such as earth, fire, wind, space, moon, sun, stars. In this regard, the study reveals the influence of leadership of the Principal's character on its leadership effectiveness. The results of the study measured that there is a positive correlation between the leadership nature and effectiveness of the leadership of SMKN 3 Tanah Putih, RokanHilir Regency, with a big influence over a third.

Keywords: Leadership Nature, Effectiveness, Principal

1 Introduction

Schools as an institution or institution of education is a means of carrying out services and processes of school education is not only made as a gathering place between teachers and students, but a system that is very complex and dynamic (Sagala, 2013: 70). School is an organization that requires management good, organizationally the school has an organizational structure, school administration has an
input-process-output element. At the most operational level, the principal is a person at the forefront who coordinates efforts to improve quality learning. In practice in Riau Province, the principal is a senior teacher who has the qualifications to occupy that position. No one who is not a teacher is appointed as the principal. Good leaders are told and communicate clear personal and educational values that represent their moral goals for school (p. 53). Vision is increasingly considered an important component of effective leadership. Beare et al. (1992) suggested the work of Bennis and Nanus (1985) to articulate ten emerging generalizations about leadership, four of which relate directly to vision:

1. Prominent leaders have a vision for their organization.
2. Vision must be communicated in a way that guarantees commitment among members of the organization.
3. Vision communication requires meaning communication.
4. Attention must be given to institutionalizing a vision if leadership becomes successful.

This generalization is basically a normative view of the centrality of vision for effective leadership. There is a high level of support for the idea of visionary leadership, but Foreman (1998)'s concept review shows that it remains very problematic. Kouzes and Posner (1996: 24) say that 'inspiring a shared vision is a leadership practice that [its head] is most uncomfortable', while Fullan (1992: 83) adds that 'visual building is a highly sophisticated dynamic process that few organizations can survive'

Linking models with leadership development Leadership can be understood as a process of influence based on clear values and beliefs and leads to 'vision' for school. The vision is articulated by leaders who strive to gain staff and stakeholder commitment to a better future for the school, students and stakeholders. Each of the leadership models discussed in this book is partial. They provide a different but not unique perspective on school leadership. Sergiovanni (1984: 6) adds that 'leadership theory and practice provide limited views, staying excessively on some aspects of leadership towards the virtual exclusion of others'.

The increasing demands on school leaders come from two contrasting sources. First, the accountability pressure faced by perpetrators is very large and continues to grow, in many countries. The government, parents and the wider community expect a lot from their schools and most of these expectations are transmitted through the principal. Crow (2006: 310), referring to the United States, refers to the increasing demands of society in a policy environment with increasingly high bets.

Leader effectiveness is sometimes measured on the basis of the leader's contribution to the quality of group processes perceived by followers or observers from outside. Is the leader able to increase the cohesiveness of members of the member cooperation groups, motivate members, solve problems, make decisions and reconcile conflicts between members? It is very difficult to evaluate effective leaders because there are many alternative measures of effectiveness, and it is not clear which size is most relevant. Some researchers try to combine several measures into one composite criterion, but this approach requires subjective judgment in giving the weight of the assessment to each measure. Lussier (2009: 316) gives the meaning of leadership is the process of influencing employees to work towards achieving organizational goals. The same thing VethzalRivai (2003: 2) defines leadership is an influential process in determining organizational goals, motivating followers' behavior to achieve goals, influence to improve the group and culture.

The leadership meant here is the leadership of the principal. Researchers want to examine and analyze the nature of leadership variables, in this case VethzalRivai (2003: 11) asserts that nature theory tries to identify typical characteristics (physical, mental, personality) that are associated with leadership success. Furthermore VethzalRivai emphasized that the nature of the theory emphasizes the personal attributes of leaders. Lussier (2009: 317) says the nature of leadership seeks to determine different characteristics in producing leadership effectiveness.

Furthermore Lussier (2009) raised the study conducted by Ghiselli (1971) from 300 managers studied resulting that certain traits are important for effective leadership.

For some of the theories and rationality studies above, the researcher wants to further assess the effectiveness of the school principal with the title "The Effect of Leadership on the Effectiveness of Leadership in the Head of State Vocational High School 3 Tanah PutihKab. RokanHilir, Riau ". 
2 Research Methods

1. This research was conducted at SMK Negeri 3 Tanah Putih, Rokan Hilir Regency, Riau, which was the object of the study were all teachers of Tanah Putih Vocational High School 3 in Rokan Hilir Regency, Riau. The method used is survey method. The population in the study were all teachers of SMK Negeri 3 Tanah Putih, Rokan Hilir Regency, Riau, amounting to 32 people, while the determination of the sample was determined by the researcher with consideration (purposive) namely, representing each department, with the weight of the number of vocational teachers in each department, so that the sample was 32 all teachers in Tanah Putih Vocational School, Rokan Hilir Regency, Riau.

2. The measurement of the leadership nature of the head of SMK Negeri 3 Tanah Putih in Rokan Hilir Regency, Riau was taken quoted from Lussier (2009) including: (1) supervision ability, (2) the need for job achievement, (3) intelligence, (4) belief, (5) confidence, and (6) initiative. Furthermore, the measurement of leadership effectiveness variables includes: (1) the right perception, (2) maturity level, (3) the right assessment of the task, (4) background and experience, (5) leader's expectations and style, (6) professional relationship.

3. Nature leadership variables have 25 statement items, where very effective statements are given a weight of 4, effectively given a weight of 3, less effective are given a weight of 2, and an ineffective statement is given a weight of 1. Furthermore, the principal's leadership effectiveness variable has 30 items. statement, where the statement is very appropriate / always given a weight of 4, accordingly / often given a weight of 3, less appropriate / rarely given a weight of 2, and the statement is not appropriate / never given a weight of 1.

4. The research instrument was in the form of a questionnaire, which was compiled from the theory concept proposed by Lussier (2009), a questionnaire form was adopted from the Likert-4 scale, before the questionnaire was prepared the researcher had made a list of variable matrices along with variable indicators to produce statement items as instruments. research. Data analysis method, using correlation and regression analysis. For calculation purposes, the research data is processed with Microsoft Excel software, and SPSS software (Statistical Product and service Solution).

5. To analyze the influence of nature (X) leadership variables on the effectiveness of the leadership (Y) of the head of Tanah Putih Vocational High School 3 SMK Hilir, Riau, the formulation or step of the analysis is carried out in two stages, each first step (1) determining whether there is a correlation between variables (r), and the second stage (2) a measure of its influence with regression analysis.

3 Research Result

Overview of Leadership The results of data processing are the leadership characteristics of the Principal of the Vocational School, which can be seen in table 1. the results of calculations that show that the percentage of each weight asked by the respondent.

Table 1.Score Based on Respondents' Responses on Leadership Nature of Principal Vocational High School 3 Tanah Putih, Rokan Hilir Regency, Riau

<table>
<thead>
<tr>
<th>Amount</th>
<th>Category</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ineffective</td>
<td>11</td>
<td>1.4</td>
</tr>
<tr>
<td>2</td>
<td>Less effective</td>
<td>51</td>
<td>6.6</td>
</tr>
<tr>
<td>3</td>
<td>Effective</td>
<td>329</td>
<td>41</td>
</tr>
<tr>
<td>4</td>
<td>Very effective</td>
<td>409</td>
<td>51</td>
</tr>
</tbody>
</table>

From the data above, there are 51 percent stated to be very effective, 41 percent effective, the remaining around 8 percent stated less (less effective / ineffective). If the results of the calculation of this variable are extended further to find out the level of leadership traits, then with the highest ideal score = 4 x 25 items x 32 respondents = 3200 while the total score of the respondents' assessment results is 2736, so the ratio is = (2736/3200) x 100% = 85.50% which describes that the leadership level of the principal has 85.5% of ideal conditions.
Overview of the Effectiveness of Principal Leadership Results of data processing variables Effectiveness of leadership of the Head of the Negeri 3 Tanah Putih Vocational High School (SMK) Rokan Hilir Regency, Riau, which is based on 30 statement items, can be seen in table 2.

Table 2. the results of the calculations show that the number of answers to each item asked by the respondent. Scores Based on Respondents' Responses About Leadership Effectiveness Principal of SMK Negeri 3 Tanah Putih, Kab.Rokan Hilir, Riau

<table>
<thead>
<tr>
<th>Botol</th>
<th>Kategori</th>
<th>Jumlah</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ineffective</td>
<td>61</td>
<td>6.4</td>
</tr>
<tr>
<td>2</td>
<td>Less effective</td>
<td>159</td>
<td>16.6</td>
</tr>
<tr>
<td>3</td>
<td>Effective</td>
<td>453</td>
<td>47</td>
</tr>
<tr>
<td>4</td>
<td>Very effective</td>
<td>287</td>
<td>30</td>
</tr>
</tbody>
</table>

From the data above, there are nearly 30 percent said to be very effective, 47 percent effective, the remaining around 23 percent said it was less effective.

If the calculation results of this variable are extended further to determine the level of leadership effectiveness, then a comparison of the number of scoring scores (with a score of 2886) is compared to the highest ideal score = 4 x 30 items x 32 respondents = 3840. So the ratio is = (2886 / 3840) x 100% = 75.15%. This describes that the principal's effectiveness level is around 75% of ideal conditions.

4 Discussion

Analysis of the Effects of Leadership on the Nature and Effectiveness of Leadership. Based on the processing of research data, with Ms-Excel and SPSS tools, it is known that the correlation values of the two variables: R (xy) = 0.489 are categorized as quite significant. Another result, states that the correlation coefficient [R (xy)] is significant at the 1% test level. This is stated from the value of Sig = 0.005 or 0.5%. This means statistically, the correlation coefficient is reliable (sure is true) of 99.5%.

Based on the results of the test, which concluded that there was a positive correlation between the variables of the study, then the influence of Leadership can be analyzed as independent variables (X) on the Effectiveness of Leadership as a Dependent (Y) variable. For this reason, a quantitative approach is used with the regression model Y = a + b X.

5 Conclusion

Based on the SPSS analysis output, there are three (3) outputs produced, each of which states:

1. Model Summary: that the linear relationship model of the nature (X) leadership variable and leadership effectiveness (Y) of the Head of the SMK Negeri 3 Tanah Putih Rokan Hilir Regency, Riau has a positive correlation of R = 0.489 the degree of relationship is R-square = 23.9 percent.
2. Table Anova: states the test model is the linearity of the relationship between the nature of leadership (X) and the effectiveness of leadership (Y) in the equation: Y = a + b X which is assumed. With F-statistics of 9.414 and Significance Test (Sig) of 0.005, then the regression model Y = a + bX can be accepted with a statistically correct confidence level of 99.5%.
3. Coefficient table: is a table that estimates the value of constants and coefficients of the regression model, so it can be written the regression model X over Y in the equation: Y = 58.999 + 0.378 XAnd from the value of the t test, the two values (constants and regression coefficients) are declared significant. Because the value of Sig (a) = 0.000 and Sig (b) = 0.005 is the second regression variable in the form of: Y = 58.999 + 0.378 X

Meaning: Changes or ups and downs of the weight of X will affect the size of Y by 37.8%. In other words, the contribution of the influence of the leadership variable on the effectiveness of the leadership of the head of the SMK Negeri 3 Tanah Putih Rokan Hilir regency, Riau reached 37.8%, meaning that there were still many other factors affecting the effectiveness of the headmaster's leadership of 62.2%.
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Journal School Principals’ Authentic Leadership and Teachers’ Psychological Capital: Teachers’ Perspectives oleh Feng Feng (2016) International Education Studies; Vol. 9, No. 10; 2016 ISSN 1913-9020 E-ISSN 1913-9039 Published by Canadian Center of Science and Education

The Effect of Moderate Intensity Physical Activity on Ureum and Creatinine Serum in Untrained Male Students

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Abstract. Exercise induces profound changes in the renal hemodynamics and protein excretion. Ureum and creatinine levels can be used to assess whether renal function is still working properly or not. Ureum and creatinine levels can be affected by physical activity because ureum and creatinine are products of protein metabolism in skeletal muscle. The purpose of this study was to see the effect of moderate intensity physical activity on ureum and creatinine serum in untrained male students. This research is a pre-experimental study with the design of one group pretest-posttest. The sample in this study were ten untrained male students taken by purposive sampling. Physical activity protocol is running on a treadmill for 60 minutes with an intensity of 60-75 percent of maximum heart rate reserve (MHR). Blood samples were taken to measure ureum and creatinine before and after the physical activity. Data were analyzed by paired T-test and Wilcoxon test. This study showed that the average results of ureum had a significant decrease and mean results of creatinine showed a significant increase. Based on these results we can conclude that the moderate intensity of physical activity on a treadmill reduces ureum and increases creatinine in untrained male students.

Keywords: Ureum, Creatinine, Renal, Moderate Intensity Physical Activity.

1 Introduction

During physical exercise there is an increase in oxygen consumption throughout the body, especially in muscle fibers (Ji, 1999), but blood flow and metabolism decrease significantly in the kidneys during exercise (Radak et al, 2013). This causes changes in the glomerular filtration rate and reabsorption mechanism which ultimately affect the marker of kidney function (Bijeh and Farahati, 2013). Kidney function tests can be done to see how the kidneys cleanse the blood from metabolic waste products that will poison the body, including urea and creatinine tests (Baniata et al, 2009).

Ureum is a residual product from the metabolism of proteins produced by the liver through the urea cycle. The urea cycle consists of five reactions, two occur in the mitochondria and three in the cytosol. The resulting urine will be transported in the blood to the kidneys to be secreted in the urine. Ureum is passively reabsorbed from the renal tubules but much less than chloride ions. When water is reabsorbed in the tubules (by osmosis along with sodium reabsorption), the urea concentration in the tubular lumen increases. This results in a concentration gradient that causes urea reabsorption. However, the urea cannot enter the tubules as much as water. Therefore, approximately one half of the urea which is filtered...
through glomerular capillaries will be passively reabsorbed from the tubules. The remaining urethra will enter the urine, causing the kidneys to excrete large amounts of this metabolic waste product (Guyton & Hall, 2008).

Creatinine is a product that results from the breakdown of creatine phosphate in the muscles that is constantly produced by the body. During the change in creatine to phosphocreatine reactions catalyzed by creatine kinase spontaneous conversion to creatinine can occur. Creatinine is filtered from the blood by the kidneys. Serum creatinine changes during physical activity depend on the type, intensity and time of exercise.

Several studies have been conducted to see the effect of physical activity on kidney function. For an et al., (2003) found that the short-term effects of marathon training increased creatinine and blood urea nitrogen (BUN). Aerobic exercise for 12 weeks decreases creatinine levels and increases glomerular filtration rates in men and women (Straznicky et al, 2011). According to Warburton et al., (2002) concentrations of urea and creatinine increased after prolonged strenuous exercise in which this increase was associated with decreased renal blood flow and glomerular filtration rate, increased protein catabolism and creatinine release due to muscle work. Based on this background the researcher was interested in seeing the effect of moderate intensity physical activity on the concentration of urea and serum creatinine in untrained male students.

2 Subjects and Methods

This research is a pre-experimental study with one group pretest-posttest research design. The subjects in this study were male students aged 19-22 years with an average age of 20.5 years as many as 10 people. Before starting the research the subjects filled out the approval sheet into a sample. The subjects is not taking drugs, has no metabolic disease and is in good health tested by a doctor. Prior to the study the subjects first conducted intensity physical activity while using a treadmill according to the ability of the sample to determine the time to do physical activity. The results obtained when doing physical activity for one hour. The intensity used is 60-75% of the maximum pulse.

Blood is taken before and after physical activity and then measured in a laboratory using a Spectrophotometer Microlab 300 with a colorimetric method for urea examination and the Jaffe method for creatinine examination. All data analysis was conducted by using SPSS 19 software. The obtained data were tested by paired T-test and Wilcoxon test. Differences were considered significant at p<0,05.

3 Results

This study aims to see the effect of moderate intensity physical activity on the concentration of urea and serum creatinine in untrained male students. From the results of the study obtained differences in the concentration of urea and creatinine as shown in Table 1.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ureum</td>
<td>Pretest</td>
<td>10</td>
<td>36,08</td>
<td>2,47</td>
<td>0,007</td>
</tr>
<tr>
<td></td>
<td>Postest</td>
<td>10</td>
<td>19,67</td>
<td>7,77</td>
<td></td>
</tr>
<tr>
<td>Creatinine</td>
<td>Pretest</td>
<td>10</td>
<td>0,97</td>
<td>0,12</td>
<td>0,039</td>
</tr>
<tr>
<td></td>
<td>Postest</td>
<td>10</td>
<td>1,10</td>
<td>0,13</td>
<td></td>
</tr>
</tbody>
</table>
From the results in Table 1, it is known that the average urea before getting physical activity with moderate intensity is higher than after getting physical activity. In the Wilcoxon test obtained $p$ value = 0.007 which means there are significant differences in the average serum urea in untrained male students. Average creatinine before getting physical activity with moderate intensity is lower than after getting physical activity. In the T-paired test obtained $p$ value = 0.039 which means there is a significant difference in the average serum creatinine in untrained male students.

4 Discussion

The results showed a significant decrease in serum urea concentration, the same result was also found by Bijeh and Farahati, (2013) that BUN concentrations experienced a non-significant decrease in untrained middle-aged women who received aerobic exercise for six months, meaningless decline. It relates to training programs and types of activities and environmental conditions and the human race. Sokal et al (2013) found that urea concentrations decreased in subjects who did physical exercise and recovery on earthed compared to un-earthed. According to them earthing during exercise inhibits liver protein catabolism or increases renal urea excretion. Different results were found by Baniata et al (2009) that urea levels experienced a significant increase in Jordanian top athletes who received aerobic and anaerobic training.

Creatinine concentration increased significantly in this study. Similar results were found by Priest et al., (1982) that creatinine increased significantly in white men who received physical activity in the form of "mini-marathons". Bijeh and Farahati., (2013) found that creatinine levels experienced an insignificant increase in middle-aged, untrained women who received aerobic exercise for six months.

Baniata et al.,(2009) found that creatinine concentrations increased significantly in Jordanian top athletes who received aerobic and anaerobic exercise. Morales et al., (2013) found that serum creatinine levels increased significantly in male street runners who ran for 6 kilometers. According to Warburton et al.,(2002) creatinine release from contracting muscles, decreased blood flow in the kidneys and decreased glomerular filtration rate and dehydration cause an increase in plasma creatinine concentration.

5 Conclusion

Based on these results we can conclude that the moderate intensity of physical activity on a treadmill reduces ureum and increases creatinine in untrained male students.

References


Model of Poor Fishermen Empowerment in Kelurahan Pasia Nan Tigo Padang West Sumatra

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Abstract. This article is based on research on fishermen in Pasia Nan Tigo urban village Padang West Sumatra. Most of fishermen in Pasia Nan Tig are small-scale and they live in poverty. So far, there are many empowerment programs which conducted by both government and non-governmental organizations to improve the welfare of fishermen. But these programs have not succeeded in improving the welfare of fishermen that live in poverty. This study tries to see the causes of difficulty in improving the living standards of fishermen despite many empowerment programs undertaken and potentials owned by fishermen. The study was conducted in an urban village using qualitative research methods to do fieldwork by doing with observasi and in-depth interviews. The results of research show that empowerment programs often did not see what is needed by the fishermen and also the gift is also not on target. Poor fishermen did not had a bargaining position they just accept what the government or elite programs do in their homes. To improve the welfare of fishermen it is important to see the potential of the fishermen and see their aspirations. The potential of the fishermen is that they are urban fishermen, where the city has adequate facilities and infrastructure for fishermen's progress. Education children who can be better than parents and the wives who can develop their own business to increase family income.

Keywords: fishermen, poverty, empowerment, potential, aspirations.

1 Introduction

The wealth of Indonesia's natural resources in the form of vast oceans and fish in them is not yet able to prosper fishermen because most of the fishermen in Indonesia are still living in conditions of poverty. The average income of low fishermen is only enough to meet the daily subsistence needs of families. Fishermen's income with traditional fishing equipment is very fluctuating because it is influenced by weather, season, and fate factors. The government has tried to empower fishermen who aim to improve their welfare. The empowerment is by carrying out various programs, but the empowerment programs of the fishing community from the government do not or have not been able to improve the standard of living of small-scale fishermen or traditional fishermen and fishermen of the ship's crew or labor fishermen.

This raises the question of why programs to eradicate fishermen from poverty do not produce what is expected. Does this relate to poverty alleviation programs which so far have only been top down not bottom based on aspirations or needs and desires of fishermen. What is the perspective of the fishermen themselves is actually about poverty alleviation programs that have been carried out by the government. What empowerment models are suitable to
improve the living standards of poor fishermen. This article is based on the results of research aimed at: 1) Explaining poor fishermen's perceptions of empowerment programs that have been carried out by the government; 2) Identify the causes of failure of poor fishermen community empowerment programs; and 3) Identify potentials that can be developed for empowerment based on available resources and aspirations of poor fishing communities.

2 Methodology

To capture the perceptions and aspirations of the poor fishing community, the research uses ethnographic research techniques. Ethnography is considered as a form of research that focuses on social meaning through observation of socio-cultural phenomena (Clifford, 1999). Then inspired by grounded theory (Glasser and Strauss, 1967) In this case it focuses on how fishing communities living in poverty interpret their lives, define their problems and produce meaning that allows them to see themselves as individuals in a wider society. This makes it possible to explain how people act based on their perceptions, such as how they respond by trying to improve their conditions, relationships, and capacities.

3 Research findings

The problem of poverty in fishing communities is actually a complex problem. As previously explained based on the results of studies conducted by researchers there are several factors that cause fishermen's poverty, including: (1) government policies in the field of fisheries that are more concerned with capital owners than improving the standard of living of fishermen, (2) scarcity resources due to over production or theft of fish by foreign fishermen; (3) inequality in the production sharing process among fishermen owners with labor fishermen there is a kind of exploitation of labor fishermen; (4) fishing equipment or equipment that is still simple; (5) fish prices fluctuate; and (6) and weather conditions that make fishermen unable to go to sea; (7) the residence of the fishing community isolated from transportation and communication facilities.

Residents in Pasie Nan Tigo Village have livelihoods, among others, as fishermen, civil servants, the private sector, and others. Most of the work of the Pasie Nan Tigo community is fishermen. even more than half of the residents of Pasie Nan Tigo village have their main livelihood as fishermen. This is supported by the Tigo Nan Pasie region on the coast of West Sumatra. So that it can be said that the superior and main economy of the community is from fisheries, especially marine fisheries.

The role of the government in overcoming the problem of poverty to the community is to provide assistance programs either in the form of direct assistance or sustainable assistance such as skills training. Fishermen are one of the elements of the community that received a lot of attention by the government regarding the empowerment program for the welfare of their lives, including fishermen in Pasie Nan Tigo Village. Especially traditional fishermen who use long tail fishing gear, quite a lot get a portion of this empowerment program. Because the number of long tail machine fishermen or more often known as biduak fingerang is very large, the distribution of aid is often given through groups that they form themselves based on direction and guidance from the Marine and Fisheries Service (DKP).

Various forms of responses and perceptions that grew among fishermen who were touched by the way of the empowerment programs. There are differences in perceptions
between individual recipients of assistance with KUB administrators and related agencies, especially assistants or extension workers who are directly involved in coaching and mentoring these fishermen groups. Especially among small fishermen such as fishermen, bidua k jariang, clearly explained their views on the practice of empowerment programs in the field.

Some programs and assistance provided positive responses and some also gave a negative impression of the program. Most fishermen's perceptions are often tilted mainly towards the running of the PUMP program which is mostly carried out by KUB based on advice and direction from the ministry of marine affairs and the Padang city fisheries. From the “skewed” perceptions of empowerment programs, finally many cause many inequalities and deviations that occur to the practice of the programs.

About the skills and potential of fishermen, especially traditional fishermen or poor fishermen and their families is a classic thing to discuss. As is well known in general, the developing dogma about fishermen has always been synonymous with the lack and lack of skills and self-potential that can be developed from these individual fishermen. But if we examine it from within there are some points that can be developed from the fisherman. Although in fact it is still related to the fisheries sector. From the results of this research interview, it was proven that most of the fishermen did not have any other skills at all, especially for those who were 40 years and over.

Meanwhile, if seen by the fishermen's family they have the potential to help the family economy. Fishermen's children generally have higher education than their parents. They can help their parents' economy by working in other sectors. While fishermen's wives can work entrepreneurship by selling. The crowded urban population in the Pasia Nan Tigo area is a potential for the businesses of the fishermen's wives.

4 CONCLUSION

This article is based on the results of research on poor fishermen in Pasia Nan Tigo Village, Padang City, West Sumatra. Fishermen here even though living in urban areas with sufficient facilities and infrastructure still live in poverty. Empowerment programs carried out by the government to improve their standard of living have not succeeded in improving their welfare. The problem raised is how the empowerment model is carried out and how the fishermen's perception of the program is carried out.

There are many empowerment programs carried out by the government but the program does not pay attention to the actual conditions and needs of the fishing community. The direct assistance program in the form of giving ships does not pay attention to the traditions and skills of the community. The group assistance program has problems with wrong targets, irregularities, and perceptions of the fishermen themselves about assistance. The fishermen empowerment model must pay attention to the real conditions of the fishing community, paying attention to the values, the structure of the community, and the potential they have. In order for empowerment to be carried out, it can touch the needs of the fishermen themselves.
References


The Development of Sensitive and Selective Potentiometric Biosensor for Urea Assay

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Abstract. The development of the biosensor as a step to obtain analytical instrument for urea is explained in this study. The aim of this research is to obtain sensitive and selective potentiometric biosensor for urea assay in clinical sample. The study was conducted through preparation of an enzyme electrode with immobilisation of urease onto the tungsten wire by using matrix polymer, followed by interfacing the sensing device vs Ag/AgCl with voltmeter that was connected with Powerlab for data acquisition. The presence of urease in the sensing device is catalytically converted the urea to ammonium ion and bicarbonate which results in the potential change in electrochemical cell. The wide linearity range for urea standard solution was obtained (0.1 - 10 mM urea) with slope 42.7 mV per-decade urea concentration ($r^2 = 0.993$). The urea biosensor gives sensitive response to urea where the detection limit was 0.1 mM urea. A very fast analytical response was achieved that was only taken four minute per-sample. The potentiometric urea biosensor developed in this study is promising since the instrumentation component is relatively inexpensive and can be modified to an portable mini biosensor.

Keywords: Potentiometric biosensor, tungsten wire electrode, sensitive and selective response, urea assay.

1 Introduction

The challenges to provide sensitive and selective biosensors is continue in analytical methodology and as they become important parameter in the successful of the biosensor construction. The quantitative analysis results obtained from the biosensors must be directly related to true value of the analyte in the sample (Situmorang and Nurwahyuni, 2018; Situmorang and Nurwahyuni, 2017). One approach to provide accurate analytical determination for urea was using potentiometric biosensor with incorporation of enzyme urease as catalytic agent in the electrode. The enzyme was immobilised on to the electrode surface by using various type of matrix polymers that were compatible with electrochemical detection systems (Situmorang, et al., 1998). The preparation of urea biosensor is needed as a step to provide a sensitive and selective analytical instrument for urea. It is known that the presence of urea at a certain level in blood and other body fluids can be used as indicators for some diseases (Friedman and Juneja, 2014; Alqasaimeh, et al., 2014). With this reason, a sensitive and selective method is needed to assure accurate urea measurement has been proceeded. A standard procedures with UV-Vis spectrophotometry is still been applied for urea where this analytical protocol is subject to interference from interfering species...
Another methods for urea determination have been introduced such as reflectometry (Ulianias, et al., 2011; Alqasaimeh, et al., 2007), colorimetry (Gaddes, et al., 2015; Zawada, et al., 2009; Sharma, et al., 2009), nuclear magnetic resonance (Liu, et al., 2012), LC–MS (Pitranggon, et al., 2014), field effect transistor (Chang, et al., 2010; Lue, et al., 2011), acoustic wave (Tan, et al., 1998), and electrochemical methods (Ma, et al., 2016; Manea, et al., 2008; Ho, et al., 1999; Hilding-Ohlsson, et al., 2012; Das and Yoon, 2015).

Most of the previous methods are operated with relatively expensive instrumentation. The development potentiometric biosensor becomes an alternative to obtain a sensitive and selective analytical device with low cost instrumentation. The method have been introduced in the previous study (Sihombing, et al., 2018; Sihombing, et al., 2017). It is by the immobilisation of urease in a polymer matrix polymer (Sihombing, et al., 2015). A tungsten wire electrodes was used as transducers similar to malate biosensors (Situmorang, et al., 2001). The compatibility of tungsten electrode in potentiometric measurement is exploited in the construction of urea biosensor. The study is aimed to present the development of a sensitive and selective potentiometric biosensor for the determination of urea. The detection system is based on the catalytic conversion of urea to ammonium ion and bicarbonate that can be monitored potentiometrically by the biosensor device.

2 EXPERIMENTAL

2.1 Reagents and Apparatus

Analytical grade of urea, Urease (EC 3.5.1.5) from Canavaliaensiformis (jack bean) Type IX (75,265 units/gram solid), tris[hydroxymethyl] aminomethane hydrochloride (trismaHCl), and were obtained from Sigma Chem. Co. Another chemical such as Polyvinyl Alcohol (PVA), Poly(vinyl chloride) (PVC: low molecular weight type), 2-nitrophenyl octyl ether (NPOE) as membrane plasticizer, potassium tetrakis (p-chlorophenyl) borate (KTPClPB) as anionic additive, 2-chloromethylquinoline, solvent of tetrahydrofuran (THF), K2HPO4, KH2PO4, KCl, and HCl were purchased from Aldrich Chem. Co. The reagents were used without purification and Milli-Q water was used for all solutions.

A Keithley 177-Microvolt Digital Multi Meter (Keithley Instrument, USA) connecting with Powerlab 2/20 AD Instrument was used for data acquisition. Working electrode of tungsten wire, 1 mm diameter (Aldrich Chem. Co.) in combination with Ag/AgCl reference electrode were used in all potentiometric measurements.

2.2 Preparation of Potentiometric Biosensor

The development of potentiometric urea biosensor was carried out similar to that explained in previous study with modification for a better response in the sensitivity and selectivity of sensing device (Sihombing, et al., 2018; Sihombing, et al., 2017). Briefly, the urease was immobilised onto tungsten (W) electrodes by the use of PVA matrix followed by sealing with plasticized PVC to produce enzyme working electrode (W/Ur-PVA/PVC). The enzyme electrode was then combined with Ag/AgCl reference electrode in an electrochemical cell. The electrodes are then connected to potentiometer with Powerlab 2/20 for data acquisition.
2.3 Potentiometric Measurements

Determination of urea by using urea biosensor was conducted in 0.01 M trisma buffer solution, pH 6.0. Successive injections of urea standard solutions (from a stock solution of 1 M urea) were made after a steady potential background was obtained with continuous record of the potential change produced by the enzymatic catalytic reaction of urea at optimum experimental conditions (Situmorang, et al., 1998). The potential was recorder as a function of urea concentration. The biosensor is then evaluated based on its performance for urea assay in the response sensitivity, working range, selectivity and biosensor stability.

3 RESULTS AND DISCUSSION

3.1 Biosensor Response to Urea Standard Solution

The response of urea biosensor to urea standard solution has been obtained as presented in Figure 1. With the biosensor (W/Ur-PVA/PVC), the potential increased with increasing the concentration of urea in the solution (Figure 1a). As a comparison, there is no potential change observed when injection of the same amount of urea standard solution into the solution when the determination was made by modified electrode (W/PVA/PVC), in the absence of urease (Figure 1b).

![Figure 1. Typical potential-time curve for successive injection of urea standard solution: (1) 0.0 mM, (2) 0.01 mM, (3) 0.1 mM, (4) 0.5 mM, (5) 1.0 mM, (6) 5.0 mM, (7) 10.0 mM and (8) 50 mM urea into 0.01 M trisma buffer solution, pH 6.0 that were detected by using: (a) enzyme electrode (W/Ur-PVA/PVC), and (b) modified electrode in the absence of urease (W/PVA/PVC). The enzyme electrode was constructed by coating the tungsten wire electrode with PVA containing urease one time.](image)

The results reveal that a sensitive signal was obtained by the urea biosensor, and the signal for urea was about five minute per sample starting from injection until the steady baseline when completing the enzymatic reaction of urea. The biosensor gave linear response to urea in the concentration range of 0.01 - 10 mM urea (Figure 2), with a calibration slope of 42.7 mV decade⁻¹ urea concentration, and the detection limit 0.01 mM urea (Sihombing, et al., 2018).
3.2 Selectivity of Urea Biosensors

To evaluate the selectivity of the biosensor upon interfering species, various types of analytes that possibly presents in clinical samples were added into urea standard solution, and the potential of each sample was measured separately (Situmorang, et al., 2000). The potential response for 1 mM of urea mixed with 1 mM interfering analytes are also measured in comparison to a single interfering species. The potential result obtained by the biosensor was summarized in Table 1. It showed that small potential was obtained for interfering species alone, that is closed to the potential value of background trisma buffer solution. However, when the analyte (1 mM interfering agent) was mixed with 1 mM urea, the presence of interfering species in urea standard solution did not influence the response sensitivity of urea measurement. This results confirmed that the use of PVA as matrix polymer and the sealing process provided by plasticised PVC improve the selectivity of the biosensor (Situmorang, 2012).

Table 1. Potential response of urea biosensor to 1 mM urea standard solution and interfering species, and the mixture of urea and interfering species (1 mM). Experimental parameters are shown in figure 1.

<table>
<thead>
<tr>
<th>No</th>
<th>Urea and analytes as interfering species (1 mM)</th>
<th>Potential response of urea biosensor E (mV)</th>
<th>ΔE (mV)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Interfering species alone (1 mM), E (mV)</td>
<td>Mixture of 1 mM urea and 1 mM interfering species, E (mV)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Urea</td>
<td>135.5</td>
<td>0.0</td>
</tr>
<tr>
<td>2</td>
<td>Glucose</td>
<td>47.5</td>
<td>1.6</td>
</tr>
<tr>
<td>3</td>
<td>Fructose</td>
<td>49.5</td>
<td>2.9</td>
</tr>
<tr>
<td>4</td>
<td>Cholesterol</td>
<td>51.5</td>
<td>1.7</td>
</tr>
<tr>
<td>5</td>
<td>Amino acid</td>
<td>62.5</td>
<td>6.0</td>
</tr>
<tr>
<td>6</td>
<td>Ascorbic acid</td>
<td>92.0</td>
<td>-10.0</td>
</tr>
<tr>
<td>7</td>
<td>Potassium ion</td>
<td>47.5</td>
<td>-0.5</td>
</tr>
<tr>
<td>8</td>
<td>Calcium ion</td>
<td>49.2</td>
<td>-1.4</td>
</tr>
</tbody>
</table>

Figure 2. The calibration curve for urea standard solution (0.01-10 mM. The experimental conditions are shown in Figure 1.
3.3 Stability of Urea Biosensor

The stability of enzyme electrode has been evaluated. Four electrodes were prepared, and the response stability was evaluated with variation in the storage of the electrode in the solution and in dry condition (Situmorang, et al., 2002). The response signal for enzyme electrode at different storage condition is presented in Figure 3. The biosensor gave a stable response when it is store dry both in the fridge (Figure 4a) and room temperature (Figure 4b), where the potential change reduce down to about 10% after 35 days compare to fresh electrode. The potential signal obtained from enzyme electrodes were significantly decreased when they are stored in buffer solutions (Figure 3c and Figure 3d). The results confirmed that dry condition is the best environment to store the enzyme electrodes, This stored condition for immobilised enzyme by using PVA was similar with enzyme immobilisation in polytyramine matrix polymer (Situmorang, et al., 1999).

![Figure 3. The stability of urea biosensors for repeated measurements of 1 mM urea standard solution, where the biosensor was stored differently: (●) Biosensor 1 stored dry in at 4 °C, (■) Biosensor 2 stored dry at room temperature, (▲) Biosensor 3 stored in trisma buffer pH 6.0 at 4 °C, (□) Biosensor 4 stored in trisma buffer at room temperature. Other experimental parameters are as in figure 1.](image)

4 CONCLUSION

Urea biosensor has been developed with immobilisation of urease in PVA matrix. The biosensor gave a sensitive and selective response to urea, only five minutes per sample from injection until obtaining a steady potential baseline. The concentration linearity range was obtained from 0.01 - 50 mM urea, slope of 42.7 mV decade^{-1} urea, and the detection limit was 0.01 mM urea. The potentiometric biosensors is stable for longer uses when stored in dry condition. The biosensor is very promising since it is prepared from relatively low cost instrumentation components.
Acknowledgments. Funding support for this work was obtained from Directorate Research and Community Service, Directorate General Strengthen Research and Development, Ministry of Research, Technology and Higher Education of the Republic of Indonesia, Under Penelitian Strategis Nasional Institusi, contract No. 073/SP2H/LT/DRPM/2018

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Institutional Ownership and Tax Avoidance: A Review Agency Theory

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Abstract. Differences in interests between owners and managers cause information submitted to financial statements to be incorrect. The interests of owners who want increased company performance and value cause managers to plan strategies, one of which is tax avoidance. Therefore, this study aims to determine the conflict of interest between managers and owners who are described through institutional ownership of tax avoidance practices. This research was conducted on manufacturing companies listed on the Indonesia and Singapore Stock Exchanges. The results of this study became the basis of tax avoidance practices that occurred in the two countries as an implication of agency theory.

Keywords: Institutional Ownership, Tax Avoidance, Indonesia, Singapore.

1 Introduction

Panama papers have recently become the latest issue in showing how tax avoidance practices are carried out by individuals or business entities. In this case, it can be seen that world leaders, people who have wealth, benefit business entities store assets and invest in countries that have tax rates or even tax haven. Therefore, the practice of tax avoidance is an issue that needs to be considered by the government in making and renewing the taxation regulations that apply in a country.

Previously, a developing country needed a large amount of funds to develop both infrastructure and the welfare of its people (Akinyomi and Okpala 2013; Oktaviyani and Munandar 2017). The funds come from taxes which are compulsory contributions from individuals and business entities. The tax received will be used for development planning and meeting public needs (Aghouei and Moradi 2015; Salehi et al. 2016). The tax is cited by a special body whose duty is to collect taxes. Therefore, taxes received by the government are very beneficial for the development of a country (Aghouei and Moradi 2015; Desai and Dharmapala 2015; Irianto and Wafirli 2017).

But on the company side, tax is a burdensome expense for the company (Sari 2014). Because taxes directly impact the company's net income. For companies, taxes are expenses that are deducted from the net income after deducting operating expenses. If large taxes will have an impact on net income that will be distributed to the owner of the company. Therefore, managers look for ways to pay less taxes. This is related to the fulfillment of the interests of the company owner.
On the other side, in the practice of implementing the company there is a conflict of interest between management and the owner. The conflict is due to differences in interests between the owner of the company as a principle and manager as an agent, namely the executor of the company. The owner of the company wants to get a return on capital through increasing the performance and value of the company so that the manager asks to improve the performance of the company (Ratnawati et al. 2018). While managers have the responsibility to run the company so that performance and value increase. Because companies that have good performance and increased value indicate that healthy companies and investors will be interested in investing in the company (Allen and Phillips 2000; Wahyudi and Pawestri 2006).

One of the managers’ efforts to improve the performance and value of the company is to increase the company's net profit through the effectiveness of the expenses paid by the company so that the profits earned will increase. In addition, companies that have increased net income tend to be more stable in carrying out their operations and have an impact on the value of the company (Ratnawati et al. 2018).

But in increasing net income there are factors that influence it. One of them is tax burden. Tax expense is an obligation for the company to be paid to the state. But the lack of public trust, especially the company towards the state, causes companies to look for ways to reduce the tax paid (Akinyomi and Okpala 2013; Kanagaretnam and Lee 2013). Another factor, the increase in tax rates imposed by the company is also a heavy burden for the company (Aliani 2013). On the other hand, the desire of the owner to improve performance and value by promising compensation requires managers to look for strategies to minimize the burden and maximize net income. Therefore, the strategy carried out is tax avoidance practices (Sari 2014).

This strategy is carried out by management to plan the amount of tax that will be deposited to the state so that its value is smaller than it should be (Desai and Dharmapala 2015; Gaaya, Lakhal, and Lakhal 2017; Lanis and Richardson 2013). Previously the practice of tax avoidance was a management strategy in reducing the amount of tax liability that the company should pay to the state by utilizing existing tax regulations (Dyreng, Hanlon, and Maydew 2010; Lim 2011; Noor, Fadzillah, and Mastuki 2010; Sari 2014). Tax avoidance practices are seen from the legality divided into two, namely tax avoidance and tax evasion. Tax avoidance is a tax avoidance practice that is carried out legally by looking for weak gaps in the prevailing laws and regulations (Lim 2011). While tax evasion is a practice of tax avoidance that is carried out illegally due to finding ways to reduce the amount of tax paid by violating the existing regulations. In this study will be seen how the aspect of agency theory in tax avoidance practices.

One aspect of agency theory in tax avoidance practices is institutional ownership. Institutional ownership is the number of company sahan holders from outside the company, especially institutional, both financial and non-financial. The relationship of institutional ownership to tax avoidance practices which serves as a company supervisor so that managers in carrying out their activities are more open in delivering public information which ultimately reduces information fraud, especially tax avoidance practices as described in the Jensen and Meckling (1979) study. The size of institutional ownership affects the implementation of tax avoidance (Khurana and Moser 2009). In agency theory it is said that the principle asks agencies to improve the performance and value of the company by promising compensation to managers. The implication is that institutional ownership assigns responsibility to managers to improve company performance by supervising company operations. The goal is that managers do not violate the rules and convey the right information to the financial statements. In addition, according to (Chen et al. 2014) that tax avoidance is an act that is contrary to ethics
and behavior that will have an impact on the decline in the value of the company (Bauer, Kourouxous, and Krenn 2018). The institutions here also consist of government institutions or legal institutions that want companies to run according to regulations. On the other side, managers know the limited resources of the company so that it is difficult to improve performance. So look for strategies to practice tax avoidance.


This research is to see the practice of tax avoidance carried out in two countries, namely Indonesia and Singapore. This is because the two countries are neighboring countries and have strong bilateral relations so that many investors and financial and non-financial companies invest. In addition, the two countries have different taxation systems so that the impact of these factors will be more visible that affect tax avoidance practices. So it is necessary to see the influence of institutional ownership in tax avoidance practices in Indonesia and Singapore. The results of this study can be a reference for financial and non-financial institutions in providing supervision to companies running their operations.

2 Literature Review

2.1 Agency Theory and Ownership Institution

Basically there are differences in interests between company owners and managers. As a result there is a conflict of interest that causes financial information to be conveyed asymmetrically. The owner of the company delegates its interests to the manager to achieve the desired goal while the manager wants a large compensation from the owner. Therefore, managers prepare strategies as an effort to improve the performance and value of the company.

According to Jensen and Meckling (1979) that company owners and managers have a strong bond if the manager carries out the interests of the owner of the company. But the concept of running here is that the owner promises compensation for the manager when it is reached. So that the bond between manager and owner becomes stronger if the manager runs the interests of the owner.

In this study, agency conflict occurs when the owner wants an increase in company performance and value through increasing profits with a small burden. According to Ratnawati et al. (2018) that companies that earn large profits show financial stability which has an impact on improving the performance and value of the company. So the owner orders the manager to increase the value of the company through increasing profits. One of them is with increasing load. Expenses are expenses that have an impact on the net income obtained by the company. The greater the burden on the company, the lower the net profit. According to the trade off theory, companies that have a large burden will have an impact on reducing the amount of net income earned so that a small net profit will have an impact on the taxes paid (Miller 1977). So that some companies increase debt which aims to increase interest expense which has an impact on tax reduction (Salehi et al. 2016).
Another strategy by the company to reduce the amount of tax is by tax avoidance. Tax avoidance here is an enterprise effort to reduce the amount of tax liability paid to the government by choosing methods and recognition that have an impact on the financial statements so that the tax burden paid is reduced (Annuar, Salihu, and Obid 2014; Desai and Dharmapala 2015; Lim 2011; Palanca and Zamudio nd; Sari 2014) In terms of legality, tax avoidance is divided into two, namely legal and illegal. The tax avoidance is carried out legally by looking for loopholes in the regulations that apply to a country's tax laws. Through these weaknesses, managers formulate strategies, one of which is the use of methods or assessments that will increase the company's burden. Whereas tax evasion is illegally carried out by the company to reduce the amount of tax through the use of methods and assessments that are contrary to applicable laws. In this study, looking at tax avoidance legally by taking into account applicable regulations.

In improving the performance and value of the company to meet the interests of the owner, managers store important information by developing strategies in financial reporting. The information is useful in making decisions for company development. But tax avoidance here shows management's behavior in reporting information that does not reflect the actual conditions of the company. This is due to the lack of supervision from the owner so that managers do asymmetric information that affects the financial statements. Tax avoidance practices have a negative impact on the owner because the information conveyed in the financial statements is not in accordance with the actual conditions and the manager uses methods that have an impact on the reduction in the amount of tax. This is because, managers fulfill the interests of the manager by expecting the promised compensation so that they look for strategies to improve the company's performance. So that managers in tax avoidance must be more careful because it will affect the sanctions received (Bauer, Kourouxous, and Krenn 2018; Oktaviyani and Munandar 2017)

One of the losers is institutional ownership. This ownership is the amount of ownership from outside the company, especially the institution that holds its capital in the company. Basically, investors expect returns on capital invested as well as institutional ownership. The institution is in the form of financial and non-financial companies. Similar to individual shareholders, institutional owners also have an interest in improving the performance and value of the company so that they ask management to work seriously in achieving these goals (Salehi et al. 2016).

The existence of institutional ownership means supervision from outside parties to run the company's operations properly and in accordance with regulations (Gillan and Starks 2003; Shleifer and Vishny, W 1986). But the lack of percentage of institutional ownership causes a lack of oversight from outside parties, thus causing the possibility of tax avoidance practices in the company (Agnes Cheng et al. 2012; McGuire, Wang, and Wilson 2014). Based on Leip's (2017) research, the number of institutional ownership smaller than 40% will lead to tax avoidance practices in companies. So that it is necessary to increase institutional ownership to avoid it.

The owner of the company wants to achieve the goal, the manager must carry out its operations without harming the owner (Jensen and Meckling 1979). But the manager has information related to the company's performance so that the lack of supervision from external parties causes the manager's freedom to comply with the company's financial reporting. In accordance with agency theory, there is a conflict of interest between owners who want the company to run in accordance with the resources they have where the expectation of improved performance but managers want increased performance in the short term in the hope of large compensation from the owner.
Research conducted by Hyun A. Hong, Ivalina Kalcheva (2017); Lim (2011); Saputra (2017) shows the results that the existence of institutional ownership makes supervision of the company's operational implementation good. This means that the higher institutional ownership causes managers to be more careful in delivering financial information and reports to the public due to tighter supervision. So that in the practice of tax avoidance, the existence of higher institutional ownership leads to a reduction in tax avoidance practices. This opinion is also supported by research conducted by Chang, Hsiao, and Tsai (2013); Leip (2017); Ratnawati et al. (2018); Salehi et al. (2016); Sari (2014); Ying, Wright, and Huang (2016). But in research conducted by Crocker and Slemrod (2005) and Slemrod (2004) shows a positive influence between institutional ownership on tax avoidance practices. On the contrary, research conducted by Chang, Hsiao, and Tsai (2013; Kholbadalov (2012); Masripah, Diyanty, and Fitriasari (2016); Oktaviyani and Munandar (2017) shows the results that institutional ownership does not affect managers in tax avoidance practices. These two opinions have not been obtained by empirical evidence of the existence of institutional ownership in the company against the practice of tax avoidance as a theoretical evidence of agency theory on the company.

In this study comparing between two countries, namely Indonesia and Singapore, which aims to look at the two countries of the state how the practice of tax avoidance is based on agency conflict. Every country has different tax regulations so that empirical evidence will be obtained about the practice. In addition, this study also looks at the characteristics of individual investors so that the results of this study provide information to the public about the characteristics of investors and tax avoidance practices between the two countries, namely Indonesia and Singapore.

3 Methodology

3.1 Research Sample

This research was conducted between two countries, namely Indonesia and Singapore. The type of company used is a manufacturing company listing 2015-2016. The type of data used is secondary data derived from the sample company's financial statements. Data is obtained from the Indonesia Stock Exchange and Singapore Stock Exchange.

3.2 Research Model

The model of this research is simple linear regression. The results of this model will be obtained information on the effect of institutional ownership on tax avoidance practices as evidence of agency theory by company owners and managers. The models in this study are as follows:

\[ TA_{it} = \alpha + \beta_1 x_{1i} + \epsilon \]

The \( TA_{it} \) is a tax avoidance practice as measured by ETR which is calculated by comparing the tax burden with the amount of net income before tax obtained by the company (Dyreng, Hanlon, and Maydew 2010; Lanis and Richardson 2013; Oktaviyani and Munandar 2017; Sari 2014). The value of tax avoidance is 25%, indicating that the smaller the company practices tax avoidance (Oktaviyani and Munandar 2017). While institutional ownership is measured by comparing the number of institutional ownership with the number of shareholdings contained in the company (see research by Saputra (2017); Thai Ha and Quyen
(2017). So that is obtained the knowledge whether the greater institutional share ownership has an impact on reducing tax avoidance practices.

4 Results and Discussion

4.1 Descriptive Statistics

The following are descriptive statistical results of institutional ownership in companies on the Indonesia Stock Exchange and the Singapore Stock Exchange.

<table>
<thead>
<tr>
<th>Institutional Ownership</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional Ownership</td>
<td>180</td>
<td>0.14</td>
<td>0.99</td>
<td>0.6659</td>
</tr>
</tbody>
</table>

Based on table 1, the results show that the number of institutional ownership in Indonesia is greater than 40%. So that indicates the high participation of institutional ownership in overseeing company activities. So that the avoidance of conflicts of interest between the principal and the agent and avoiding the practice of tax avoidance.

<table>
<thead>
<tr>
<th>Institutional Ownership</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional Ownership &gt; 40%</td>
<td>22</td>
<td>0.40</td>
<td>0.98</td>
<td>0.7006</td>
</tr>
<tr>
<td>Institutional Ownership &lt; 40%</td>
<td>42</td>
<td>0.01</td>
<td>0.39</td>
<td>0.1998</td>
</tr>
</tbody>
</table>

Based on table 2 above it can be seen that the average company listing on the Singapore Stock Exchange has more than 40% ownership which indicates that the supervision of external parties is high in the course of the company's operational activities. This result also indicates a smaller conflict of interest due to strict supervision of the implementation of company activities.

4.2 Results

The research model was tested using simple linear regression. Here are the results of testing the model using linear regression on companies listing on the Indonesia Stock Exchange.

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>T</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>-1.458</td>
<td>0.131</td>
</tr>
<tr>
<td></td>
<td>Institutional Ownership</td>
<td>0.207</td>
<td>0.189</td>
</tr>
</tbody>
</table>

Based on table 3 above it can be seen that institutional ownership does not affect the practice of tax avoidance both large companies and small companies. Besides that, the research model is obtained as follows:
The following are the results of testing the research model on companies listing on the Singapore Stock Exchange. In testing the hypothesis is divided into 2 parts, namely the ownership of institutions less than 40% and more than 40% as said in the research of Khan, Srinivasan, and Tan (2017). The following are the test results in Tables 2 and 3.

### Table 4 Hypothesis Testing with Ownership <40%

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>-1.638</td>
<td>0.286</td>
<td>-5.719</td>
</tr>
<tr>
<td>Institutional Ownership</td>
<td>-0.367</td>
<td>1.256</td>
<td>-0.293</td>
</tr>
</tbody>
</table>

Based on Table 4 above, the results show that institutional ownership does not have a significant effect on tax avoidance practices, although the percentage of ownership is less than 40% which indicates weakness in company supervision. The research model is:

\[ Y = -1.638 - 0.367X1 \]

### Table 5 Hypothesis Testing with Ownership > 40%

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>-1.801</td>
<td>0.333</td>
<td>-5.415</td>
</tr>
<tr>
<td>Institutional Ownership</td>
<td>0.208</td>
<td>0.464</td>
<td>0.449</td>
</tr>
</tbody>
</table>

Based on table 5 above, the results show that institutional ownership does not have a significant effect on tax avoidance practices even though ownership is greater than 40%. The model for ownership testing greater than 40% is:

\[ Y = -1.801 + 0.208X1 \]

### 5 Discussion

Based on the results of testing the linear regression analysis obtained the results that the existence of institutional ownership in a company in general does not affect managers in tax avoidance practices. This result is contrary to what was previously stated in agency theory. In agency theory, managers make tax planning that aims to reduce the amount of tax paid to the state legally. The aim is that the profits earned by the company are not too large to be paid to the state in the form of tax expense.

In addition, according to the agency theory that profits derived from tax avoidance are used for returns to owners and bonuses to managers. But on the contrary the results of this study indicate there is no influence both large and small institutional ownership contained in the company. Contrary to the opinion of Khurana and Moser (2009) that the percentage of institutional ownership in a company greatly influences the practice of tax avoidance by a company. This is due to institutional ownership as an internal supervisor in carrying out the company's operational activities. This is supported by Salehi et al. (2016) that institutional
ownership functions as a supervisor so as to minimize the practice of tax avoidance. This result is in line with research conducted by Kholbadalov (2012); Khurana and Moser (2009); Masripah, Diyanty, and Fitriasari (2016); Sari (2014) where the results of this study indicate that there is no influence between institutional ownership on tax avoidance practices.

The results of this study indicate that institutional ownership does not always function as a supervisor in a company or that there are other interests of institutional ownership in taking ownership of a company such as to be easy to monitor in terms of profit sharing, supervision of debt payments, and others (Kholbadalov 2012). Based on the results also shows that managers have other interests in improving the performance and value of the company which aims to attract the attention of investors in investing in the company. With the increasing performance, investors are expected to have a positive outlook on the company.

In addition, this study was conducted in two countries, namely Indonesia and Singapore, which indicated that both share ownership in Indonesia and Singapore paid little attention to supervision of tax avoidance practices in both Indonesia and Singapore where institutional ownership generally did not affect tax avoidance practices. If we look like in companies in Indonesia, the amount of institutional ownership exceeds 50% which is seen in the average share ownership where supervision of the company is very large but does not have an impact on tax avoidance practices. So that there are other interests such as in overseeing investment decision making, supervision of dividends, supervision of payment obligations, and others. So this result also contradicts the research conducted by Khan, Srinivasan, and Tan (2017); Leip (2017); Ratnawati et al. (2018); Salehi et al. (2016); Ying, Wright, and Huang (2016) where institutional ownership has a negative effect on tax avoidance practices. The results of this study indicate that there is evidence of the practice of agency theory where institutional ownership supervises managers who have different interests with company owners.

1 CONCLUSION

Based on the results of the research model, it was concluded that the number of institutional ownership in both Indonesia and Singapore did not have a significant influence on tax avoidance practices as evidenced in the research conducted by Khan, Srinivasan, and Tan (2017); Khurana and Moser (2009); Leip (2017); Ratnawati et al. (2018); Salehi et al. (2016); Sari (2014); Ying, Wright, and Huang (2016). These results indicate that institutional ownership has other interests such as dividend payments, supervision of debt payments, and others. In addition, managers improve the performance and value of the company aims to attract the attention of investors in investing their capital in the company so that it becomes an additional capital that can be used to develop the company. The results of this study are in line with research conducted by L. L. Chang, Hsiao, and Tsai (2013); Kholbadalov (2012); Masripah, Diyanty, and Fitriasari (2016); Oktaviyani and Munandar (2017).
References


Reception Écrite Teaching and Learning Model Based on Multiliteracies Approach (A Strategy in Improving Students’ Multiliteracies)

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Abstract. The twenty-first century life demands the mastery of various twenty-first century skills. Therefore there is a need for learning innovation that can enhance the mastery of students’ multiliteracies in a specific learning process. Teaching multiliteracies in a learning process requires a teaching model, in which several literacies could be taught synergistically and systematically. Multiliteracies is a skill in using various methods to understand concepts and information by using various kinds of texts - whether conventional or innovative, symbols, and multimedia. Multiliteracies is also considered as the ability to view learning integratively, thematically, multimodally, and interdisciplinarily. In this case, academic language plays an important role in the teaching and learning process. Consequently, the students are expected to be able to master academic language and literacy properly. Because of the importance of multiliteracies mastery, and in order to simplify Reception Écrite teaching and learning process, Reception Écrite teaching and learning model based on multiliteracies approach will be developed in this study. The study aims to obtain a good quality Reception Écrite teaching and learning model based on multiliteracies approach. In line with the purpose, there will be a developmental research with reference to the concepts of development by Plomp (1997), which are (1) investigation, (2) design, (3) realization/construction, (4) test, evaluation, and revision and (5) implementation.

Keywords: Teaching and Learning Design, Production Écrite, Twenty-First Century.

1 Introduction

The ability to speak French of the students of French Language Education Study Program at the State University of Medan (UNIMED) is still not so good yet. Based on the data obtained from the study program, the graduates who received DELF B2 international certificate is just 10%. This has been a serious problem that must be solved sooner than later. On the other hand, there is a demand of life in the twenty-first century which requires the mastery of multiliteracies. Therefore, learning must facilitate students to master multiliteration wherever possible.

To date, French learning in the French Language Education Study Program at UNIMED was carried out partially through grouping of four main courses, namely (1) reception orale, (2) reception écrite, (3) production orale, and (4) production écrite. On the one hand, this separation can focus more on one particular language skill, while on the other hand this separation often results in overlapping materials because the books used are the same. This
separation also affects the difficulty of choosing the right learning model in accordance with
the characteristics of the four subjects of language skills. In line with this, it is necessary to
develop appropriate learning models to teach all four French language skills and other literacy.
Learning models that are considered appropriate are learning models based on multiliteration
learning approaches.

Multiliteracies is the skill of using various ways to express and understand ideas and
information using conventional text forms as well as innovative text, symbols and multimedia.
From multiliteracies perspective, students need to be experts in understanding and using
various forms of text, media, and symbol systems to maximize their learning potentials, follow
technological changes, and actively participate in global communication. Thus, multiliteracies
learning is aimed at developing students' skills in critical literacy, visual literacy, media
literacy, technology literacy, cross curriculum literacy, and literacy in other languages
(Abidin, 2015: 51).

Luke (Kist, 2005: 41) states that multiliteracies is the ability to view knowledge (learning)
in an integrative, thematic, multimodal, and interdisciplinary manner. In this case academic
language plays a very important role in the learning process. In line with this reality, students
are required to be able to master academic language and literacy competently (Abidin, 2015:
53).

The formulation of the research problem is how the process and the results of developing
the Reception Écrite Learning Model Based on Multiliteracies Learning Approach are of good
quality? The study aims to produce a Reception Écrite Learning Model Based on
Multiliteracies Learning Approach of good quality.

## 2 Method

The object of this research is the development of Reception Écrite Learning Model Based
on Multiliteracies Learning Approach (MP-REBP2M). The data that will be collected, namely
(1) data on the process of developing Reception Écrite Learning Models Based on
Multiliteracies Learning Approaches, and (2) the quality of the Reception Écrite Learning
Model Based on Multiliteracies Learning Approaches in terms of validity, practicality, and
effectiveness. This research will use a developmental research approach, based on Plomp's
(1997) development theory, which consists of: (1) investigation phase, (2) design phase, (3)
realization/construction phase, (4) test, evaluation, and revision phase, and (5) implementation
phase.

In the investigation phase, researchers will conduct an in-depth study of the things needed
to carry out the development of the Reception Écrite Learning Model Based on the
Multiliteracies Learning Approach. This study includes analysis of documents related to
research needs, analysis of student needs, and analysis of lecturer needs in learning.

In the design phase, the design of the Reception Écrite Learning Model Based on the
Multiliteracies Learning Approach will be carried out. The design of this model is in the form
of learning model and specifications.

In the construction phase, the learning model will be developed based on the format and
specifications of the learning model.

In the test, evaluation, and revision phase, experts will evaluate the learning model that has
been developed, and continue with revisions based on input from the experts. This process
will run continuously until a valid learning model is obtained.
After obtaining a valid learning model, it will proceed with the implementation phase. In this phase the product development test will be conducted in the trial class.

Data on the process of developing a learning model will be obtained through observation by researchers. Data validity of learning models will be obtained through experts’ judgments. Data on the practicality of the learning model will be obtained through the assessments of students and instructors on the learning model. Data on the effectiveness of the learning model will be obtained by comparing the results of the pretest with the posttest.

Data about the learning design development process will be analyzed descriptively qualitative. Data on validity, practicality, and effectiveness of learning design will be analyzed quantitatively and qualitatively.

3. Theoretical Framework

The world of work in the 21st century requires mastery of four groups of skills, namely (1) thinking skills, (2) working skills, (3) using tools to work skills, and (4) life skills (Binkley, et al. 2012: 18-19). The four groups are developed into ten competencies, namely (1) critical thinking, problem solving, and decision making, (2) meta-cognition, (3) creativity and innovation, (4) collaboration, (5) communication, (6) life and career, (7) information literacy, (8) information and communication technology literacy, (9) citizenship attitude, and (10) personal and social responsibilities.

There are four characteristics of 21st century learning, namely (1) information, (2) computing, (3) automation, and (4) communication (Abidin, 2015: 102-103). The first characteristic of 21st century learning is the characteristic of information where learning must encourage students to find out, not be told. This feature is in line with the Constructivism theory which views that knowledge is the result of cognitive construction through one's activities. Humans construct their knowledge through interaction with objects, phenomena, experiences, and their environment (Paul Suparno, 1997).

The second characteristic, which is computing, is where work can be completed more quickly and precisely using computer technology. Fatima Pirbhai - Illich, K.C. Nat Turner, and Theresa Y. Austin, (2009) in their research states that digital literature as a multiliteracies section needs to be developed in the context of teaching where learning is demanded by many factors. The inclusion of a digital curriculum provides greater possibilities for academic success for students who are marginalized in mainstream schools and alternative schools.

The third characteristic, which is automation, is that all dimensions of life can be controlled automatically. Learning must be able to foster students to think critically. This critical thinking ability is part of higher order thinking skills that must be trained in learning.

The fourth characteristic is communication, where learning must be able to practice communication and collaborative skills. Kenneth David Strang (2015) in his research states that business schools and other disciplines can apply collaborative learning models to help students improve exam results, reduce differences in views regarding gender, age, and ability.

In line with the paradigm and characteristics of 21st century learning, a learning model is needed that can develop students’ multiliteracies. Learning must be able to integrate various literacies needed in a learning process. In learning French, for example, to learn listening skills must involve other language skills. Furthermore, if the listening learning activity uses technology as a learning medium, it means that technological literacy has been developed in the learning process. In connection with this, and to optimize learning outcomes, a multiliteracies approach based learning model is needed.
Before discussing the concept of multiliteracies, we will first discuss the concept of literacy. Literacy is traditionally considered as the ability to read and write. Along with the passage of time, the concept of literacy has expanded to various other important fields. The concept of literacy has undergone five phases of development. In the early generation literacy was only defined as the ability to use language and images for reading, listening, speaking, writing, seeing, presenting, and thinking critically about ideas. In the second generation, literacy was related to the situation and social practice. In the third generation, literacy experienced a growing of understanding of the rapid progress of information and multimedia technology. In the fourth generation, it was seen as a social construction and was never neutral. In the fifth generation, the term literacy is better known as multiliteracies where literacy has covered various fields of life (Abidin, 2015: 50-51).

Multiliteracies is a way of understanding more broadly the literacy curriculum learned in the world of formal education so that students are able to participate productively in society (Baguley, et al., 2010). Conceptually, multiliteracies is a design that can be used to understand various types of texts and media through pedagogic concepts to make it easier for teachers to present information using text and media. With the learning based on multiliteracies learning model approach, learning activities will become more effective and efficient (Cope and Kalantzis, 2005). Furthermore, Iyer and Luke (2010) states that students who learn to use multiliteracies approach will gain a higher understanding.

To be able to better implement the multiliteracies learning approach in Reception Ecrite learning, a multiliteracies learning approach based learning model is needed. The learning approach does not provide a clearer description of the learning syntax, social system, support system, and instructional impact and impact of learning accompaniment.

Learning model is a plan or a pattern that is used as a guideline in planning learning in class or in tutorial activities (Joice & Weil, 1992: 4). It is used to determine learning devices, and serves as a guide for teachers in designing learning. Eggen (1996: 11) states that learning model is a learning perspective strategy designed to achieve learning goals.

The opinions stated above clearly state that learning model is a learning perspective strategy in which it describes systematic procedures in regulating learning activities, and serves as a means to achieve learning goals. A learning model will largely determine what learning tools are needed to achieve the learning objectives set.

A learning model can be analyzed based on five operational core concepts of learning models namely: (1) syntax, (2) social systems, (3) reaction principles, (4) support systems, and (5) instructional and accompanying effects (Joice & Weil, 1992: 13-16).

Syntax is the phases or steps of the activities of the model which is a series of learning activities. The learning syntax shows the activities that need to be done by lecturers and students during learning activities. The social system is the situation or atmosphere and the norms that apply in the model. The principle of reaction is the way lecturers view and respond to what students do. The support systems are means, infrastructure, learning materials, and tools needed to implement the model. Instructional and companion impacts are learning outcomes that are achieved directly by directing students to the expected goals. To be able to develop the Reception Écrite learning model based on multiliteracies learning approach, a conceptual framework is designed as follows.
In order for the concept of multiliteracies learning approaches to run well, it is necessary to integrate multiliteracies activities in reception écrite learning. This integration is in line with integrated learning theory developed by experts such as Joni (1996: 3) who states that integrated learning is a learning system that allows students, both individually and in groups, to actively explore and discover scientific concepts and principles holistically, meaningfully, and authentically. Integrated learning will occur if authentic events or exploration of topics or themes become controllers in learning activities. By participating in the exploration of the theme/event, students learn the process and contents of several subjects simultaneously. Integrated learning is also seen as learning that begins with a particular subject that is related to other subjects that are carried out spontaneously or planned, both in one field of study and with various learning experiences of students.

There are several theories that are in accordance with the principles of multiliteracies learning such as Piaget, Vygotsky, Constructivism, and John Dewey and Herbert Thelan theory. In Piaget's theory it is said that every child has an innate curiosity that drives him to interact with his environment. Piaget believes that physical work experience and environmental manipulation will develop his abilities. He also believes that social interaction with peers will clarify the results of his thinking more logically (Slavin, 2000: 32).

Reception Écrite Learning Model Based on Multiliteracies Learning Approach directs students to engage in task completion activities and problem solving in groups. The interaction between students is facilitated by the lecturer, allowing subjective knowledge that is built by each student to become objective knowledge.
In Vygotsky's theory it is stated that the acquisition of "sign system" occurs in the sequence of invariant stages for each child as stated by Piaget. It's just that Vygotsky sees differently in the "triggers" of children's cognitive development. According to him, the child's cognitive development is very strong with input from other people. In connection with this, learning needs to be done cooperatively, and the importance of learning approaches that emphasize scaffolding (Slavin, 2000: 46-47).

Vygotsky's theory provides a strong foundation for the Reception Écritte Learning Model Based on Multiliteracies Learning Approach. Students will be grouped into several groups with heterogeneous backgrounds. They are trained to interact, work together, complement each other, and help each other. For underprivileged students will get guidance from capable students, and also guidance from lecturers.

Constructivism theory considers that knowledge is the result of cognitive construction through one's activities (Paul Suparno, 1997). In learning to use the Reception Écritte Learning Model Based on Multiliteracies Learning Approach, the knowledge gained by students is not obtained passively (transferred from lecturers), but is actively constructed by the students themselves. The results of individual construction and group construction still need to be discussed in class to obtain objective knowledge.

The theory of John Dewey and Herbert Thelan states that lecturers need to create a social system characterized by democracy and scientific processes in the classroom learning environment. The responsibility of the lecturer is to motivate students to learn cooperatively and think about social problems every day. Classes must be used as a miniature of democracy that aims to examine social and interpersonal problems (Arends, 1997: 112). In the Reception Écritte Learning Model Based on Multiliteracies Learning Approach, the concept of John Dewey and Herbert Thelan is seen in the heterogeneous members of student learning groups. Students will discuss to explore learning materials and conduct critical reading activities.

4. Conclusion

The world of work in the 21st century requires the mastery of four groups of skills, namely (1) skills in ways of thinking, (2) skills in how to work, (3) skills to use tools to work, and (4) life skills. To be able to reach these four skill groups, learning innovation is needed that can develop multiliteracies on students. One form of learning innovation in question is to develop a reception écrite learning model based on a multiliteracies approach.

Reception écrite learning model based on a good multiliteracies approach must include five components of learning model, namely (1) syntax, (2) social systems, (3) reaction principles, (4) support systems, and (5) instructional and accompanying effects. In these five components there must be a learning process that trains students' multiliteracies skills.

References

Development of Interactive Learning Model Based on E-Learning on Instructional Design

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Abstract. This study aims to develop an interactive e-learning based learning model assisted by the Edmodo program in the instructional Design Course, this research is expected to produce (1) produce e-learning based interactive learning model that are feasible to use, easy to learn and can be used for individual learning and learning material that refers to the competencies that have been set, (2) to find out the result of the implementation of e-learning based. Interactive Learning Model in instructional design courses and the right strategies used in instructional design learning, (3) to determine the effectiveness of e-learning interactive Learning Models learning develop in instructional design courses as well as to find out effective and efficient interactive learning models. This research was conducted in the State University of Medan Post Graduate, Education Technology Study Program in 2016 until 2018. The target population was all student who were receiving Instructional Design sources. The Sampling technique used in Cluster Random Sampling. To achieve this research, the overall research uses research and development methods by following the steps of the preliminary survey, media planning, media testing, media testing, media validation and socialization. This research was carried out in there stages 2017 is a research in the second year at the Validation stage. Validation carried out includes validation of media experts and design and material experts. In validation to validation by experts, individual validation was also carried out on 3 students, then group validation of 5 students after improving individual validation result. After that the validation is done on the actual class.

Keywords: Model, Development, e-Learning

1 Introduction

The success of improving the quality of human resources through education is related to various aspects, one of which is the ability of lecturers to design a learning process. In this regard, Roodjakkers (1993) states that teaching is an attempt to transmit knowledge to others [1]. Furthermore, Gagné, Briggs and Wager (1992) say that learning is an activity that can make learners learn and easily know what is delivered [2]. The achievement of this can not be separated from the use of learning media which is a tool to deliver messages. This is in accordance with the opinion of Jaemu Lee and Yong-Jae Lee who stated that: "The successful design of e-learning relies on careful consideration of the underlying pedagogy of how
learning takes place online and e-Learning will yield new levels of institutional and instructional productivity [3].

The development of science and technology has led to changes in learning materials. There are two types of learning material, namely written teaching materials and teaching materials as learning media, or called printed teaching materials and non-printed teaching materials. Non-printed teaching materials are teaching materials developed to enrich students' understanding of the subject matter learned, in addition to filling in the shortcomings that arise due to reading culture problems as well as time constraints and to answer the diversity of student learning styles. The development of non-printed teaching materials must be able to make the most of its media capabilities. In other words, the selection of material in accordance with the specified media is an important first step, using a language that is simple, communicative and clear, capable of involving students' thinking processes, and allowing students to achieve a level of mastery independently.

Education that gets a touch of information technology media has sparked the birth of the idea of e-learning or electronic learning. There are various types of e-learning such as Moodle, Blackboard, Sakai, Dokeas and edmodo assisted e-learning which are currently the most widely used. E-learning is learning that uses electronic circuits or internet networks to convey the content of learning, interaction or guidance (Rusman, 2009: 49). In addition, e-learning as a form of distance education is done through internet media. E-learning is also an indirect (asynchronous) learning activity through computer electronic devices to obtain learning material that suits their needs.

Educational Technology Study Program (ET) is one of the study programs in the Faculty of Postgraduate Studies at the State University of Medan. One of the Educational Technology areas is the utilization area, so the use of information technology in learning activities is needed in improving the quality of learning and naturally the learning outcomes of students will increase. Pratama (2014: 45) said, that some of the problems that occur in learning in the world of education are (1) most of the learning concepts that are carried out are abstract, (2) limited time available to teach material to be delivered and (3) lack of participation learners in the learning process. Pratama (2014: 45) also found that these problems can be overcome by using concrete models of teaching materials in the form of images, animations or videos delivered by teaching staff and applying learning approaches that involve students, which can be done by utilizing the internet as a communication tool to maximize the participation of students so that the limitations of time constraints can be overcome, and provide teaching materials that can be learned individually by students outside the classroom.

This form of learning innovation is by integrating the instructional design learning process with Communication Information Technology which is better known as e-learning based interactive learning. One of the most interactive e-learning models based on instructional design learning is Edmodo-assisted interactive learning model. Edmodo is a site used by teachers / lecturers, students and parents to facilitate the online learning process. The main goal of making EDMODO as a social media tool that helps connect teachers and students in each school also ensures they are connected throughout the world. Edmodo spurs a safer and easier class to connect with one another, offering a real time-based platform to exchange ideas, content, and access homework, values, and important information from school. This interactive learning model helps to plan, analyze, implement, manage learning and provide access to learners of the material whenever and wherever students are.
2 Methodology

2.1. Development Model

The research method used is the development method. The development model used was a modified version Borg and Gall (1983) development model [7]. The steps of the development stage are as follows: 1) Research and information collecting (Planning and Initial Information Collection). In this case, literature studies related to the problems are conducted, 2) Planning. At this stage the activities are related to the formulation of skills and expertise related to the problem, 3) Developing a preliminary version of product. At this stage, an initial form of e-learning model will be developed that will be produced in the development of learning models, 4) Preliminary field testing. This stage is a stage of testing on a limited scale based on observation or questionnaire, 5) Main product revision (Revision of Learning Products). At this stage, it will be reviewed and improvements to the initial learning products produced based on the results of the initial trial will be made, 6) Operational product revision. At this stage there will be improvements based on the results of a wider trial, 7) Final product revision. At this stage improvements will be made to the developed learning model, 8) Dissemination. At this stage implementation activities will be carried out.

The syntax of the learning model offered is as follows

![Figure1: E-Learning Syntax](image-url)
2.2 Research Procedure

This research will actively involve students, both in the preliminary studies, product development, development of teaching materials, product testing and final product design. Systematically, the research that will be conducted is as follows:

This research was carried out in three stages. Each stage is the implementation of the year. At this stage the research was carried out in the first stage. The first phase of this activity is to analyze the e-learning media that is most appropriate to be used in instructional design learning, through surveys in preliminary studies, including identification of learning needs, identification of student characteristics, identification of students' initial abilities, as well as the competency standards of courses which include analysis of learning. Moreover, identification of the characteristics and initial behavior of students, determination of basic competencies and indicators are also conducted. The learning outcomes test that will be made in e-learning is a benchmark reference test. The next activity is to develop learning strategies, develop learning materials. In addition, in this learning there is also a quiz that must be completed by students, therefore it is necessary to compile questions at the end of each specified material and provide feedback. Then, proceed with the preparation and design of the software including: making a script, making a storyboard, and making a flowchart view.

The second stage is the second year. The activities carried out at this stage are collecting materials, including: making and collecting images and animations, recording and collecting audio, developing and making interactive e-learning learning media. The next activity is a study of the media, competencies, and learning materials that have been found in the first stage. Learning media, learning materials, competencies will be tested on small and large scale as well as input for the initial stage revision. Thus, in the second initial phase there will be limited trials, large-scale trials, revisions, and finished results. In the second phase of the study, a trial method was used through the procedure (a) expert review, (b) one-on-one trials, (c) small group trials, and (d) large group trials (real class) for learning media which is operational.

The third stage is the third year. Activities carried out at this stage are preparing guidelines (guidelines) for the implementation of the use of interactive e-learning learning media, evaluation, dissemination and development that can be carried out in the form of experiments to see the effectiveness and efficiency of interactive learning media products developed.
2.3 Data Collection and Analysis

For measurement of the effectiveness and practicality of e-learning-based interactive learning models in this study, the e-learning used is Edmodo. Thus, several research instruments were developed and compiled that will be used in the study. Before the Instrument was used, the trial included: includes: expert trials, individual trials, small groups and actual large groups or groups.

3 Results

Based on the results of product development, it was found that Edmodo-assisted e-learning for instructional design courses contained several important menus including evaluation, presentation, discussion, lecture assignments, teaching materials, instructional media, important links, learning tools, and plagiarism check.

Main Menu contains a description of the instructional design courses and the lecturers involved in this course. The Evaluation Menu contains items related to the formative. Besides that, it also presents the evaluation material that will be tested. Presentation menu contains the material that will be presented such as instructional needs analysis, instructional analysis, development of benchmark reference tests, learning strategies, development of teaching materials. The discussion menu contains important things that need to be discussed related to the basic competencies that exist in instructional design courses. Lecture Task Menu is a
collection of tasks that students must complete according to the time displayed on this menu. Delay in collecting assignments online indicates that the student is unable to send it back, except with the permission of the subject lecturer. Menu of Teaching Materials is a collection of teaching materials that will be used in Edmodo-assisted e-learning. Students can download instructional materials presented by course lecturers with the permission of the lecturer. Learning Media Menu presented several materials related to learning media. This material can be in the form of powerpoint, word document, excel sheet, images which include extension jpg, bup, etc., as well as videos with wmv and other extensions. Link menu contains several links related to instructional design learning materials. This link is a web address that can be used to add information to students regarding additional material needed. Learning Device Menu contains learning tools in instructional design courses. The devices in question include lecture contracts, semester learning plans, quizzes, and others. Check Plagiarism menu can check the tasks collected by students for plagiarism. This is needed especially in the assessment. The lecturer must be able to give a good assessment related to the creativity of the student's work. The check plagiarism menu is presented as follows.

3.1 Validation Result Data

3.1.1 Expert Validation Results Data on Material

Validation of learning devices based on material Expert is to obtain information related to the compatibility between the material presented in Edmodo-assisted e-learning and the basic competencies found in instructional design course. The material expert in this case involves competent people in their fields. The basic competencies and indicators that will be studied in this course are some basic competencies and several indicators derived from basic competencies.

Evaluation of material experts on the development of EDMODO-assisted e-learning based interactive learning tools for instructional design courses was conducted by Education Technology lecturers at the State University of Medan. Assessment is done to get information about the quality of learning on instructional design course. The validator involved in material validation consists of two experts. Expert validation scores of edmodo-assisted e-learning based interactive learning materials can be seen in table 1.

<table>
<thead>
<tr>
<th>Assessment Indicator</th>
<th>Average</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content Aspect</td>
<td>4</td>
<td>Good</td>
</tr>
<tr>
<td>Presentation Aspect</td>
<td>3.86</td>
<td>Good</td>
</tr>
<tr>
<td>Language Aspect</td>
<td>4.8</td>
<td>Very good</td>
</tr>
<tr>
<td>Overall average</td>
<td>4.22</td>
<td>Very good</td>
</tr>
</tbody>
</table>

Table 1. Expert Validation Score on Learning Materials

There are three important things that are validated in the material, namely aspects of content appropriateness, aspects of presentation appropriateness, and linguistic appropriateness aspects. Based on the table, it is obtained that for the aspect of content...
appropriateness, the average score is 4 and is in the good category. Furthermore, for the aspect of presentation appropriateness, the average score was 3.86 and in the good category, while for the aspect of linguistic appropriateness, the average score was 4.8 and in the very good category. Based on the table, the overall average is 4.22 or in the very good category. Based on this, it was found that learning material could be used.

3.1.2 Expert Validation Results Data on Learning Media

Validation of learning media was carried out to obtain information about product evaluation in several aspects including aspects of usage, navigation system, graphic design, content, access ability, access speed, and function. Validator that validates learning media consists of three experts. Expert validation scores on edmodo-assisted e-learning-based interactive learning media can be seen in the table 2.

<table>
<thead>
<tr>
<th>Assessment Indicator</th>
<th>Average</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utility</td>
<td>4.33</td>
<td>Very good</td>
</tr>
<tr>
<td>Navigation System</td>
<td>4.67</td>
<td>Very good</td>
</tr>
<tr>
<td>Graphic Design</td>
<td>4.48</td>
<td>Very good</td>
</tr>
<tr>
<td>Content</td>
<td>4.52</td>
<td>Very good</td>
</tr>
<tr>
<td>Accessibility</td>
<td>4.00</td>
<td>Good</td>
</tr>
<tr>
<td>Speed of Access</td>
<td>3.92</td>
<td>Good</td>
</tr>
<tr>
<td>Function</td>
<td>3.83</td>
<td>Good</td>
</tr>
<tr>
<td>Overall average</td>
<td>4.25</td>
<td>Very good</td>
</tr>
</tbody>
</table>

Some indicators that are validated by experts related to e-learning media include the use of an average score of 4.33 with very good categories, the navigation system obtained an average score of 4.67 with a very good category, graphic design obtained average average score of 4.48 with a very good category, content / content obtained an average score of 4.52 with a very good category, access ability obtained an average score of 4.00 with good category, access speed obtained an average score amounting to 3.92 with good category, and the function obtained an average score of 3.83 with good category. The average overall score of the indicator is 4.25 and is in a very good category. Evaluation results from media experts were analyzed by developers and discussed again with media experts as a basis for revision to improve instructional design learning design. Overall, the assessment, input and suggestions from material experts and media experts serve as the basis for making decisions to carry out the revision of the role of material experts. Yet, media experts did not stop at this stage; the discussion of the revised results continued until the e-learning-based interactive learning tools were finished and ready to be disseminated.

3.1.3 Individual Trial Test Data Result (Restricted)

Individual trials were conducted at the Education Technology study program at the State University of Medan. Individual trials were conducted on three random students who had high achievement, moderate achievement, and low achievement each. The purpose of this
individual trial is to identify the shortcomings of edmodo-assisted e-learning-based interactive learning model. Data on individual trial results can be seen in the table 3:

<table>
<thead>
<tr>
<th>Assessment indicators</th>
<th>Average</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Aspect</td>
<td>3.83</td>
<td>Good</td>
</tr>
<tr>
<td>Material Aspect</td>
<td>4.00</td>
<td>Good</td>
</tr>
<tr>
<td>Information Aspect</td>
<td>4.13</td>
<td>Very good</td>
</tr>
<tr>
<td>Overall average</td>
<td>3.99</td>
<td>Good</td>
</tr>
</tbody>
</table>

There are three aspects tested in individual trials including aspects of appearance. In this aspect of view there are eight indicators that are used as a reference. Based on the results of individual trials, the average score was 3.83 and in the good category. The next aspect is the material aspect. In this aspect there are nine indicators that will be assessed. This material aspect obtained an average score of 4 and was in the good category. The last aspect is the aspect of information. In this aspect there are five indicators that are assessed. In this aspect an average score of 4.13 was obtained and in the Very good category. Based on the table, the overall average score is 3.99 and is in the good category.

3.1.4 Small Group Data Test Result

Small group trials were carried out in the same class involving five students consisting of 2 high-achieving students, 2 middle-achieving students and 1 low-achieving student. This small group trial data is intended to find out some of the weaknesses or obstacles faced when the e-learning based interactive learning model with Edmodo is done in a wider trial. This small group trial was used as an initial experience before the e-learning model was tested in the field. The small group test results data can be seen in the table 4.

<table>
<thead>
<tr>
<th>Assessment Indicator</th>
<th>Average</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Aspect</td>
<td>3.91</td>
<td>Good</td>
</tr>
<tr>
<td>Material Aspect</td>
<td>4.07</td>
<td>Very good</td>
</tr>
<tr>
<td>Information Aspect</td>
<td>4.04</td>
<td>Very good</td>
</tr>
<tr>
<td>Overall average</td>
<td>4.01</td>
<td>Very good</td>
</tr>
</tbody>
</table>

There are three aspects that are tested in small group trials including aspects of the display which involve eight indicators as a reference for assessment. Based on the results of the small group trial, the average score was 3.91 and in the good category. The next aspect is the material aspect. In this aspect there are nine indicators that are used as a reference for assessment. In this material aspect an average score of 4.07 is obtained and is in the Very good category. The last aspect is the aspect of information. In this aspect there are five indicators that are assessed. In this aspect, the average score is 4.04 and is in the Very good category. Based on the table, the overall average score was 4.01 and was in the Very good category.
3.1.5 Large Group Trials (Field Test) Data Results

Large group trials or field trials were carried out by first correcting the deficiencies of existing deficiencies found in initial product trials, individuals and small group tests. Large group trials were carried out in two classes, namely class A and class B in the study program of Education Technology with a total of 23 students. Large group trials were conducted at the State University of Medan Postgraduate Program. Each student uses a computer that is connected to the internet in the learning process. From the results of the large group trial, the data obtained can be seen in the table 5.

<table>
<thead>
<tr>
<th>Assessment Indicator</th>
<th>Average</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Aspect</td>
<td>4.24</td>
<td>Very good</td>
</tr>
<tr>
<td>Material Aspect</td>
<td>4.41</td>
<td>Very good</td>
</tr>
<tr>
<td>Information Aspect</td>
<td>4.43</td>
<td>Very good</td>
</tr>
<tr>
<td>Overall average</td>
<td>4.36</td>
<td>Very good</td>
</tr>
</tbody>
</table>

The same is true for small group trials. In the large group trial there were three aspects tested including aspects of the display which involved eight indicators as a reference for assessment. Based on the results of the trial of large groups on display aspect, an average score of 4.24 is obtained and is in a very good category. The next aspect is the material aspect. In this aspect there are nine indicators that are used as a reference for assessment. In this material aspect, the average score was 4.41 and in the very good category. The last aspect is the aspect of information. In this aspect there are five indicators that are assessed. In this aspect an average score of 4.43 is obtained and is in a very good category. Based on the table, the overall average score was 4.36 and in the very good category.

3.2 Data Analysis

a. Validation Data Analysis for Material Experts

Validation carried out by material experts related to Edmodo-assisted e-learning-based interactive learning covers three aspects, namely aspects of content appropriateness, aspects of presentation appropriateness, and linguistic appropriateness aspects. Based on the data obtained, the average presentation appropriateness aspect score has the lowest score compared to the other aspects of 3.86 and is in the good category. The content appropriateness aspect has an average score of 4 and is in the good category and linguistic appropriateness aspect has an average score of 4.8 and is in the very good category. On average, the overall aspects were at 4.27 and in the very good category. The results of the assessment of the material indicate that the errors in the material are very small errors and can be ignored such as typing errors which can be improved by revising.
b. Media Expert Validation Data Analysis

Assessment conducted by media experts shows that overall it has been very good, which is indicated by the average overall score obtained at 4.25. The aspect that has the lowest average score is the function aspect of 3.83, even though the average score is still in the good category. There are seven aspects that are assessed in this media validation, namely 1) aspects of utility with an average score of 4.33 and in the very good category, 2) navigation aspect with an average score of 4.33 and in the very good category, 3) aspect of graphic design with an average score of 4.48 and in the very good category, 4) the aspect of content with an average score of 4.52 and in the very good category, 5) aspect of accessibility with an average score of 4 and in good category, 6) access speed with an average score of 3.92 with good category, and 7) function aspect with an average score of 3.83 and in good category. Based on the experts' opinion, it was stated that edmodo-assisted e-learning-based interactive learning was feasible to be tested and revised according to the advice given. The experts state that interactive learning based on edmodo-assisted e-learning is acceptable and much needed.

c. Analysis of Individual Trial Results Data

Based on the results of the trial data conducted on three students, the average overall score was 3.99 and in the good category. There are three aspects as the indicators in the assessment related to the individual ciba test. The aspect that has the highest score average is the aspect of information that is equal to 4.13. The highest score in this aspect of information is indicated by the indicator for giving new information, with an average of 4.67. This shows that edmodo-assisted e-learning based interactive learning is very helpful for students to obtain information according to their learning needs. The aspect that has the lowest average score is the aspect of display with an average score of 3.83. This shows the need for improvement on input that has been made in this trial. The lowest indicator in this aspect is an indicator of navigation with a score of 3.00. Although this aspect has the lowest score, this aspect is in the good category. Another aspect is the material aspect. In this aspect, the average score was 4.00 and in the good category. Indicators that have the highest score are indicators of material suitability and ease of understanding sentences in the text which is indicated by a score of 4.67. This shows that all the material presented is in accordance with the needs of the subject and the needs of students. The following are the aspects of each student based on individual trials.

<table>
<thead>
<tr>
<th>Assessment Indicator</th>
<th>Student 1</th>
<th>Student 2</th>
<th>Student 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Aspect</td>
<td>3.63</td>
<td>3.88</td>
<td>4.00</td>
</tr>
<tr>
<td>Material Aspect</td>
<td>3.89</td>
<td>4.11</td>
<td>4.00</td>
</tr>
<tr>
<td>Information Aspect</td>
<td>4.20</td>
<td>4.00</td>
<td>4.20</td>
</tr>
<tr>
<td>Average</td>
<td>3.87</td>
<td>3.99</td>
<td>4.05</td>
</tr>
<tr>
<td>Criteria</td>
<td>Good</td>
<td>good</td>
<td>Very good</td>
</tr>
</tbody>
</table>

Based on the data obtained it can be seen that each student gives an average score of 3.87, 3.99, and 4.05 which is in the category of good, good, and very good. This shows that edmodo-assisted e-learning-based interactive learning can be used for the next phase of testing.
d. Analysis of Small Group Test Results Data

Based on the data from the trials conducted on five students, the average overall score was 4.01 and in the good category. In this case the average score obtained has increased compared to individual trials, this is because there have been improvements made. There are three aspects as indicators in the assessment related to small group trials. The aspect that has the highest average score is the aspect of the material that is equal to 4.07. The highest score in this aspect of information is indicated by the indicator for giving new information, with an average of 4.60. This shows that edmodo-assisted e-learning based interactive learning is very helpful for students to obtain information according to their learning needs. The aspect that has the lowest average score is the aspect of display with an average score of 3.91. This shows that there is still a need to improve the input that has been made in this trial. The lowest indicator in this aspect is a navigation indicator with a score of 3.40. This indicator has increased from the previous one which only got a score of 3.00. Although this aspect has the lowest score, this aspect is in the good category. Another aspect is the material aspect. In this aspect, the average score is 4.07 and is in the very good category. Indicators that have the highest score are indicators of material suitability, accuracy of the order of presentation, and ease of understanding the ease of understanding the subject matter presented in accordance with the needs of the course and the needs of students. The following are the aspects of each student based on individual testing.

<table>
<thead>
<tr>
<th>Assessment Indicator</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Aspect</td>
<td>4.00</td>
<td>4.00</td>
<td>4.13</td>
<td>4.00</td>
<td>3.38</td>
</tr>
<tr>
<td>Material Aspect</td>
<td>4.11</td>
<td>4.22</td>
<td>3.78</td>
<td>4.00</td>
<td>4.22</td>
</tr>
<tr>
<td>Information Aspect</td>
<td>4.40</td>
<td>4.00</td>
<td>4.20</td>
<td>3.60</td>
<td>4.00</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>4.14</td>
<td>4.09</td>
<td>4.00</td>
<td>3.91</td>
<td>3.86</td>
</tr>
<tr>
<td><strong>Criteria</strong></td>
<td>Very good</td>
<td>Very Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
</tbody>
</table>

Based on the data obtained it can be seen that each student gives an average score of 4.14, 4.09, 4.00, 3.91 and 3.86 which is in the category of very good, very good, good, good and good. This shows that edmodo-assisted e-learning-based interactive learning can be used for trials in large groups.

e. Analysis of Large Group Trial Results Data

Based on the results of the trial data conducted in two classes with 30 people on average, the overall score was 4.36 and in very good category. In this case the average score obtained has increased compared to the previous small group trials, this is because there have been improvements made. There are three aspects that become indicators in the assessment related to small group trials. The aspect that has the highest average score is the aspect of the material that is equal to 4.41. The highest score in this aspect of information is shown by the ease of understanding of the text indicator with an average of 4.87. This shows that interactive learning based on edmodo-assisted e-learning is very easy to understand in terms of language and is very helpful for students to obtain information according to their learning needs. The
aspect that has the lowest average score is the aspect of view with an average score of 4.24. However, this aspect is in a very good category. The lowest indicator in this aspect is an indicator of video quality with a score of 4.03. This indicator has increased from the previous one which only got a score of 3.67. Although this aspect has the lowest score, this aspect is already in a very good category. Another aspect is the aspect of information. In this aspect, the average score was 4.43 and in the very good category. The indicator that has the highest score is a new information giving indicator with an average score of 4.83. This shows that all information presented is in accordance with the needs of the course and the needs of students.

4 Conclusion

From the results of the research and development stages that have been carried out, it can be concluded that: almost all students responded positively about Edmodo-assisted e-learning-based Interactive Learning Tool, in the context that is beneficial, interesting, and can increase student learning motivation, which is done in data collection for the needs analysis. Judging from the general aspects, software engineering, visual communication, the substance of the material and learning, the Edmodo-assisted e-learning-based Interactive Learning tool proved to have shown results in good categories. From the results of validation and product testing, with several criteria that have been established in the planning of research and development methods. The use of Edmodo-assisted interactive learning based on e-learning provides convenience to lecturers and students in absorbing lecture material

References

The Contribution of Internship Program 1 and 2 on the Student’s Learning Commitment at Faculty of Educational Unimed

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Abstract. This research examines the issues of (1) how’s the perceptions of students about the activities implementation policy on Internship program 1 and 2, at Unimed (2) How’s the learning commitment of FIP college students of Unimed, and (3) contribution analysis of implementation policy on Internship activities 1 and 2 against College Student Learning Commitment FIP Unimed. This research was carried out in the Faculty of Education (FIP) Unimed for 645 college students all over the 2016/2017 academic year that have been doing Internship Program 1 and 2 in the sample unit of education as research population, and the research has been specified using random sampling technique as many as 141 students. This research data collected with the use of a questionnaire instrument with Likert Scale patterns and student learning outcomes in the form of Grade Point Average (GPA). This research data is processed by using the descriptive correlation technique, by performing a test of its homogeneity and normality of variables, test requirements analysis, and test the hypothesis by using t test. The findings of this research are expected to be signaled that the internship activities 1 and 2 have a pretty mean benefits against the formation of student learning commitment so that it can develop the right learning motivation in achieving maximal activity success on lecture.

Keywords: Contribution, Internship Program, Commitment, Learning.

1 Introduction

Students as learners at the college level are always the concern of decision makers and/or policies. Various policies are stipulated as guidelines in producing students while in college, where they are always accompanied, guided, directed, and motivated to learn, learn, learn with various approaches, methods, and techniques that are well designed by managers and their education personnel. Since the 2016/2017 academic year, Unimed has established policies in the curriculum field, which is applying the Indonesian National Qualification Framework Curriculum model in which academic activities refer to learning outcomes which are the internalization and accumulation of knowledge, skills, attitudes and competencies that can be achieved through structured education and training processes that cover certain fields of science or expertise. This policy is in line with the spirit of Permenristekdikti No. 55 of 2017 which makes schools as a place to practice acquiring teaching competencies, both for undergraduate education programs through Introduction to School Fields and for teacher professional education through Field Experience Practices.
Field Experience Practice for students in previous years was held in the sixth semester. Through the policy of the Unimed Leaders, all students in the 2016/2017 academic year are required to attend the Internship Course, with three stages, namely (1) Internship 1, the stages of observation of classroom practice and the management and implementation of school curriculum, in the second semester; (2) Internship 2, which is Stages of reviewing the practical aspects of the school curriculum and its application in the classroom that is associated with Unimed lectures, in the fourth semester; and (3) Internship 3, namely the Teaching Implementation Plan preparation phase and its implementation based on its relevance to lectures in Unimed, on sixth semester.

This Unimed Leadership Policy has lasted 2 years and the 2017/2018 academic year has entered its second year (fourth semester) for students in 2016/2017 (Internship 2). How far the impact on student learning commitment is a question that needs to be analyzed. Analysis can be done in various ways, and among them are predicted to be more accurate by conducting scientific research. Through research studies that have been carried out, it has obtained a signal that Internship 1 has a relationship with the commitment of students to prepare themselves to become Candidates for Educators and / or educational staff in FIP, especially in the Unimed PLS FIP Study Program with a correlation coefficient of 0.49 and the amount of contribution is 24.6 percent (Wau, 2017). About how can be the same thing achieved by other study programs, so far no significant data has been obtained. The importance of the learning experience of this apprenticeship program has also been investigated by several experts, including (1) Ashland who’s in collaboration with universities and students (1996), (2) Deen Lango (2018), (3) Luka bakar (2017), (4) Dove Terrence (2017), and (5) Lewis Anne C (2004) in providing them with a number of learning experiences that are useful in the formation of various learning skills including learning commitment building.

Learning commitment is the determination or promise of students to themselves to do all the learning activities that have been determined by the institution that organizes the study program in universities.

How far the results of internship courses 1 and 2 can realize or influence student learning in preparation to become professional educator candidates and / or teaching staff will need to be studied scientifically through research entitled "Analysis of the Contribution of Internship 1 and 2 Subjects to Learning Commitments of Unimed FIP Students ".

A. Formulation of the Problem

Based on the background of the problems raised above, the problem of this research can be formulated as follows:

1. How is the student’s perception of the results of the Implementation of Internship 1 and 2 in FIP Unimed
2. How is the student's learning commitment in preparing themselves to become Prospective Educators and / or educational staff in Unimed FIP
3. How is the Contribution of Perception to Internship Courses 1 and 2 to Student Commitment in Unimed FIP
B. Literature Review

1. Student Learning Commitment

Learning commitment describes a situation in which students state their commitment or motivation to do learning activities seriously. This is consistent with the concept of organizational commitment proposed by Robbin (2006: 94-95) that organizational commitment shows the involvement of members in an organization that describes the willingness of members to side with certain work that has been determined. In a writing of a student in Doctoral Program on the "Learning Commitment / My Ph.D Life" page, Chrisphdlife with the title "we need more commitment than motivation" (https://chrisphdlife.wordpress.com/tag/commitment-learning/) revealed that "commitment comes from within ourselves about how much consistency we do what is planned. Commitment is not based on feelings (like it or not, enthusiasm, or not).

Prayitno (2009) states that commitment is the willpower, firmness of attitude, and seriousness of determination, to do better, not to repeat the wrong actions or violate it; will not do the same thing in the same place or elsewhere. Likewise Luthans (2006) explains that organizational commitment can be defined as (1) a strong desire to remain as a member of a particular organization, (2) a desire to strive according to the desires of the organization, and 3) certain beliefs, and acceptance of organizational values and goals, so it can be synthesized that student learning commitment is as (1) a strong desire to remain as a student in the chosen department, (2) a desire to strive according to the study program's wishes, and 3) certain beliefs, and acceptance of the values and objectives of the department or study program.

2. The Nature of Internship Studies

Internships are generally defined as part of a job training system that is held in an integrated manner between training in training institutions by working directly under the guidance and supervision of instructors or workers who are more experienced in the production process of goods and / or services in the company, in order to master skills or certain expertise (Minister of Manpower and Transmigration Regulation No. Per.22/Men/IX/2009 concerning Implementation of Internship in the Country).

Internships that are briefly stated above, at the tertiary level, especially at the State University of Medan (Unimed) which have made fundamental changes in the implementation of the Indonesian National Qualifications Framework (KKNI) curriculum, make it an internship course for educational and non-education study programs. This internship program is a compulsory subject for all students in Unimed, with three stages, namely (1) Internship 1, (2) Internship 2, and (3) Internship 3 (Unimed, 2017).

The Internship program designed in the Unimed curriculum provides benefits to various parties, especially students, which include (1) Students can apply and enhance the knowledge gained in the lecture bench, (2) Improve the ability of students to master professional competence in the field of gradual science (3) The opportunity to establish self-confidence and improve professional skills and expertise, (4) Obtain understanding, appreciation, and experience in the field of the education profession, (5) Gain experience through observation of the process of forming competencies in the field of science in the field, (6) Obtain experience about how to think and work interdisciplinary, and (7) Obtain reasoning ability in conducting research, formulation and problem solving of professional fields in the business world.
The objectives and benefits of the internship above, especially Internships 1 and 2, will be achieved if students can cooperate with parties that are directly related to the study program and the educational institution/unit where the Internship 1 is held. The learning activities that students have to do in Internship 1 have been designed in such a way by universities and study programs, which include observations of the Education Unit consisting of (1) management unit education culture, (2) educator competence, and (3) students, (4) the learning process in the classroom, a reflection of the results of the learning process, while the second internship was given the experience of developing learning tools by (1) studying the curriculum, (2) studying learning strategies, (3) reviewing the assessment system, (4) designing learning preparation, (5) developing media, learning materials and devices.

2 Method

Learning commitment of students in Education Personnel of Education Institutions to prepare as professional educators and/or education personnel can be determined by many factors both from themselves and from outside themselves. If the encouragement from outside is the chosen institution/study program in the form of providing various types and levels of lecture activities as outlined in the curriculum, syllabus, learning implementation plan that must be done by students, then the perception factor from within the student will determine how to respond to and implement everything the type and level of activities programmed by the study program.

The policy of applying for Internship Courses can also be predicted to provide opportunities for students to reflect on activities while attending or doing the Eye of Internship 1 and 2. The results of these reflections can be decisive for students to think about, analyze, and decide again on their learning commitments in their chosen study program. Students who already have an understanding of the ins and outs of organizing education and learning activities in schools and teachers who must be professional in teaching their students will encourage themselves to have a high learning commitment to prepare themselves to become professional education candidates in the field of science they conduct.

Based on the mindset above it can be synthesized that the policy of applying Internship Courses for students at Unimed has encouraged the importance of being studied more deeply the contribution of Internship Courses 1 and 2 to the learning commitment of students in universities, especially in the Unimed Faculty of Education. with the research paradigm as follows:

3 Conclusion

Based on the above framework, it can be concluded that the policy of applying Internship Courses at Unimed has encouraged the importance of further study about how far the policy contributes to student learning commitment and as a follow-up of this study, data collection will be conducted to prove the following hypothesis. “There are significant contributions in 1 and 2 Internship Courses on Learning Commitments for Students in Unimed FIP.”
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[16] https://chrisphdlife.wordpress.com/tag/komitmen-belajar/
Experimental and Performance Assessment of Indonesian Biomass-Fired Based Stove with Internal Air Box using Coconut Shell

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Abstract. This paper presents an integrated performance evaluation of in-lab manufactured own designed prototype biomass fired-stove used coconut shell as feedstock. Two different stoves in terms of air required for combustion supply mode; (1) external air box (EAB), (2) internal air box (IAB) mode were tested and assessed with respect to the following performance indicator such as water time to boil, specific fuel consumption, and thermal efficiency. The stoves tested were the forced draft modified rocket-stove types with a battery mini fan-assisted to induce draft to force the controlled air for combustion requirement into the stoves. Flame temperature was recorded and displayed using K-type thermocouple and thermometer indicator respectively. Specific fuel consumption (SFC), thermal power (Pth) and the thermal efficiency (Îªth) were calculated using the water boiling test (WBT 4.2.3) version protocol. Results showed that the internal air box (IAB) mode has higher thermal efficiency (38 %), specific fuel consumption (2.5 kg/h), and flame temperature (500 0C) than external air box (EAB) mode. However, the thermal output of the EAB (2.3 kW) was reached higher compare to IAB mode. The findings were used to improve the current biomass fired-stoves further that usually used for heating and cooking applications in rural communities.

Keywords: Biomass, Stove, Combustion

1 Introduction

Currently around 35% of the world's population uses biomass as a source of energy for heating needs. This happens because there are still many remote areas that have not been reached by the electricity, fuel oil and also gas. Besides, the price of gasoline and gas also continue to increase making people's purchasing power becomes reduced and prefer to use alternative fuel especially biomass.

This amount will increase again by the year 2030 where almost half of the human population will use biomass as energy source (Priddle, 2002), and each family will need 2 tons of timber per year for cooking and heating purposes (Cookstoves, 2011). This will have an impact on the magnitude of the need for biomass-based fuels, especially solid wood fuels that can easily be obtained primarily by exploiting forests.
Biomass is usually burned directly to get heat energy, but this will greatly affect the
human environment for a long time. Carbon dioxide (CO2) released into the atmosphere and
can disrupt the human respiratory system. Sometimes carbon monoxide (CO) is also formed
by an imperfect combustion process and one of the most radical types of air pollutants that can
lead to death in large numbers (Bertrand et al, 2017).

Until now, biomass combustion technology using stove continues to grow. The
combustion zone was designed, modified and tested to obtain the expected performance at
least closer to the performance of the stove using LPG or kerosene as fuel. However, since the
combustion reaction is usually not stoichiometric, where excess air is supplied to the stove
will produce a high temperature (950- 1000°C) in combustion zones. High temperatures will
trigger the reaction of the formation of nitrogen oxide (NO) pollutants, where nitrogen in the air
reacts with oxygen to form carbon monoxide (CO). Besides causing pollution, fine particles,
unburned carbon will also formed and released into free air with combustion gases.

Not only in the use of primary/fossil fuel sources, the use of energy sources from biomass
also causes negative impacts on the environment (global impact warming), especially air
pollution around the indoor air pollution that can cause respiratory infections. Not only in the
country, abroad also experience the same problem that residents who use biomass fuel
experience problems in breathing.

Direct combustion generates emissions gases and also smoke that is bad for the
environment. Until now the atmospheric temperature has increased and sometimes the weather
is very bad. Some references say that the impact of burning of primary fuel and also biomass
is closely related to world climate change. Another problem arising from the use of biomass as
a fuel directly by combustion is to produce unburned carbon particles. In industrial areas we
often see and feel the unhealthy air condition and even often seen a real black cloud is a fine
particle of fuel combustion. In such a large number that such circumstances will disturb the
view, especially on air traffic, this will be very bad.

This study focused on evaluating the performance of two different biomass stove using
coconut shell as feedstock. Specific objectives to obtain the type of air requirement
distribution in the stove. Expected from this study that a prototype of biomass stove based the
best air distribution is achieved. This prototype will also be used as a medium of learning in
energy conversion courses related to heat energy, especially fuel combustion technique.

1.1 Biomass as Energy Alternative for the Future

Biomass has been a source of energy alternative since the first in the development of
human civilization in this world. In the early 1960s for example, the Indonesian government
has begun to realize and glance at biomass as an alternative energy source. Besides being an
environmentally friendly and renewable energy source, production is also abundant
considering Indonesia is an agrarian country with significant biomass production. Based on
the data from the Ministry of Energy and Mineral Resources that the energy source of biomass
equivalent to 50,000 MW is slightly below the energy source of water (hydropower). This
indicates that biomass is very potential in contributing to energy needs in Indonesia as well as
reducing dependence on primary energy sources. In the national energy plan, by 2025 the
government targets 15% of the energy comes from renewable energy and that's 5% of it is
contributed by biomass (Indonesia, 2004).
Biomass energy studies have also been conducted by several researchers in Indonesia. By increasing biomass quality has a great contribution to its burning rate. This has been proven experimentally in combustion of biomass of cocoa pod husk (CPH) after doing carbonization treatment has a significant increase in the burning rate (Syamsiro et al., 2012).

An effort to increase the value of product gas (syngas) heating value has also been conducted by improving the ability of the reactor. A new method of gasification has successfully developed and implemented experimentally to increase heating value of product gas. The value of syngas from sawdust biomass can reach almost 7 MJ/m³ when be processed in a concentric cylindrical fluidized bed with internally particle circulation mode (Simanjuntak & Zainal, 2015).

Numerous efforts were undertaken to improve performance of a new developed reactor. Modelling and experimental validation are usually used to study the reactor characteristics. Particle hydrodynamic in the concentric cylinders with internally circulation for biomass gasification can be observed using modelling. It has been found that by increasing the particle circulation in the concentric two compartment cylinders reactor followed by increasing particle flow rate (Simanjuntak et al., 2018b). Since the particles act as a heat transfer medium in gasification process, the energy for the process is always available. This finding supports the result found that heating value of syngas increase with the particle circulation rate (Simanjuntak & Zainal, 2015).

In terms of biomass utilization in Indonesia, a great literature study on the possibility of biomass utilization to fuel internal combustion engine has been conducted. It was concluded that with the calorific value of the gas product from the biomass of about 3 MJ/m³ it can be used to drive spark ignition combustion engines to replace of petroleum (Simanjuntak et al., 2018a).

1.2 Biomass-Fired Stove Performance and Development Study

It has been long time ago that to get energy from biomass is conducted through direct combustion. The biomass is collected, dried and burned as necessary. The stove used is very simple, i.e three fireproof objects or (three stones) which arranged with a pot holder where the object will be heated (Grimsby et al., 2016). At that time the efficient way of burning biomass is not known and the combustion process is also very simple. The combustion process is done in an open environment by utilizing the surrounding air as oxidizer. This makes the combustion process unfavorable and result very much pollutant and fine particles that are very bad for health. The process of burning using stoves began in the 1980s, but the problem of stove ability is not important. Until the 1990’s studied of improving stove materials / materials ranging from clay and sand, the shape is modified fitted to a chimney to overcome the problem of pollution. But on the matter of age (life time), this stove cannot last long. In improving furnace capability, knowledge of heat transfer also began to be considered until in early 2000’s a strong, heat-resistant furnace material began to be taken into account. Some researchers tried to make some effort of improvements and modifications to the stove, including construction, materials, and operation parameters include air supply and distribution in the combustion zone of the stove. Especially in the method of combustion, researchers continue to attempt to combustion process to near complete combustion. The perfect combustion process generates maximum heat and reduces emissions.

Some researchers tried to make an effort to improve and modify the stoves including geometry, materials, operating parameters including air supply into the stove. Biomass types and characteristics has a significant impact on the heating value. An effort has been done to
evaluate the combustion of biomass in a furnace and focuses on testing of certain types of biomass as fuel. Three stoves were tested and evaluated with 3 forced-draft kilns and two types of biomass to determine furnace efficiency(Raman et al, 2013). Furthermore, biomass energy can be converted into another useful type. Electrical can be obtained from biomass stove. A study of 5 small-scale stoves to generate electrical energy using thermoelectric generators (TEGs) has been conducted. However, each type of biomass used also has a different impact on the environment(O'Shaughnessy et al, 2015). Similar findings, a study of 5 types of biomass in terms of emissions generated during the combustion process has also performed. It was found that the biomass type greatly affects the emissions and the resulting fine particles(Vicente et al, 2015).

Another parameter that important to know during biomass combustion, numerous types of stoves also need to investigate. A group researches studied several types of stoves and its operating temperatures in terms of producing fine particles. They concluded that different stove designs would produce different fine particles also. They also undertook parameter studies of biomass stoves to determine parameters that were the main focus in the design and operation of a biomass furnace(L'Orange et al, 2012).

The biomass can also form another form functionally. The briquettes blended with rice husk were also used as feedstock in biomass stove. A successful research obtained 6 kW of electrical energy from the stove (Ahiduzzaman & Islam, 2013). Another group laboratory also investigated the efficiency of a biomass fired stove with palm shell as solid fuel. They managed to get stove efficiency up to 66.63% based on modified stove geometry and operating parameters(Febriansyah et al, 2014).

Environment quality is also has to be considered due to the effect of using solid fuels as heat-generating energy. Fine particles of combustion that fly into free air are very harmful to human respiration. Studies on biomass burning furnaces are also widely practiced considering they are very practical for generating heat energy. (Semmens et al, 2015). The most contributed to environment damage are the gas products that sacrifice to atmosphere. By using briquette as solid fuel, it was found that CO, NOx and SO2 were the most widely generated pollutant components(Roy et al., 2013).

According to these research findings, it can be summarised that one of important aspect on improving the fired-stove performance is to achieve complete combustion process. In order to attain complete combustion, the good air combustion requirement distribution is needed. A number of researcher studied and focused on air combustion requirement, but the information on the effect of internal air box (IAB) utilization on the stove performance is not available. The IAB mode is an attractive and promising stove geometry to attain good mixing between air and flameable gas during combustion process. Thus, the objective of this study is to find out the impact of IAB application on the stove performance. An improved biomass fired stove, an external air box (EAB) mode was also tested to compare the results found from the IAB fired stove examination.

1.3. Stove Design and Construction

Forced draft stoves type with internal air distributor used in this study were designed. The stoves are made and modified from the used can of aluminium material, easy to obtain that usually as household waste. Both stoves working principle are force draft type based where a controlled air for combustion needed is supplied by a mini battery fan.
The stoves configuration can be seen in Error! Reference source not found.. An important key factor of high thermal output of biomass combustion is air fuel ratio aspect. A good combustion must require enough oxygen. However, without good air distribution in the combustion zone, the combustion does not reach a complete level. Thus in this stove operation, maintaining and controlling a fixed ratio between the amounts of biomass and the air supplied into the stove is needed to meet the stoichiometric reaction during process. From layout of stove with internal plenum (Error! Reference source not found.), a uniform mix between feedstock and air possible occurred due to its position in the centre of the stove.

A number of holes with 8 mm in diameter drilled on the air-box wall were placed to ensure the air distribution. The air directly supplied into the hot zone in the stove. The internal air box is the most promising of fan-operated stoves to carry out a complete combustion process. This type of stove also potential to reduce emission besides of improving in combustion and also the heat transfer to the cooking vessel. However in this work that the potential harmful emission as a combustion product is not discussed.

2 Materials And Method

2.1 Stove Design Construction and Material

The stoves prototype designed in this work as shown in Figure 2. Clearly, the difference between the stove; external air box mode and the internal air box mode can be figured out easily. In Fig. 2(a) the air holes are placed on the wall of the cylinder of EAB mode, while Fig 2 (b) shown the opposit, where the air holes are placed on the wall of inner airbox of IAB.
The coconut shell was selected as feedstock in this study. This material is most widely used for cooking purposes as described previously. This biomass consists of 54.52% carbon, the rest is ash or other chemical substances (Raman et al, 2013). Coconut shell is very easy to obtain because there are many home industries that use coconut shell as raw material. The bakery industry for example also uses a lot of coconut baking material and produces coconut shell as the rest of the processed. Usually, the coconut shell is found physically as shown in Figure 3.

![Coconut shell raw material](image)

Figure 3. Coconut shell raw material

### 2.2 Experimental Procedures, Instrument and Measurement

In initiating the operation of a stove, start-up heating becomes very important. In this study, preheating or initial ignition was carried out using charcoal that usually available in the household store. About 25 g of charcoal was used to light the fire using matches. The charcoal was considered well-lit when it’s colour was visually observed fully red. Afterwards, 250 g of coconut shell with approximately 5 cm x 5 cm in sizes are fed into the stove precisely above the grate along with 1 litre of water in the closed pan located on the grid at the top of the stove. The time required for initial ignition should be as short as possible until the stove-generated flame. Three experiments were conducted with both stoves once the stove was ready to test. After the fire arises from the stove, the experimental process begins, the fan air supply was turned on and the air flow was measured using anemometer.

The flame temperatures during the test-run were measured using a K-type thermocouple, viewed and recorded using a digital temperature indicator. Mass balance is used to measure the mass of biomass, ash and water while the time is measured using stop watch of smart phone. In order to achieve maximum thermal energy from biomass, the operating parameters used must accordance with the theory. Air-fuel ratio should be appropriate for stoichiometric combustion. A complete combustion does not produce oxygen in the combustion product. The main product of combustion are CO₂ and H₂O of stoichiometric combustion.

To evaluate the performance of the designed fired-stove, the modified water boiling test (WBT 4.2.3) version was performed due to the lack of the instrument in the laboratory. The results were carefully consulted to the standard protocol WBT under numerous work. WBT protocol has been widely used to assess improved stove. This method has been used to evaluate the performance of solid fuel burning furnaces (Chen et al, 2016; Grimsby et al, 2016).
3 Results And Discussions

Understanding the operation of both stoves tested has been achieved through the visual observations of the flames colour and temperature profiles during running-test. The stoves flames observed during experiment can be seen as shown in Figure 4. Clearly, the difference between the stove with external air box and the internal air box in terms of flames can be observed. The flame temperature of the stove-fired based is in the range of 400-500 °C where the water completely boiled average in 3 minutes and it is possible going to increase further due to potential burning of the rest solid fuel in the stove. It was observed that the flame temperature from the IAB’s stove is higher than the EAB’s one. The higher the flame temperature indicated higher thermal power output of the stove. High temperature increased heat transfer rate to the water pot, thus making the fired stoves work at higher efficiency than the traditional stoves. It was also observed that both of the stoves have difference in colour. This type of colour indicated low heat level with the temperature below 1000 °C.

![Figure 4: The stove flames photoghrapic in operation: (a) EAB stove’s, (b) IAB stove’s](image)

Temperature profile of both stoves during process can be seen on Figure 5. It was observed that the temperature of the IAB stove was higher than the EAB stove. This is because that the air/oxygen for combustion requirement distributed uniformly caused better mixing between combustible gas and oxygen leads to an increased in the combustion. This results in accordance with results work by (Wibawa, 2017). In principle, combustion process initiated primary by pyrolysis and gasification process, where combustible gases emitted diffuse and mix with the surrounding air. With sufficient air/oxygen, the gases will combust further in the same zone produced high temperature flue gas and leaving the stove.
In this study, performance of the stoves was evaluated by using the water boiling test (WBT) since this method perform well under some of difference in biomass and stove geometry. The performance parameters obtained from WBT were thermal efficiency, specific fuel consumption and also the thermal output of the stove. This protocol was also used by a number of researcher to evaluate their biomass fired stove (L’Orange et al, 2012; Raman et al, 2013). The findings in this work were alot of similar with another results founded by researches. Figure 6 shows the performance parameters obtained in this work. Thermal efficiency of the stove using coconut shell is found tobe similar with another researcher (Raman et al, 2013). While the specific fuel consumption and the thermal output power are quite comparable with previous researcher.
4 Conclusion

A new way on performance improvement of biomass fired stove based in terms of air requirement supply for combustion was developed and tested. It was found that there was significant effect of the air distribution mode in the combustion zones on stove performances. Good mixing of gas product and oxygen contributed to the best performance of the stove in terms of flame temperature. In this study, it was found that the temperature of the flame strongly affected by the air distribution mode. Using internal air box mode (IAB) highly possible to distribute uniformly air required for combustion reached entire the combustion zone. Thus the performance of the biomass fired stove could be improved.

Acknowledgments

The authors would like to acknowledge Universitas Negeri Medan for financial support through DIPA, Number 000574/UN33/KU/2018, Marc 22, 2018. The authors was highly acknowledge supports from mechanical engineering workshop member, engineering faculty, Universitas Negeri Medan and also all the student for their participation in this project.

References

The Meaning of Verb *Falloir* and other Impersonal Verbs in French and Its Equivalences in Indonesian Language

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Abstract. This study aimed to explain the meaning of Verb especially Falloir in French and Its Equivalence in Indonesian Language. Impersonal verb is a verb where its subject is abstract (sujet apparent). However, in fact, the study result showed that the abstract subject could also appear in its Indonesian language translation. Its appearance was made coherent with its Indonesian language structure which is sentence context. While in some cases, if impersonal verbs are followed by a nominal or equivalent group, it represents the real subject which has an intermediate status between the subject and the complement. Based on the study result found that impersonal verb falloir could be equivalent in French with other impersonal verbs such as il est necessaire, il est oblige, il est éxasperant, and other verbs in the forms of imperative and devoir. Meanwhile, in Indonesian language, literal meaning of il faut “harus” have synonymous forms such as mesti (semestinya), perlu, wajib, and patut. If all expressions of equivalence of il faut were made into negative forms, the sentence could have antonymous meaning. The data sources used were 2 novels written in french and their translation, and 2 novels written in Indonesian and their translation. This study used equivalence method by making Indonesian language as its determination tool.

Keywords: Verbs impersonals, Meaning, Equivalence Word, French, Indonesian Language

1 Introduction

French expresses tense(tempes),aspect(aspect), and modus(mode) in a verb through its interpretation form. Meanwhile in Indonesian language, there is no tense verb(tempes du verbe) and grammatical aspect use is facultative. Hoed (1989) said that in Indonesian language, perspective aspect equivalence (passé composé atau passé simple) is sudah (perfect tense),telah (perfect tense), or action way. So, in Indonesian language, there is no morphological change on the verb form to determine an aspect of a sentence. Samsuri (1981: 252) added that Indonesian language does not use morphological change to state an aspect, but particles telah/sudah (past simple), sedang/lagi (present progressive), and akan (future tense) that are not always found in sentence.

Basically, in verb construction, there is a sentence meaning expression which is usually explicitly. So, to understand the sentence meaning, it is needed a strong reasoning on the verb interpretation form. Because French is a less of special morphological signs as time sign and aspect of a sentence. This is equivalent what Lachet (2013) said, en ce qui concerne l’aspect
grammatical, le français est une langue qui est dépourvue de marquage morphologique spécifique.

This paper is going to explain how impersonal verb falloir which has meaning harus (must) can be equivalent with other impersonal verb in French. Its equivalence in Indonesian language if seen from its literal meaning does not have a correlation at all with falloir. This shows how implicit meaning of the verb is said in French and Indonesian language. The study result would be very important for students and teachers of French who would like to closer understand the use of impersonal verb, especially falloir.

This research was done with equivalence method where Indonesian language as the reference. The study resources are 2 French novels and their translation and two Indonesian novels and their translation.

Equivalence method in this research included basic technic and continuence technic. The basic technic used is Pilah Unsur Penentu (PUP). PUP is used to classify grammatical meaning of verb conjunction through time, aspect, and modus which can affect to lexical meaning in French and Indonesian language. Next, continuence technic used is Hubung Banding Menyamakan (HBM) which is relevant with its determined data (Sudaryanto, 1993:27).

In the next part would be showing datas of impersonal verb falloir and its meaning harus and its equivalence in French and Indonesian language which was implicitly expressed.

2 Discussion

Table 1: Apperance list of verb Falloir in French and its interpretation on Les Mots and its interpretation in Indonesian language words.

<table>
<thead>
<tr>
<th>No.</th>
<th>French</th>
<th>Indonesian</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Il ne faut pas même remuer l’orteil ;</td>
<td>Jempolkakipuntidakkugerakkan</td>
</tr>
<tr>
<td>2.</td>
<td>Je me lançai dans une incroyable aventure ; il fallait grimper sur les chaises, sur les tables..</td>
<td>Akuterjundalampetualangan yang luarbiasa; menaikikursi, meja ….</td>
</tr>
<tr>
<td>3.</td>
<td>Cette absence prodigieuse le transfigura. Il s’en fallait de beaucoup que l’Institut fût au complet;</td>
<td>Ketidakhadiranitumenyulapnya. MemangtidaksemuaanggotaInstit uthadir</td>
</tr>
</tbody>
</table>

Table 2: Apperance list of verb Falloir in French and its interpretation in Indonesian language on Thérèse Raquin and its interpretation Thérèse Raquin

<table>
<thead>
<tr>
<th>No.</th>
<th>French</th>
<th>Indonesian</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Elle demeurait affaissée sur sa chaise,</td>
<td>Iahaarusdudukterenyak di kursinya.</td>
</tr>
<tr>
<td>2.</td>
<td>Tu sais, lui dit-il, il faut que je fasse ton portrait.</td>
<td>Akuakanmenulisportretmu.</td>
</tr>
</tbody>
</table>
3. D’autre part, depuis longtemps, il n’avait pas contenté ses appétits; Il sevrait sa chair, et il ne voulait point laisser échapper l’occasion de la repaire un peu. Sementara itu, sudah lama sekali ia tidak memuaskan hasratnya; uangnya tidak banyak, ia harus memendam keinginan tubuhnya dan tak mau kehilangan kesempatan untuk menikmatinya sedikit.

4. Dans la boutique, sa maîtresse devenait une femme comme une autre, qu’il ne fallait point embrasser et qui n’existant pas pour lui. Di dalam toko, wanita selingkuhannya adalah wanita biasa, sama dengan wanita-wanita lainnya, yang mungkin tidak akan dicipi naminya, dan kehadirannya tidak akan berarti apa-apa baginya.

5. J’ai besoin de croire que la police est bien faite Aku harus percaya bahwa kepolisian bekerja dengan baik.

6. Dans la boutique, sa maîtresse devenait une femme comme une autre, qu’il ne fallait point embrasser et qui n’existant pas pour lui. Di dalam toko, wanita selingkuhannya adalah wanita biasa, sama dengan wanita-wanita lainnya, yang mungkin tidak akan dicipi naminya, dan kehadirannya tidak akan berarti apa-apa baginya.

7. Elle tendait ses volontés de toutes ses forces, car elle avait peur d’éclater en sanglots et de tomber à terre. Ia harus mengerahkan seluruh kekuatannya untuk mengendalikan diri, karena ia takut akan menangis tersedu-sedu dan tercebur kedalam air.

8. C’est ma faute, cria-t-il, je n’aurais pas dû laisser ce pauvre garçon danser et remuer comme il le faisait... Ini salahku, tangisnya.” Aku semestinya tidak membiarkan pria malang itu menari-nari dan mengguncangkan perahu…

Table 3: Appearance list of verb Falloir in French as lexes in Indonesian language in the novel “Keberangkatan” and its equivalence in French in the novel Le Départ

<table>
<thead>
<tr>
<th>No.</th>
<th>Indonesian</th>
<th>French</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Itu juga tidak baik.</td>
<td>Mais ce n’est pas ce qu’il faut faire non plus.</td>
</tr>
<tr>
<td>2.</td>
<td>Tetapi lebih sering kami menunggu hingga tiba giliran.</td>
<td>Mais le plus souvent il fallait attendre notre tour.</td>
</tr>
<tr>
<td>3.</td>
<td>Dia bertanggung jawab akan selalu adanya bahan makanan di rumah.</td>
<td>Elle devait veiller à ce qu’il y ait toujours des provisions</td>
</tr>
<tr>
<td>5.</td>
<td>Tetapi Anna sudah menguasai pelajaranannya, dan akan ujian pecan berikutnya.</td>
<td>Mais Anna avait bien révisé et devait passer son examen la semaine suivante.</td>
</tr>
<tr>
<td>6.</td>
<td>Ku tambahkan agar lain kali menelepon kebagian Penerbangan atau dating untuk membuat janji.</td>
<td>J’ajoutai que la prochaine fois, il devrait me donner un coup de fil à la Division des vols ou venir afin qu’on fasse un rendez-vous.</td>
</tr>
</tbody>
</table>
**Table 4**: Appearance list of verb Falloir in French as lexes in Indonesian language in the novel “Telegram” and its equivalence in French in the novel Télégrame

<table>
<thead>
<tr>
<th>No.</th>
<th>FALLOIR</th>
<th>Indonesian</th>
<th>French</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Seandainya kelakada yang hendak kau sesalkan, apa yang akan kau lakukan?</td>
<td><em>Si tu devais le regretter, plus tard,</em> <em>que ferai-tu?</em></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Bagaimana kalau kita berciuman, bergandengan, bertegur sapa, berpandangan, hanya karena tugas kelak?</td>
<td><em>Et si nous devions nous embrasser,</em> <em>nous tenir pas la main,</em> <em>nous parler,</em> <em>nous regarder désormais par devoir?</em></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Tetapi sebagai orang yang masih mempunyai kesempatan, baiknya dipikirkan, kalau-kalau ada jalan lain.</td>
<td><em>Tant que nous en avions la possibilité,</em> <em>nous devions réfléchir et chercher s’il existait une autre voie.</em></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Ada saja kabar-kabar yang mengganggu ketenangan orang yang ingin melangsungkan niat pribadinya.</td>
<td><em>Il faut toujours que des nouvelles viennent troubler la quiétude des gens plongés dans leurs desseins privés.</em></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Sementara di luar persoalan itu segalanya berjalan lancar sebagaimana adatnya.</td>
<td><em>Mais en dehors de cela, tout se produisait sans heurt,</em> <em>comme il se devait.</em></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Tentu dalam hatinya tergores pula, bahwa ia tidak akan pernah mempunyai saat-saat seperti itu.</td>
<td><em>Elle devait se dire aussi qu’elle ne connaîtrait jamais d’instant comme celui-là.</em></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Pasti di rumahnya dia tidak pernah mendapat perhatian.</td>
<td><em>Personne ne devait faire attention à lui,</em> <em>à la maison.</em></td>
<td></td>
</tr>
</tbody>
</table>

### 2.1 Time, Aspect and Modus

From the tables above, it is known that time and verb modus contained in falloir does not affect at all the interpretation form of impersonal verb in Indonesian language. The tables showed that interpretation form or verb conjunction does not affect the interpretation at all. In other words, aspect elements implicitly appeared is not explicitly interpretated in Indonesian language. Datas from the four tables showed that verb times determining aspect in sentence either présent, or passé were not explicitly interpretated.

In Indonesian language, the sentence does not use sign particle sudah (perfect tense) , telah (perfect tense), sekarang (progressive), akan (future), etc. For example data of number 1 and 2 of the table 1. It is found that meaning of aspect sign did not appear at all in the interpretation. So, particle use of telah or sudah does not has to be appeared.

### 2.2 Reasoning Meaning

Impersonal verb il faut can be equivalent with other verbs that have literal meaning such as devoir. Nevertheless, in particular case, devoir can express a hope (un souhait) or a willingness (un désir) if the interpretation form is in imparfait. As the data number 1 and 2 of
The two data shows that in Indonesian language, there is no harus (must) or its equivalence, but in its interpretation in French found verb devoir which was conjuncted in imparfait form. So, devoir used to express a conditional sentence that express a hope implicitly. This is similar to case number 7 of table 3 where its Indonesian version has advice meaning (le conseil). But in its French version, this meaning was implicitly interpreted through verb interpretation in conditional present.

Next found that impersonal verb meaning il faut can appear on the other verbs which have literal meaning which is different, such as data from number 1, 3, 5, and 7 of table 2. Verbs demeurait, sevrait, ai besoin, tendait have literal meaning which much far from il faut, but its interpretation in Indonesian version has the same meaning, namely harus (must). Hence, this implicit meaning is available in French which is made equivalent with its sentence context.

<table>
<thead>
<tr>
<th>Impersonal Verb</th>
<th>Meaning Corelation in French</th>
<th>Meaning Equivalenc in Indonesian Language</th>
<th>Verb Meaning</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falloir</td>
<td>Il est nécessaire de + infinitif</td>
<td>Harus (must)</td>
<td>La nécessité</td>
<td>Il est nécessaire de réussir l’examen final</td>
</tr>
<tr>
<td></td>
<td>Il est obligatoire de + infinitif</td>
<td>Harus (must)</td>
<td>La nécessité</td>
<td>Il est obligatoire d’avoir une licence pour conduire une voiture</td>
</tr>
<tr>
<td></td>
<td>Il est urgent de + infinitif</td>
<td>Harus (must)</td>
<td>La nécessité</td>
<td>Il est urgent de finir tes études à temps</td>
</tr>
<tr>
<td></td>
<td>Il est indispensable de + infinitif</td>
<td>Harus (must)</td>
<td>La nécessité</td>
<td>Il est indispensable de porter une casque au moment de conduire</td>
</tr>
<tr>
<td></td>
<td>Harus (must)</td>
<td>La nécessité</td>
<td>Il est indispensable de porter une casque au moment de conduire</td>
<td></td>
</tr>
<tr>
<td>L’interdiction</td>
<td>Il ne faut pas faire le parking ici</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Le souhaite</td>
<td>On m’a donné plusieurs choix mais celui-ci qui me fallait</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Le désir</td>
<td>On m’a proposé quelques offres d’emploi mais, ce poste là qui me fallait</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L’ordre</td>
<td>Il faut faire la queue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Le conseil</td>
<td>Il faudrait se rendre visite à vos parents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Il vaut +</td>
<td>Sebaiknya</td>
<td>Le conseil</td>
<td>Il vaut mieux</td>
<td></td>
</tr>
</tbody>
</table>
2.3 Semi-Auxiliary Verb

However in other side, it can be seen that particle akan (future tense) which is a sign of undone things can be interpreted with imparfait time, as shown in number 5 and 6 of table 3. Devais and devait that should have past time in its interpretation which has meaning akan (future). Through that, sentence meaning as if happens in the future but in fact the word akan does not mean as the tense sign of the sentence in its interpretation.

Devais which is followed by infinitive alert shows that devais of which literal meaning was equivalent with il faut has function as the semi-auxiliary verb. Due to be followed by infinitive verb, devais has no longer real meaning and this affect the sentence situation. So, this form is called as périphrase verbale. Fleur d’encre (2009) stated that un lien est tissé: comme l’auxiliaire, le semi-auxiliaire présente un sens différent de son sens habituel. The same with data number 8 of table 2 that has avoir in the form of conditionnel present. The function of avoir is also a semi-auxiliary verb which has no full meaning ‘have’. In this sentence, avoir that functions as modal verb gives meaning and situation like “obligation” (l’obligation).

3 Conclusion

After making detail observation about the use of impersonal verb from tables made, it is found that il faut of which literal meaning is harus (obligation) can implicitly appear in French and explicitly in Indonesian language or conversely. Then, il faut that has literal meaning in French may be equivalent with other verbs that have no correlation with il faut, but interpreted into its equivalence in Indonesian language. This equivalence process is made based context and sentence reasoning through 3 things that are always overlapped, namely tenses, aspect, and modus in French.

References

Preliminary Study on the Development of Book Reviewed from the Value of the Character of Students of Physics Education of the Faculty of the State University of Medan

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Abstract. This research is a preliminary research study of the development of books general physics and students worksheet based on inquiry to improve the thinking skills and value of character of physics education students of FMIPA Medan State University. This research is an R & D research which includes three stages of research, namely: 1) Preliminary Study, 2) Development of books and students worksheets, and 3) Trial of books and students worksheets. The preliminary study was carried out in a) library analysis and b) questionnaire sheets. Library analysis to study syllabi on the of magnetic electric waves and about inquiry learning in terms of character basis. The questionnaire sheet was given to students of the 2017/2018 class physics education program and a field survey of the lecturers of basis of magnetic electric waves courses by giving questionnaires to 3 lecturers. The results of the study showed that the basic course of basis of magnetic electric waves based on inquiry can improve character. The character of students can increase from the habit of conducting inquiry activities in their learning. The results of the preliminary study show that learning outcomes of students tended to be low with poor character.

Keywords: Reviewed, Value Character, Students, Physics Education.

1 Introduction

As the Indonesian National Qualifications (KKNI) framework based curriculum is valid at the State University of Medan, most of the names of courses also experience changes such as General Physics II, the name of which is the magnetic wave base of one of the courses taught in all MIPA study programs. This is done on the basis of changes, development and innovation in each study program that is required to clarify the "graduate profile" which is expected through the activities of tracking studies, feasibility studies and needs analysis in the community. The graduate profile reflects the minimum ability that students must master after graduation which refers to four aspects of needs. The material in General Physics II are: 1) Vibration, 2) Waves and Sounds, 3) Optical Geometry, 4) Electricity, 5) Alternating Current and Voltage, and 6) Quantum Symptoms (Kurikulum Fisika KKNI 2016). So far, some lecturers have taught general physics material II by lecturing, discussion, assignment and rarely use a student centered approach (student-centered learning) which causes student difficulties in understanding physical symptoms (Manurung, 2014). In order for general
physics concepts II to be understood by students, there needs to be innovation in lectures. One of the innovations in the lecture was the existence of a textbook based on inquiry-based electricity wave courses (Manurung, 2015; Abdi, 2014; Lawson, 2010). Inquiry learning innovation improves character Sarwi, dkkr (Diani, 2015; Sawidkk, 2018) and thinking skills, mastery of knowledge, concepts, and physical principles, skills in developing knowledge, skills and self-confidence can be applied in everyday life and as a provision for continuing higher education is one of the physics learning objectives listed in the curriculum (DirjenDikti 2009). Textbooks are very useful to use in learning (PPS Unibraw, 2010). Physics learning materials will be more quickly understood if applied inquiry learning (Joyce & Weil, 2009, Arends, 2012). This is supported by the opinion of Ausubel (Dahar, 1989), and Antony Robbins (dalamTrianto, 2009) "Learning is the process of creating a relationship between knowledge that has been understood and something new knowledge". The inquiry approach is based on experimental activities in the laboratory, namely formulating hypotheses and investigative activities. This activity educates students to have good character values, namely curiosity, honesty, cooperation, logical thinking, critical, creative, and innovative, healthy lifestyle, confidence, respect for diversity, discipline, independent, responsible, care for the environment, love science. Lickona (1991) states that character education is a deliberate effort to help someone so that he can understand, pay attention to, and carry out core ethical values. Character education values can be integrated into the learning process, including in physics learning (Gunawan, 2012, Undang- Undang, 1989).

2 Methods

This research includes research and development. Type R & D research is a process used to develop and validate educational products (Sani, dkk, 2017). in this study an inquiry-based book product for physics learning will be developed. in general, the research was carried out in 3 stages, namely: preliminary study phase, stage of inquiry-based book design development for physics learning, and model validation and evaluation stages at present the research is still in the preliminary study stage. at this stage the method used is descriptive method researchers can directly relate to respondents and other objects related to the problem under study.

3 Result and Discussion

3.1 Needs Analysis

Needs analysis is carried out through preliminary studies at one of the state universities in north sumatra. this activity is intended to get an idea of what students need as candidates for physics teacher and can be fulfilled through basic lectures of electric and magnetic waves, what is the condition of the electrical and magnetic wave elementary courses that have been carried out, the available learning facilities, and the student background reviewed from the ability of the thinking process, and its character.
3.2 Student Needs Analysis

According to minister of National Education Regulation number 16 of 2007 (Permendiknas, 2007), for the dimensions of professional competence, a teacher must be able to: 1) master the material, structure, concepts, and scientific mindset that supports the subjects being taught; 2) master the competency standards and basic competencies of the subjects being taught; and 3) developing creative learning material. mastery of these three things in physics teachers must be supported by subjects that underlie the field of physics, including basic courses in electric and magnetic waves. at this level, the needs of prospective physics teacher students for the basic lectures of electric and magnetic waves are the ability to apply physical concepts in everyday life and technology. the ability to apply this physics concept mainly supports the dimension of the ability to develop learning materials creatively and innovatively.

3.3 Content Analysis

Students who have good thinking skills, enable them to develop an understanding of the concept. Concept understanding needs to be developed because of the five cognitive processes (understanding, applying, analyzing, evaluating, and creating) that are based on transfer ability and emphasized in schools and universities are understanding Manurung, 2016., Manurung, 2016., Saputri dkk, 2016., Sever &Guren, 2014). One of the main functions of the electrical and magnetic wave basic lectures is to equip the physics teacher candidates in developing the understanding of the concept (NSTA, 2003., Klauz& Horn, 2014., Wilkinson, 2010., Stein, 2015). Students are said to understand if they can construct the meaning of learning messages, both oral, written, or graphic. Material delivered through teaching, books, or multimedia. Understanding concepts in Electric and magnetic waves, among others, are realized in a number of abilities in terms of: interpreting, giving examples, classifying, comparing, explaining, and concluding Analysis of lecture conditions of basic waves electric magnetic for physics teacher candidates at one of the state universities in North Sumatra have a weight of 3 credits. Based on the weight of this credits, basic electrical and magnetic wave lectures are carried out with a lecture system (2 x 50 minutes / week as many as 16 meetings including formative examinations). Lecture with the ratio of lecturers to students 1:50. Practicum activities are carried out separately, with a ratio of 1:50 lecturers to students for 2x50 minutes / week. Lecture and practicum sessions are taught by one lecturer. The source of learning lectures uses books developed by lecturers plus other reference books.

3.4 Character Value Analysis

Physics learning requires students to have a scientific attitude (William, 1993., Koc& Liu, 1994., Kalman, 1961) which will cause them not to be prejudiced in making decisions, tolerant, honest, responsible, respecting the opinions of others is the character's value. Practicum activities in the laboratory are carried out in accordance with standard operating procedures, so before conducting practicum students must read and obey the work rules in the laboratory to maintain workplace safety and security (discipline value). With the practicum instructions that have been provided they do the preparation / set of tools according to the instructions together (value of work), one member helps the other, then performs data collection (independent, love of knowledge) both by measurement and reading carefully so that the data obtained valid and can be analyzed (respecting diversity, business value and responsibility) without being affected by the results of each other (the value of confidence and
honesty). The data that has been obtained is then analyzed together by conducting discussions (critical, logical thinking, innovative) which are then used to compile reports (confident, creative).

3.5 Character Indicators and How to Train

From the results of the practicality test through observation sheets 10 character behaviors for 10 respondents (score range 0-4) obtained data as shown in Table 1.

<table>
<thead>
<tr>
<th>No</th>
<th>Character indicators</th>
<th>Average score</th>
<th>Category</th>
<th>How to train character indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>careful and serious</td>
<td>3.6</td>
<td>Very high</td>
<td>Pay close attention and note when the lecturer explains everything related to teaching material.</td>
</tr>
<tr>
<td>2</td>
<td>responsible</td>
<td>3.6</td>
<td>Very high</td>
<td>In carrying out their duties and obligations as they should and when students conduct experimental activities are trained to be careful when working with tools and materials, carry out activities in accordance with the procedures provided and can carry out tasks in accordance with the division of labor.</td>
</tr>
<tr>
<td>3</td>
<td>polite</td>
<td>3.6</td>
<td>Very high</td>
<td>Speak and behave to all people well and smoothly, and when asking and expressing opinions politely, behaving well and using good language so as not to offend others in taking data during practicum and doing individual tasks.</td>
</tr>
<tr>
<td>4</td>
<td>honest</td>
<td>3.6</td>
<td>Very high</td>
<td>In taking data during practicum and doing individual tasks.</td>
</tr>
<tr>
<td>5</td>
<td>careful</td>
<td>3.6</td>
<td>Very high</td>
<td>In an experimental activity where this behavior is shown from the actions of students in taking step of work on careful and earnest and recording the results of observation.</td>
</tr>
<tr>
<td>6</td>
<td>cooperate</td>
<td>3.1</td>
<td>High</td>
<td>This character is trained in students in shaping behavior in themselves to establish relationships with other people and in group activities and discussions where this character can be demonstrated through the actions of students including not dominating the lesson, being able to provide assistance or asking for help and sharing information.</td>
</tr>
<tr>
<td>7</td>
<td>Confidence</td>
<td>3.2</td>
<td>High</td>
<td>To form an attitude of confidence in one’s own abilities trained through question and answer activities, discussions, experiments and in examinations.</td>
</tr>
</tbody>
</table>
Students dare to express their opinions, dare to answer questions and be able to do things confidently.

<table>
<thead>
<tr>
<th></th>
<th>Character</th>
<th>Score</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Mutual respect</td>
<td>4</td>
<td>Very high</td>
</tr>
<tr>
<td>9</td>
<td>Independent</td>
<td>1, 9</td>
<td>Low</td>
</tr>
<tr>
<td>10</td>
<td>Democratic</td>
<td>3</td>
<td>High</td>
</tr>
</tbody>
</table>

This character is trained in students to form an attitude of respect and acknowledge everything that is conveyed by others. In discussion activities where actions that show this character can appreciate the opinions of others who are different, acknowledge the advantages of others, and can accept if their opinions are not accepted by others.

This character is trained in shaping attitudes and behaviors that are not easily dependent on others in completing tasks. In learning, this character can be trained in evaluation activities including giving exercises, oral questions, examinations and homework. Students are able to make their own assignments, do not ask questions during exams, and believe in their own abilities. The low observation results for independent characters in the above practicalities are due to evaluation activities carried out only through several questions verbally so that only a few students are appointed to answer.

This character is trained in shaping ways of thinking, acting, and acting that assess the rights and obligations of himself and others. In learning activities, this character can be trained in group activities and discussion. Actions that show this character are owned by students including in doing assignments in groups of students can provide opportunities for friends to actively express opinions, in the discussion can express opinions which are a collection of some friends in groups, do assignments in groups according to the division of tasks.

Learning Implementation base on RPP that is made by teacher, with always gives character values base on learning material given provided by the teacher and familiarized in their daily lives (Prihartini, 2013).
4 Conclusion

Character education is a potentially powerful tool in the critical process of child and adolescent development, a process in which schools must (and inevitably will) play a central role.

Acknowledgments. The research is funded by the Competitive Grants DP2M Director General of Higher Education Ministry of Education and Culture. Therefore, researchers who receive grants DP2M to thank the Director General of Higher Education which has provided funds, and the opportunity for researchers to conduct research in Physical Education Program, Unimed. On this occasion, the authors would like to thank the Rector and Chairman of the Research Institute of the State University of Medan which has given opportunity to the team of researchers to conduct research

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Movement Analysis of Lay Up Basketball

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Abstract. This research aims to know the common mistakes made when doing a lay up shot in the game of basketball. Analysis of lay up shot is very necessary for the coach or instructor and basketball player itself to figure out how to fix the error. Analysis of lying Shot started, step (1. Reflecting sphere of the Agency towards the ring, 2. Forward with the right foot), jump (jump using the left foot), shot (1. Insert the ball with your right hand, 2. Thighs lift your right leg, 3. Head the ball to the target on the reflection). The number of samples as many as 35 people, who came from rookie basketball player i.e. students aged 17-19 years. The results of this research are (1) stepped on stage just as much as 44.3% to successfully perform the phases correctly. (2) at the stage of jumping as much as 77.1% to successfully perform this stage well and (3) on the stage of entering the ball just as much as 41% who succeed do the phases correctly.

Keywords: Basketball, Lay Up Shot, Movement Analisys

1 Introduction

Basketball is one of the most popular sports in the world that his fans came from all ages felt that basketball is fun, competitive sports, educate, entertain and, salubrious, individual skills like shots, bait, dribel, and rebound, as well as team work to invade or survive is the prerequisite to succeed in playing this sport (Oliver, 2007:1).

The game of basketball is aiming to get the value of running mates with how to insert the ball into the opponent's basket and keep their own basket from the entry of the ball from an opponent. As mentioned by Wissel, (1996:2) that "the aim of the game of basketball is gaining value (score) by inserting the ball into the opponent's basket and prevent other teams do the same thing."

One of the techniques that must be mastered by students in the game of basketball is a technique lay up shoot. This technique is the easiest technique to obtain the numbers so that can go on the purpose of the game of basketball itself.

This research aims to know the common mistakes done by a novice at the time lay up shot in the game of basketball. Analysis of lay up shot is very necessary for the coach or instructor and basketball player itself in order to find out how to fix the error. Analysis of Lay Up Shot starts from, step (1. Bounce the ball near the agency headed to the ring, 2. Forward with the right foot), jump (jump using the left foot), 3. Place the balls (1. Insert the ball with your right hand, 2. Thigh lift right foot, 3. Redirect the ball into the goal box in the Board of reflection).

Oliver (2007:20) States, "lay up is most likely shot high to print numbers in basketball, the players must try to do a assailant lay up in a game".
In doing shots lay up much-needed presence of accuracy in directing the ball into the basketball hoop. According to Wissel (2000:44), "the basic skills that should be trained in lay up shot is accuracy in shooting". One of the decisive factors to produce an accurate shot is the angle of the shot.

As for the several stages of a lay up shot in the game of basketball, among others:

1. Dribble close to the basket with your right hand.
   Since you're doing a right-handed lay up, angle your approach toward the right side of the basket. You want to get close enough to have easy access to the basket, but not so close that you end up directly under it. Lay ups are often taken off of a running dribble. Practice approaching the basket slowly at first, and increase your speed once you’ve got the footwork down. You can do a right-handed lay up if you're starting near the center or right side of the basket. If you're approaching the basket from the left, you'll want to do a left-handed lay up.

2. Step toward the basket with your right foot.
   When you're just a few feet from the basket, take a step toward it with our right foot. Use this step to gain distance and position yourself within easy shooting range. Dribble the ball one last time just outside your right foot.

3. Jump off of your left foot.
   As soon as your left foot lands, use it to jump in the direction of the basket. Your body should be moving toward the basket, but don't lean forward. Ideally, you'll be positioned close enough to the basket that you can jump straight up to take your shot. As you jump, bring the ball out of the dribble to your chest to prepare for the shot.

4. Shoot with your right arm as you lift your right leg.
   As you jump, imagine a string attached to your right arm and your right leg. Move them at the same time as you shoot, as though someone were pulling upward on the string. Your right knee should be bent and pointed toward the basket while your right arm moves up to shoot the ball. Arch your arm toward the basket. Shoot with your elbow slightly bent, so that your arm looks like the neck of a swan.

When you're doing a lay up, the shooting technique is slightly different from that of a regular shot. Instead of using your left hand to steady the ball, you want to shoot the ball using only your right hand. This gives you more reach, and since you’re so close to the basket that it's difficult to miss the shot, you don’t really need your left hand to steady the ball. As you shoot, slightly rotate your wrist inward to give the ball a little bit of spin, rather than snapping your wrist forward as you would for a regular shot. The gentle spin will keep it from hammering off the rim or backboard with too much force.

5. Aim for the sweet spot on the backboard.
   One of the reasons a lay up is such a sure bet is because you can always use the backboard to help ease the shot into the basket. When you're doing a right-handed lay up, the sweet spot is slightly to the right of the square in the center of the backboard. This spot absorbs the impact of the ball and drops it right down through the net.

You'll get two points no matter how you make your shot, but it's better to aim for the backboard instead of trying to just tip the ball over the rim. The backboard allows more room for error, but if you hit the rim funny the ball will bounce right out. There's nothing worse than missing a wide-open lay up when you have full access to the basket, so work on hitting that sweet spot every time.
2 Material and Methods

In this research, the authors use a suitable research methods with the purpose of this research, qualitative research. The number of samples as many as 35 people, who came from a basketball player the beginner students aged 17 to 19 years.

The collection of data used in this research is to use the tests. And tests that will be used is a test of a lay up shot (Sodikun, 1992:125).

Objective: to measure the skill shot lay up. Equipment: a set of boards, basketball, basketball court, whistles and basketball.

Hint: the Testee is in the middle of the field, while holding the right side of the ball. Dribble himself headed to the basketball and do shots lay up.

3 Result

The results of this research are (1) stepped on stage just as much as 44.3% to successfully perform the phases correctly. (2) at the stage of jumping as much as 77.1% to successfully perform this stage well and (3) on the stage of entering the ball just as much as 41% who succeed do the phases correctly.

Table 1: Analysis Lay Up Shot Basketball

<table>
<thead>
<tr>
<th>Step</th>
<th>Jump</th>
<th>Shot</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>∑ ind 1</td>
<td>∑ ind 2</td>
<td>∑ ind 1</td>
</tr>
<tr>
<td>8</td>
<td>23</td>
<td>27</td>
</tr>
</tbody>
</table>

Everage = 44.3%
Everage = 77.1%
Everage = 41%
4 Conclusion

From the results of the data analysis above, it can be concluded that the stages of step and jump had a lower score, while entering stage tend to be higher.

So from the above analysis we can know, of the three stages we can start and stressed an exercise program or learning that we should start first. We can create a form of exercise or learning in accordance with the results of the analysis and to give priority to three stages.

References

Development of Football Electronic Books to Enhance Technical Knowledge and Tactics of Football Games

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Abstract. The development of E-book football to produce a draft electronic book soccer, as the source of learning and alternative media, which can facilitate the student exercises, in hopes of improving student reading interest and also can increase knowledge of techniques and tactics of playing football on the undergraduates, this research. Method used in is the (research and development) this liquid development research aims to produce a product in the form of E-book Football Soccer training. The results of data analysis it is known that average percentage of the results of the analysis of data from a multimedia expert was 89.83% with very good category, the average percentage of the results of the analysis data from to expert soccer is 90.55% with very good category, the average of the percentages obtained from analysis of the data a small scale trial was 89.42% with very good category, the average percentage is obtained from the results of the data analysis of large-scale trials was 91.44% by category, whit categories are retrieved, then soccer training E-book can be developed and very effective as an exercise. A summary of research that the end product development E-book liquid a form of learning that is effective for training in the basic techniques of soccer games the advice can be ist current status is a good idea to give lecturers the courses football, making use of new technology also is more varied and creative by using soccer training E-book.

Keywords: football, e-book, knowledge.

1 Introduction

Superbly book about football knowledge is immense, but the Fund at present this module cannot yet fully give soccer complacency to these students. Superbly finished Peel book football games this is what being a major cornerstone of this research. Football book fulfillment should be adapted to the new technologies also IE. Actual professors write and produce open book set up in article 12 of ACT No. 12 year 2012 of higher education mentions that the lecturers individually or in groups mandatory write open book or text book, published by the College high and/or scientific publications as one of the sources of learning and to the development of academic and cultural activities read write pembudayaan for the civitas Academica. Even specifically in Act No. 14 of 2005 teachers and professors mentioned that professors as educational, professional, and its main task is the scientist, mentranformasi, develop, disseminate science and art through education, research, and devotion to the community. Products that want to apply the electronic book development developed soccer to improve the knowledge of techniques and tactics of football games against freshman football
games courses. Formulation of the problem in this study is 1) how to develop electronic books to improve the knowledge of techniques and tactics to play soccer against a student? 2) how far the application of the book of football by electronic group developed and tested their effectiveness can increase interest and ability to read the techniques and tactics play soccer against students?. Research objectives this development is 1). Produce a draft electronic book soccer, as the source of learning and alternative media? 2. test validity) the design of the electronic book of football as a development of the design of the electronic books that can increase interest in reading and can also increase knowledge of techniques and tactics play on student participants.

The E-Book is short for Electronic Book or e-book. No other e-book is a book form that can be opened electronically via computer. This e-book file format is in the form of an assortment, there in the form of PDF (portable document format) which can be opened with Acrobat Reader program or the like. There are also the ones with the shape of the HTML format, that can be opened by browsing the internet dental explorers or offline. Along with the development of today's digital world, the e-book also evolved into a product that is extremely preferred by people. In addition to the e-book in PDF form, we can also find e-books in the form of exe. Same as e-book shaped PDF, e-books in the form of exe also should our Installer. So that later we can read these e-books. World e-book while this indeed becomes a trend and greatly facilitate those authors to be able to disseminate his writings and easily accessible. With that in mind we can technically write, imagine if an e-book doesn't take a very big costs as is the case with a book that is functional and useful, among other things: 1) small physical size, because the E-Book has a digital format, he could store in the data storage (hard drive, CD-ROM, DVD) in a compact format. Dozens, even hundreds, of books can be stored in a DVD so it doesn't take a lot of place (large room). 2) Portability, some books in e-book format can be carried easily, while it took the book in print format very heavily rotted No. 3), the e-book does not become obsolete just like regular books. Digital format of E-books can last long into the future with quality has not changed. 4) Easily processed, the contents of E-book can be traced, in-search quickly and easily. This is very useful for people who do a study of the literature. 5) can be used by people who cannot read, because the E-Book format can be processed by the computer, the contents of E-Book can be read by a computer using text to speech synthesizers. Certainly research is still needed to make the technology a good reading. In addition to the blind, the reading can also be used by people who are illiterate. In addition to this demonstration can also be set by using a font which is great for people who are difficult to read small letters.

2 Methods

This research is the development of research that aims to produce a product in the form of E-Book football, according to the study. Referee (2010:47) is the research and development activities that are relatively long known in the world of industry. Research and development (research and development) is a relatively new concept in the world of sports, particularly research conducted by lecturers as well as students in the research fields of sports. Through this research is expected to be a variation of the research more towards theory test produce a product that can be used in developing an E-Book learning basic techniques to improve football games on student course football.
The procedures used in the development of an E-Book learning techniques to improve soccer games soccer courses students comprising several stages, namely: the findings draft design of small scale trials, revision 1, test try it on a large scale, revision 2 and the final product. The subject of the trial is the target users of the product i.e. soccer courses students, including Regular PJKR class C and D PJKR. This test is done with the intent to find out if the product development of an E-Book learning football generated can be used with students of courses of football. Small scale trials of the 24 participants are students of courses football, large-scale trials of 64 students football courses. Data collection techniques in the study using interview, observation and questionnaire. Observations and interviews were conducted to gather information about the implementation process and associated football ... A questionnaire was used to obtain the results of the assessment of products from experts as well as students of courses of football to provide input and advice on the products that will be generated, as well as the assessment sheet from experts before tested to small scale as well as large scale to get the end product that fits with the expected goal.

3 Result

Development of an E-Book learning soccer after applied to students of courses of football expected 1) result from the design of an E-Book learning the basic techniques of football deserves to be used as a medium of collaboration in learning to process Soccer courses on students. 2) soccer courses Students liked and response to the E-Book, so by the time the study subjects football students better understand the basic techniques of soccer games properly. 3) the applicability of learning by using media E-Book that can enhance the capabilities developed basic techniques of soccer games soccer courses students. The next stage is to create a product using the following steps: analysis of the purpose and character of the product, an analysis of the character of students, goal setting, determining the techniques that will be practiced in the E-Book, create, Edit an E-Book. Before being tested in small scale trials, early product model E-books learning the basic techniques of soccer first performed the validation of appropriate experts with field research. Researchers involves 3 people are expert lecturers, namely, Dr. Nimrot Manalu, M. Kes as a football expert, M. Akhmal, M. Or as an expert II soccer, and Hariansyah Fiky, S. Kom as a multimedia expert to validating products E-Book learning basic techniques Football courses for college students. The results of the questionnaire of charging football experts, multimedia expert, gained an average of more than 4 value i.e. 4.60 with that fall into the category of assessment of “good/right”. In this case it can be inferred that the model E-books learning the basic techniques of soccer to football courses student participants can be used for small scale trials.

A small trial result performed against E-Book products in learning can be in positive student response motivation courses football of 89.42%. The conclusion of the effectiveness of the response of the students of courses of football against E-books learning football in the categories very well.

Product E-books learning soccer after tested on a small scale and has been revised, the next step is to conduct a large-scale trial. Large scale trials underway in two (2) regular class PJKR the Faculty of sports science State University of Medan. For 64 students as respondents in may in response to positive soccer learning in students of 91.44% so the conclusion of football courses student effectiveness against E-books learning football in the categories very well.
4 Discussion

In perfecting this product where E-Book for learning football researchers generate is the E-Book, so that later users of this product i.e. Lecturer/trainer of football or even the students themselves would be easier to mention in its use. Provide learning the basic techniques of soccer games on student subjects, especially football fundamentals basic techniques of football games is not easy. In addition, in the learning process should be able to provide easy movement technique is practiced by students of courses in learning the basic techniques of soccer football games. Excellence E-Book study course students on football soccer this is presenting fundamental basic techniques of soccer games. Development of an E-Book learning football, serves the basic techniques of soccer games that are expected to simplify student soccer courses to enhance the capabilities of football games. In addition to having an advantage, E-books learning soccer also has drawbacks. In E-learning This soccer Book shows only basic techniques on how to do the exercises while dribbling, passing and shooting without showing on the football game’ application.

5 Summary And Advice

Based on the results of research and discussion about the development of an E-Book learning soccer, then it can be inferred from the Form 1) this medium in the form of an E-Book learning basic soccer techniques soccer can be used as an alternative media learning soccer future collaboration. 2) how to use or operation of the media E-Book football learning very easy and the equipment used must be appropriate hardware and software for the E-Book deployment.

Suggestions with the utilization of this product is: E-books learning soccer football courses for students at the Faculty of sports science State University of Medan as products that have been produced in this study can be used for learning alternative football by lecturers in improving basic techniques of soccer games soccer courses students. A few suggestions that can be delivered with the use of this product: 1) Suggested we recommend to professors, as well as coach as the constructor of Student activity units of football should utilize advances in technology that are more varied and creative with using E-books learning football as soccer learning program. 2) University/Faculty of Parties is expected to provide facilities of usage of E-books learning basic techniques for the enhancement of football soccer games soccer courses students.

References


Numerical Solution of Delayed SIR Model of Tuberculosis with Combination of Runge Kutta Method and Taylor Series Approach

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Abstract. In this paper, the implementation of fourth-order Runge Kutta method with Taylor series approach for solving Susceptible Infected Remove (SIR) Model with including to system of delay differential equation (DDEs). The method obtained approximate solutions of the model using constant step size. The DDEs will be treated in expansion of Taylor Series i.e. \( y(t - \tau) = y(t) + \tau \frac{dy}{dt} \). Numerical results are presented to show that the method is suitable for solving the System of DDEs and also time delay give the effect to Infected and recovered populations for \( \tau \geq 0 \).

Keywords: Runge Kutta Method; Taylor Series; SIR Model; Time Delay.

1 Introduction

Tuberculosis (TB) continues to be a health problem in the world, especially in developing countries. Tuberculosis is the top ten most common infectious diseases in the world. In 2016, as many as 10.4 million people worldwide had contracted tuberculosis and 1.7 million of them died.

Indonesia, India, China, the Philippines, Pakistan, Nigeria and South Africa are seven developing countries that contribute 64 percent of the total spread of tuberculosis worldwide. Data from the World Health Organization (WHO) recently released in January 2018 states that the number of TB cases in Indonesia reached 1.6 million in 2016, with an estimated 100,000 deaths per year. Thus, there are 273 cases of death per day or 11 deaths every hour due to TB (Putra (2018)). The average discovery for the city of Medan in that month could be 1000 people suspect TB with sufferers of 150 to 200 people every month found. TB patients who have been found in the past six years reached 7,600 people. Those who recovered were 3,078 people. The rest, currently in the process of processing and there are also many who die as many as 35 people (Dani, 2017). From the data submitted by Dani, (2017), there is an increasing TB cases in Medan, therefore finding a suitable mathematical model to control spread of TB disease is important.

Many researchers continue to build mathematical models for TB disease such as Zwerling et al., 2015, find new diagnoses, therapies, and develop algorithms to improve case discovery, diagnosis, and clinical management of patients with TB, making policies in making difficult decisions and choosing to use technology when working under heavy pressure. Then Taufik et
al. (2015) developed a mathematical model of vaccinated TB disease with exogenous infection and found that disease-free eigen values were always negative, meaning that the stable model was symptomatically disease-free. Rangkuti et al. (2014) have been constructed an mathematical model of TB, VSEIR, to analysis the stability and the dynamical VSEIR populations for 0≤t≤25. Iskandar et al. (2017) analyzed the stability of the mathematical model of SIR by adopting time delay during recuperation. The model was stabil.

Various numerical method have been solved SIR model. A more robust and intricate numerical technique is the Runge Kutta method (RK). This method is the most widely used one since it gives reliable starting values and is particularly suitable when the computation of higher derivatives is complicated Islam (2015). Based on previous statement, RK method will use to solve SIR model.

In skandar’s paper, the solution of SIR with time delay numerically to show impact of time delay toward number of SIR populations.

2 Sir Model With Time Delay

The delay time in the model is described as the time needed by the virus that infects cells so that the virus develops, delays occur due to continuous treatment. In this paper the model of susceptible, infected and recovery (SIR) with time delay and without delay. This model was developed by Iskandar et al (2017) as

\[\frac{dS_v}{dt} = \frac{c\pi N + \gamma R - \frac{\beta_v S_v I}{N} - \mu_s S_v}{N}\]

\[\frac{dS_T}{dt} = (1 - c)\pi N - \frac{\beta_T S_T I}{N} - \mu S_T\]

\[\frac{dI}{dt} = \frac{\beta_v S_v I}{N} + \frac{\beta_T S_T I}{N} - \mu I - \delta I(t - \tau)\]

\[\frac{dR}{dt} = \delta I(t - \tau) - \mu R - \gamma R\]

\[N = S_v + S_T + E_v + E_T + I + R\]

Where N as the total population, S_v as vaccinated susceptible, S_T as unvaccinated susceptible, I as recovered, c as vaccination rate parameter, π as birth rate parameter, β_v as transmission rate parameter of vaccinated susceptible, β_T as transmission rate parameter of unvaccinated susceptible, μ as natural mortality rate parameter, γ as the transfer rate of population from recovered to be susceptible, μ_T as parameter of death rate due to TB, ν as recovery rate parameter, and τ as period recovery.

The model can be simplified by assuming the following fractions

\[w = \frac{S_v}{N}, x = \frac{S_T}{N}, y = \frac{I}{N}, z = \frac{R}{N}\]

Thus, the model can be simplified as follows

\[\frac{dw}{dt} = c\pi + \gamma z - \beta_v x y - \mu w\]

\[\frac{dx}{dt} = (1 - c)\pi - \beta_T x y - \mu x\]

\[\frac{dy}{dt} = (\beta_v + \beta_T) x y - \mu y - \delta y(t - \tau)\]

\[\frac{dz}{dt} = \delta y(t - \tau) - (\mu + \gamma)z\]
Here, the time delay variable \( y(t-\tau) \) is expanded by Taylor series in form \( y(t) - \tau \frac{dy}{dt} \). The SIR model can be written as

\[
\begin{align*}
\frac{dx}{dt} &= c\pi + \gamma z - \beta V z - \mu x \\
\frac{dy}{dt} &= (1 - c) \pi - \beta T y - \mu x \\
\frac{dz}{dt} &= \theta \left( y(t) - \tau \frac{dy}{dt} \right) - (\mu + \gamma) z
\end{align*}
\]

(9) (10) (11) (12)

3 Runge-Kutta Method

Fourth order Runge Kutta Method is the best method for solving system of differential equations. The following formula normally used is written as

\[
y_{i+1} = y_i + \frac{1}{6} (k_1 + 2k_2 + 2k_3 + k_4)
\]

(13)

Where

\[
k_1 = f(x_i, y_i) \\
k_2 = f \left( x_i + \frac{1}{2} h, y_i + \frac{1}{2} k_1 h \right) \\
k_3 = f \left( x_i + \frac{1}{2} k_2 h, y_i + \frac{1}{2} k_2 h \right) \\
k_4 = f (x_i + h, y_i + k_3 h)
\]

(14)

To overcome the difficulty in solving delay form, the delay form i.e. \( y(t-\tau) \) changed to \( y(t) - \tau \frac{dy}{dt} \) which was proposed by Toaha (2009). They\( (t) + \tau \frac{dy}{dt} \) was obtained by Taylor series.

4 Result And Discussion

Several investigations have done for SIR model of Tuberculosis with time delay in this paper. This model is suitable for the Medan City. Some parameters are taken from department of Health. The parameter is known as \( c:=0.005 \), \( \pi:=0.03 \), \( \gamma:=0.067 \), \( \beta_V:=0.1 \), \( \beta_T:=0.675 \), \( \mu:=0.03 \), \( \mu_T:=0.032 \), \( \theta:=0.7389 \) The initial populations in probability are

\[
w(0) = \frac{2540}{222940}, x(0) = 2080288/2229408, y(0) = 92470/2229408, z(0) = 31250/2229408
\]

Reported by department of health of medan city. The simulation was carried out using MAPLE by adopted data of Tuberculosis cases in the Medan city.

Behaviour dynamic of SIR model without delay time can be seen from figure 1.
Here, x-axis is time (months) and the y-axis is the probability of SIR model. Above results showed that probability of vaccinated susceptible increased sharply, whereas unvaccinated susceptible dropped dramatically tend to x-axis. For probability of infection, decreased slightly tend to horizontal axis, it means, by this model, infection population will be small, while recovered population increase slowly because, number of infection also slight. The following figure showed dynamical result of SIR with various time delays which were described in Figure 2.
Figure 2 was divided by four time delay values ($\tau$): (a) for $\tau=0.1, 0.5, 1.0$ and $\tau=1.2$, impact of time delay is small. Probability of susceptible without and with time delay almost same. (b) for different $\tau$ was given, the impact of time delay also small to susceptible population. (c) the impact of time delay is too big. By time delay, population of infection drop sharply close to x-axis, as long the time delay, infected population getting smaller. (d) the last graphic showed that there is no impact of $\tau$ to development of recovery population.

5 Conclusions

Numerical solution of SIR with delay time has been obtained. Some parameters are taken from department of Health. The parameter is known as $c:=0.05$, $\gamma:=0.03$, $\gamma:=0.333$, $\beta_v:=0.1$,
$\beta_T=0.675$, $\mu=0.03$, $\mu_T=0.032$, $\theta=0.37$ The initial populations in probability are $w(0) = \frac{25400}{229408}$, $x(0) = 2080288/2292408$, $y(0) = 92470/2229408$, $z(0) = 31250/2229408$

reported by department of health of medan city. Calculation for numerical method used fourth order Runge-Kutta Method and assisted by MAPLE software. Time delay $\tau$, i.e. $\tau=0.1,0.5,1.0$ and $\tau=1.2$, very gave big impact to number of infected population. The population of infection drop sharply close to $x$-axis, as long the time delay, infected population getting smaller otherwise no impact of time delay to other populations. RK method can be an alternative method for solving another system of delay differential equation.

Acknowledgments. The heading should be treated as a 3rd level heading and should not be assigned a number. The financial support received from BOPTN UNIMED is gratefully acknowledged.

References


Needs Analysis and Effectiveness of Learning Outcomes with Competence-Based Learning Application

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Abstract. Construction work is an activity carried out by building construction workers related to infrastructure development or civil works. Construction workers are people who are directly involved in project implementation and play an important role in achieving project objectives. Generally, construction workers do not have basic skills, let alone competence in entering the building construction work market. The purpose of this study is to produce an analysis of learning material needs and produce an analysis of the effectiveness of competency-based learning. The results of the study were 1) The results of the instrument validity test on learning needs were declared valid 2) Materials for the Stone Concrete Settlement Work stated that concrete stone finishing work was needed to build construction workers, 3) The results of the analysis of the task evaluation, psychomotor and affective on the CBL model stated that all three aspects are considered very effective to improve the competence/knowledge of building construction workers.

Keywords: Needs Analysis, Effectiveness, Competence-Based Learning

1 Introduction

The development of the construction management sector needs to be balanced with the presence of workers or workers with good quality human resources. Aspects of human resources are construction workers in the field, namely construction workers who are directly involved in project implementation and play an important role in achieving project objectives. Project workers in the field, in this case, building construction workers are identical with hard-sector jobs, where the majority are male workers. In entering work as a building construction worker, it is not expected to have a high education. Likewise, in entering the world of construction work, construction workers are very easy to enter this work field. Considering that construction work has never run out, construction workers will be very easy to find jobs in this field. Generally, the job as a construction worker is with a high school education background.

The formal job market requires high competitiveness for formal job seekers. The formal job market requires a formal educational background in entering it. In other words, if you want to enter the formal job market, you must have educational legalities such as a diploma or other expertise certificate. This will have an impact on low-educated urban residents who are unable to enter the formal labor market. Medan City statistical data in August 2017 states that the
number of people with lower levels of education than high school reached 32.23% of the total population of Medan City which reached 2.5 million. Whereas of the total population, the productive workforce working in the informal sector reached 57.50%. The results of interviews with several contractors in the city of Medan stated that generally, construction workers with the highest education were graduating from high school. Generally, construction workers do not have basic skills, let alone competence in entering them. In addition, construction workers also do not need capital (financial) while the world job market of building construction is quite broad and never stops both large and small scale.

Building construction competence is divided into several skills such as concrete stone engineering, steel engineering, wood, building drawings, furniture and so on. Concrete Stone Engineering expertise competencies have basic competencies such as foundation installation, wall, stamping, finishing and others. The results of the interview with the contractor stated that one of the promising basic competencies in building construction was finishing work. Included in finishing work are ceramic installation, moulding techniques, and wallpaper installation. This will be the basis of this research to provide basic competencies for building construction workers. If this basic competence is given to building construction workers, it can have an impact on increasing competitiveness, competitiveness and ultimately can improve the welfare of building construction workers.

To overcome the facts above, it is necessary to conduct research on how to improve competence for building construction workers. Competence is human measurable ability needed to improve effective work performance. Model and competency analysis is to identify various people management systems such as workforce planning, selection, employee development, performance management and welfare improvement (Sultana, A, 2014). Companies that adopt competency-based labor practices find solutions to effective management problems and monitor their workforce in the new world of work. Therefore it is necessary to research the development of competency-based learning models whose results are to develop a competent workforce, competitive in the world of work can improve the level of welfare of workers.

To purpose of this study are to producing needs analysis Competency-based learning and to generate an analysis of the effectiveness of competency-based learning outcomes for construction workers.

2 Literature Review

2.1 Competency-based Learning

Competency-Based Learning (CBL) is learning that is carried out with an orientation towards achieving students' competencies. So that the final estuary of learning outcomes is an increase in the competence of learners that can be measured in the pattern of attitudes, knowledge, and skills (Purnomo: http://kidispur.blogspot.com). Furthermore in the aspect of learning, the Ministry of National Education (2002) states that competency-based learning has the following five characteristics: (1) Emphasizes the achievement of the competencies of students both individually and classical; (2) Oriented on learning outcomes and diversity; (3) Submission in learning using various approaches and methods; (4) Learning resources are not only lecturers but also other learning resources that fulfill educational elements; (5)
Assessment emphasizes learning processes and outcomes in mastery efforts or achievement of competence. In line with this, according to Gonczi (1998: 38), important characteristics are found in competency-based education models, including (1) a list of competencies that are documented accompanied by specific standards and conditions for each competency; (2) at any time students can be assessed for achievement of their competence; (3) learning takes place in a module format that is related to each competency; (4) assessment based on certain standards in competency statements; (5) most of the skills-based assessments are demonstrated in real terms; (6) students can obtain exemptions from the learning section and proceed to the next work unit based on the competencies that have been achieved; (7) student learning outcomes are recorded and reported in competency statements.

2.2 The Model of Competency-based Learning

Competency-based learning model building construction workers are designed with the following characteristics: (1) The learning approach used is adult learning; (2) Planning learning includes the preparation and formulation of objectives, learning methods and techniques, learning materials and materials, resource persons, learning media and evaluation of learning; (3) Learning methods that are considered appropriate to the needs of adult students who have worked are participatory learning because this learning actively engages students in learning activities ranging from planning, implementation to evaluation. Besides that participatory learning has principles derived from the needs of students, goal oriented, learner-centered and based on learning experiences; (4) Learning materials related to the needs, daily life and experience of students, namely as construction workers. The material presented in the form of basic building with earthquake-resistant building construction; (5) The media used is media that has conformity with the objectives of teaching, can stimulate thinking and generate the same perception, interesting and clear, easy to use and adapted to the level of thinking ability of students. The types of media used include images, color photos, videos, and original forms; (5) The resource person or facilitator has a background that is appropriate to the activities that will be given, experts or have experience and know the learning methodology, able to use the media, communicative and able to provide motivation; (5) Evaluation is carried out before and after learning which aims to assess the achievement of goals.

3 Methods

Construction work is an activity related to efforts to develop infrastructure or civic buildings, which have a series of activities and fulfill the requirements and through a certain scope of work carried out by a group of people. Construction work is identical to work in construction projects where construction work only takes place temporarily and in a limited period. Construction projects allocate certain resources to carry out tasks whose targets are clearly outlined.

4 Results And Discussion
4.1 Need Analysis

The analysis carried out was to analyze the need for the development of learning models, analyze the feasibility/needs and prerequisites in the development of new learning models. The problem that occurs is because the existing learning model is not relevant to the needs, learning environment (facilities and infrastructure), technology, characteristics of students, and so on. The implementation of learning programs is carried out because of problems such as lack of skills and knowledge/competencies that lead to the low performance of individuals in the organization or company. Improvement of the quality of knowledge and skills is carried out due to the low competency of the participants in this case construction workers in entering the building construction work. Therefore, it is necessary to do a needs analysis, namely to determine the abilities or knowledge/competencies that need to be learned by participants to improve performance or knowledge/skills that have implications for increasing competence. Analysis of learning needs is carried out through questionnaires to stakeholders (users) in this case educators, practitioners, and instructors. The dissemination of this questionnaire aims to obtain data on the need for learning to be taken during the research process. The results of the distribution of questionnaires were processed and analyzed to determine the competencies/knowledge needed in concrete stone finishing work. There are two instruments examined, namely the needs analysis validation instrument and the learning needs analysis. Researchers provide questionnaires, each of which consists of 47 statement items and questions.

Analysis of the instrument of the validity of learning needs using Aiken's formula in determining Valid or invalid items of the instrument given. Assessment is done using a Likert scale where score 5 (Very Valid) for the highest score and score 1 (Very Invalid) for the lowest value. The results of the analysis of the validity instrument are carried out with the aim to obtain the validity of the analysis of learning needs designed. The result is the validity of the learning needs instrument can be seen in Table 1. Below

<table>
<thead>
<tr>
<th>No</th>
<th>Rated aspect</th>
<th>Number of items</th>
<th>V Aiken's</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Workplace safety</td>
<td>9</td>
<td>0.906</td>
<td>Valid</td>
</tr>
<tr>
<td>2</td>
<td>Inspection of building materials</td>
<td>12</td>
<td>0.906</td>
<td>Valid</td>
</tr>
<tr>
<td>3</td>
<td>Concrete Stone Work Tools</td>
<td>13</td>
<td>0.888</td>
<td>Valid</td>
</tr>
<tr>
<td>4</td>
<td>Plastering Work</td>
<td>5</td>
<td>0.877</td>
<td>Valid</td>
</tr>
<tr>
<td>5</td>
<td>Tile and Ceramic Installation</td>
<td>3</td>
<td>0.890</td>
<td>Valid</td>
</tr>
<tr>
<td>6</td>
<td>Moulding Techniques</td>
<td>5</td>
<td>0.900</td>
<td>Valid</td>
</tr>
<tr>
<td></td>
<td><strong>Summary</strong></td>
<td><strong>47</strong></td>
<td></td>
<td><strong>Valid</strong></td>
</tr>
</tbody>
</table>

The results of the instrument validity test on learning needs are Valid with an average Aiken’s V value of 0.870. V Aiken’s value obtained 0.870> 0.600 is stated in the valid category. The highest result of validity is on the health aspects of workplace safety and inspection aspects of building materials that is 0.906, this is because every building construction work must pay
attention to the importance of occupational health and safety. Likewise, with the need to
inspect building materials starting a building construction work. Overall from table 1, it can be
valid because all the validity values obtained are greater than 0.600.

Analysis of competency-based learning needs for building construction workers is concrete
stone finishing work. This questionnaire uses a rating scale with a scale of 1 - 5. Where the
value of 5 for material that is badly needed, a value of 4 is needed, the value of 3 is doubtful, a
value of 2 for less material is needed and a value of 1 for material that is not needed. This
questionnaire was validated by 5 (five) stakeholders consisting of educators, practitioners, and
instructors.

From the 47 questions distributed to retrieve data on concrete stone work needs, there were 6
aspects assessed: 1) Workplace safety, 2) Building Materials Inspection, 3) Concrete Stone
Works, 4) Plastering Work, 5) Installation of Tiles and Ceramics and 6) Moulding
Techniques. Each criterion that is judged to have a different item is adjusted to the needs for
its analysis. Based on the questionnaire data analysis, the need for concrete stone finishing
work learning model can be seen in Table 2 below:

<table>
<thead>
<tr>
<th>No</th>
<th>Rated aspect</th>
<th>Avg</th>
<th>%</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Healthy safety work</td>
<td>4,622</td>
<td>92,44</td>
<td>Very Needed</td>
</tr>
<tr>
<td>2</td>
<td>Inspection of building materials</td>
<td>4,550</td>
<td>91,00</td>
<td>Very Needed</td>
</tr>
<tr>
<td>3</td>
<td>Concrete Stone Work Tools</td>
<td>4,508</td>
<td>90,15</td>
<td>Very Needed</td>
</tr>
<tr>
<td>4</td>
<td>Plastering Work</td>
<td>4,560</td>
<td>91,20</td>
<td>Very Needed</td>
</tr>
<tr>
<td>5</td>
<td>Tile and Ceramic Installation</td>
<td>4,600</td>
<td>92,00</td>
<td>Very Needed</td>
</tr>
<tr>
<td>6</td>
<td>Moulding Techniques</td>
<td>4,480</td>
<td>89,60</td>
<td>Needed</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>4,553</td>
<td>91,07</td>
<td>Very Needed</td>
</tr>
</tbody>
</table>

Based on the results of the needs analysis, it can be concluded that the Concrete Stone
Finishing Work material for planning education and training programs is needed. This is seen
from the average percentage of 91.07 which is categorized as ‘very needed’. From the results
of the above analysis strengthen researchers to conduct research by developing a CBL model
of building construction workers.

4.2 Implementation

The implementation phase is carried out on education and training participants in this case
building construction workers. The implementation of CBL was carried out at the Civil
Engineering Workshop of the Faculty of Engineering Unimed by implementing the developed learning model. Furthermore, participants will implement the knowledge and skills gained from education to be applied in the building construction work. The task assessment is carried out by observing participants in doing Concrete Stone Finishing work.

4.3 Effectiveness of Learning Outcomes

Building construction workers as education and training participants were 27 people, who were assessed based on observations. Assessment is carried out by instructors, and supervisors during the activity. Based on the processing of data from the assessment of the tasks performed, the results of statistical analysis are as follows. Task assessment includes 1) Having an action plan, 2) Use of materials, 3) Use of tools, 4) Work steps, 5) Cooperation and interaction, 6) Understanding of work, 7) Presentation, 8) Appropriateness of work size, 9) Ability to analyse work, and 10) Make new work ideas. The results of the task assessment statistics can be seen in Figure 1.

![Figure 1: Histogram assessment CBL’s model tasks](image1.png)

![Figure 2: Percentage of Task Assessment CBL’s Model](image2.png)

Figure 1 and Figure 2 show the results of the statistical evaluation of CBL participants in evaluating the task assessment of the 10 observed criteria. The results showed that there were
still 2 participants (7.41%) who had not reached 70. While 25 participants (93.59%) had scored above 70. The highest assessment results were within the 70.0 - 75.0 score range, 0 is 25.93% (7 people). Overall the ability of participants can be said to be good because it has reached the graduation rate of 93.59%> 80% (graduation percentage of a class).

Figure 3: Histogram of psychomotor assessment CBL model

Figure 4: Percentage of Psychomotor Assessment CBL’s Model

Figure 3 and Figure 4 show the results of evaluating the statistics of CBL participants in evaluating psychomotor assessment of the 14 observed criteria. Psychomotor assessment criteria consist of Preparation Aspect 4 criteria, process aspects 5 criteria and product aspects 5 criteria. Each criterion is followed by a list of rubrics to facilitate the observation and assessment carried out. The results show that all participants can pass the 70 marks (minimum psychomotor rating). There is only 1 person (3.7%) who has a value of <75.0. The highest assessment result is in the limit of values of 80.0 - 85.0 of 25.93% (7 people). Overall the psychomotor ability of participants can be said to be good because it can achieve psychomotor abilities with a 100% graduation rate.

Affective assessment rubric for participants consists of assessment criteria for attitudes, interests, self-concept, values and morals. Each assessment criterion has 2 statements to mutually reinforce each of the affective assessment criteria. Each assessment criterion is carried out by observing participants in conducting CBL model activities. Each task assessment criteria is assessed with 4 answer choices. The highest score is 4 (four) in the Very Good category, the score is 3 (three) for the good category, the score is 2 (two) for the Poor
category and the lowest is 1 (one) for the Poor category. This value is then converted to get the value from 0-100.

Participants in education and training are not only assessed by cognitive and psychomotor aspects, but also by their affective aspects. Assessment is carried out based on observations by the instructor and mentor during the activation process. Based on the processing of assessment data, the results obtained from the statistical analysis are as follows.

![Figure 5: Histogram of the affective assessment CBL's model](image)

![Figure 6: Percentage of affective assessment CBL's model](image)

Figure 5 and Figure 6 show the results of the statistical evaluation of participants in the CBL model in evaluating the affective assessment of the 14 observed criteria. The results show that all participants can pass the 70 marks (the minimum limit for affective assessment). There is only one person (3.7%) who has a value <75.0. The highest assessment result is in the value limit of 80.0 - 85.0 of 37.04% (10 people). Overall the affective ability of participants can be said to be good because it can achieve the value of affective abilities with a 100% graduation rate.

5 Conclusion

The results of the exposure that have been presented have the following conclusions
- The stage of needs analysis is carried out by analyzing the need for CBL stating that the competence of concrete stone finishing work is very needed.
The results of the instrument validity test against learning needs are stated to be valid with the average Aiken’s V value of 0.870.

Based on the results of the needs analysis can be concluded material Concrete Stone Finishing Work with an average rating scale of 91.07. This value indicates that concrete stone finishing work is needed for building construction workers.

The results of the task assessment analysis carried out with 10 aspects that were considered to show high results with a passing grade of 93.59%.

The results of psychomotor analysis carried out with 14 aspects that are considered to show high results with a passing grade of 100%.

The results of the affective analysis carried out with 12 aspects that are considered to show high results with a passing grade of 100%.

**Acknowledgments.** This research was conducted at the Unimed Engineering faculty workshop. Therefore, the researcher would like to thank the Dean who has given permission to use the Pendidikan Teknik Bangunan's workshop. To all staff and laboratory assistants who have helped during this research. Thank you very much. May Allah blessing us.
References

Implementation of Virtual Lab Media Using Problem Based Learning Models to Increase Students Learning Achievement Based STIFI and Learning Style Test

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Abstract. This research aims to implement the Virtual Lab media using Problem Based Learning assisted to increasing the students' learning achievements in Cahaya Medan High School and finding out whether there are differences in student learning achievements using virtual lab media and Problem Based Learning models in terms of the STIFIn test and learning style tests. This study uses a pretest-posttest group design. Data analysis techniques using One Way Anova analysis. The results showed: (1) there were differences in the increase in students' chemistry learning achievements in terms of the STIFIn test, and (2) there were differences in the increase in students' chemistry learning achievements in terms of learning style tests.

Keywords: Virtual Lab Media, Problem Based Learning Models, STIFIn, Learning Style, Learning Achievement.

1 Introduction

Education is a conscious effort that is done so that students can achieve certain goals to reach maturity (Utami et al. 2016). Education is not only the process of transferring knowledge possessed by the teacher to students but also develops a good personality to students in terms of knowledge, attitudes and skills (Ratna & Sani, 2017). In fact, during the learning process, students are less actively involved, tend to just accept the subject presented and result in less optimal achievement (Fauzan et al. 2017).

One effort to overcome these problems is apply the Problem Based Learning. Problem Based Learning provides opportunities for students to be responsible for their own learning (Ulger, 2018). In the Problem Based Learning, the role of the teacher is to present a variety of authentic problems so that it is clear and requires the activeness of students to be able to solve the problem (Wulandari & Surjono, 2013).

In the learning process not only pay attention to the external factors of students, known as the learning model, but also pay attention to the internal factors of the student, namely the personality type (Utami et al. 2016). The STIFIn concept can describe a person as a whole as well as his social relationships, even if only with the information of the brain hemisphere and the dominant brain layer (Poniman, 2016). In the STIFIn concept, there are 5 brain hemispheres in humans where there is only one dominant (Hiday, 2017). In STIFIn, the learning patterns of each machine-intelligence are modeled as follows: Sensing (S), Thinking (T), Intuiting (I), Feeling (F) and Instinct (In) (Rafianti & Pujiastrutti, 2017).
In addition to the use of learning models, other efforts that can be done to overcome the problems of student learning achievements are the use of learning media, one of them is virtual lab media. Virtual chemlab is a virtual software that can be used for laboratory simulations on chemical subject that allows the educators to make their own laboratory simulations (Naipospos, 2016). Sari et al. (2014), reported that Learning by using Virtual lab media provides improvement of learning achievements. The research was conducted by Panggabean et al. (2017) state that, the learning achievements of students who were taught with virtual lab media were higher than those of students who were taught with real lab media. Linked with Hikmah’s research, et al. (2017) the influence of the application of virtual simulations in improving students' conceptual understanding.

This study aims to determine differences in the improvement of student learning achievements using virtual lab media with Problem Based Learning Model terms of STIFIn tests (Sensing, Thinking, Intuiting, Feeling and Instinct), and learning style tests (Visual, Auditory and Kinesthetic).

2 Material And Methods

2.1 Time and Place Allocation

Research was conducted at the Medan Cahaya High School which is located at Hayam Wuruk street No. 11 Medan. The time of the research was carried out in the odd semester academic years of 2018/2019.

2.2 Research Procedure

The research was carried out in several stages as follows: 1) giving pretest, STIFIn test, and learning style before treatment; 2) implementation of virtual lab media using by Problem Based Learning Model with the STIFIn method; 3) giving posttest after treatment. The research method used was experimental research with pretest-posttest group design (Silitonga, 2014). The sample of this study was 30 students. Data collection methods are carried out by learning test results, STIFIn tests, learning style tests and personality tests.

2.3 Data Analysis

Data analysis techniques to be used includes: 1) tabulation of research results data; 2) determination of normalized gain; 3) data normality test using the approach Kolmogorov-Smirnov; 4) data homogeneity test using approach Levene's Test; and 5) hypothesis testing using the Analysis of One Ways Anova variance (Silitonga, 2014).

3 Result And Discussion

3.1 Description of Student Learning Achievements

Before being given treatment, students are given a pretest, a STIFIn test, and a learning style test. Furthermore, students were given treatment using virtual lab media with Problem Based
Learning models. At the end of the meeting students are given again a post-test to find out student learning achievements. Increased student learning achievements are calculated by normalized gain techniques.

<table>
<thead>
<tr>
<th>STIFln</th>
<th>Statistic</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensing</td>
<td>N</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>17.50</td>
<td>33.67</td>
<td>0.71</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>3.017</td>
<td>0.816</td>
<td>0.034</td>
</tr>
<tr>
<td>Thinking</td>
<td>N</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>17.50</td>
<td>35.83</td>
<td>0.81</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>1.225</td>
<td>1.169</td>
<td>0.055</td>
</tr>
<tr>
<td>Intuiting</td>
<td>N</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>16.83</td>
<td>37.17</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>2.401</td>
<td>1.169</td>
<td>0.048</td>
</tr>
<tr>
<td>Feeling</td>
<td>N</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>17.17</td>
<td>34.67</td>
<td>0.77</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>1.329</td>
<td>1.033</td>
<td>0.038</td>
</tr>
<tr>
<td>Instinct</td>
<td>N</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>17.33</td>
<td>31.67</td>
<td>0.63</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>0.816</td>
<td>1.211</td>
<td>0.063</td>
</tr>
</tbody>
</table>

Students with the Sensing type from the pretest results obtained an average score of 17.50 and an average post-test score of 33.67 and an average increase in learning Achievements (gain score) of 0.71 (high). Students with Thinking-type got an average pretest score of 17.50 and an average posttest score of 35.83 with an average gain score of 0.81 (high). Students with Intuiting type got an average pretest score of 16.83 and an average posttest got score of 37.17 with an average gain score of 0.88 (high). Students with the type of Feeling got an average pretest score of 17.17 and an average posttest score of 34.67 with an average gain score of 0.77 (high). Students with Instinct type got an average pretest score of 17.33 and an average posttest score of 31.67 with an average gain score of 0.63 (moderate).
Table 2. Increasing of Learning Achievements Based on Learning Style Test

<table>
<thead>
<tr>
<th>Learning Style</th>
<th>Statistic</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual</td>
<td>N</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>17.50</td>
<td>32.70</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>2,273</td>
<td>1,567</td>
<td>0.069</td>
</tr>
<tr>
<td>Auditory</td>
<td>N</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>17.30</td>
<td>34.60</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>1,252</td>
<td>1,578</td>
<td>0.066</td>
</tr>
<tr>
<td>Kinesthetic</td>
<td>N</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>17.00</td>
<td>36.50</td>
<td>0.85</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>1,944</td>
<td>1,434</td>
<td>0.065</td>
</tr>
</tbody>
</table>

Data on increasing of students learning achievements based on learning style test are seen in table 2. Students with visual learning styles from the pretest results got an average score of 17.50 and an average posttest score of 32.70 and an average increase in learning achievements (gain score) of 0.67 (medium). Students with auditory learning styles got an average pretest score of 17.30 and an average posttest score of 34.60 with an average gain score of 0.76 (high). Students with kinesthetic learning styles got an average pretest score of 17.00 and an average posttest score of 36.50 with an average gain score of 0.85 (high).

3.2 Hypothesis Testing

Hypothesis testing is done to analyze differences in the improvement of student learning achievements (gain scores) using virtual lab media with Problem Based Learning model terms of STIFIn tests, and learning style tests. Hypothesis testing was carried out using variance One Way Analysis technique.

3.2.1 Hypothesis Test Based on the STIFIn Test

Differences in the increase in student learning achievements based on the STIFIn test were analyzed by One Way ANOVA as in table 3.

<table>
<thead>
<tr>
<th>ANOVA</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>.210</td>
<td>4</td>
<td>.052</td>
<td>22.203</td>
<td>.000</td>
</tr>
<tr>
<td>Within Groups</td>
<td>.059</td>
<td>25</td>
<td>.002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>.269</td>
<td>29</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results of the analysis on Table 3, obtained the Fcount of 22.203 with the sig. value. 0.000 <0.05, so it can be concluded that there are differences in the increase in student learning
achievements (gain scores) using virtual lab media with the Problem Based Learning models terms of the STIFIn test.

To find out which group gives a better influence (based on the STIFIn test), then do the Tukey test. Tukey test results are presented in table 4.

Table 4. Tukey Test Results Based on the STIFIn Test

<table>
<thead>
<tr>
<th></th>
<th>Sensing</th>
<th>Thinking</th>
<th>Intuiting</th>
<th>Feeling</th>
<th>Instinct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sig.</td>
<td>.014</td>
<td>.000</td>
<td>.373</td>
<td>.05</td>
<td>3</td>
</tr>
<tr>
<td>Sensing</td>
<td>-</td>
<td>-</td>
<td>.473</td>
<td>.000</td>
<td>3</td>
</tr>
<tr>
<td>Thinking</td>
<td>.01</td>
<td>-</td>
<td>.473</td>
<td>.004</td>
<td>.00</td>
</tr>
<tr>
<td>Intuiting</td>
<td>.17</td>
<td>.000</td>
<td>.327</td>
<td>.000</td>
<td>1</td>
</tr>
<tr>
<td>Feeling</td>
<td>.37</td>
<td>.473</td>
<td>.004</td>
<td>-</td>
<td>.00</td>
</tr>
<tr>
<td>Instinct</td>
<td>.05</td>
<td>.000</td>
<td>.000</td>
<td>.001</td>
<td>-</td>
</tr>
</tbody>
</table>

The results of further tests (Tukey’s test) show that there is a difference in the increase in learning achievements (gain scores) between students who have the type of Sensing with Thinking (p = 0.014), between Sensing and Intuiting (p = 0.000), between Thinking with Instinct (p = 0.000), between Intuiting with Feeling (p = 0.004), between Intuiting and Instinct (p = 0.000), and between Feeling and Instinct (p = 0.001). Tukey's test results also showed no difference in the increase in learning achievements (gain scores) between students who had the type of Sensing with Feeling (p = 0.373), between Sensing with Instinct (p = 0.053), between Thinking with Intuiting (p = 0.173) and between Thinking with Feeling (p = 0.473).

The results of study show that students with the Intuiting type got an average increase in learning of achievements (0.88) higher than students with the type of Feeling (0.77), Sensing (0.71) and Instinct type (0.63). Students with the Thinking type got an average increase in learning of achievements (0.81) higher than students with the Sensing type (0.71) and Instinct type (0.63). Students with the type of Feeling got an average increase in learning of achievements (0.77) higher than students with Instint type (0.63).

### 3.2.2 Hypothesis Test Based on Learning Style Test

Differences in the increase in student learning achievements based on the learning style test were analyzed by One Way ANOVA as in table 5.
Table 5. Hypothesis Test Results Based on Learning Style Test.

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>.148</td>
<td>2</td>
<td>.074</td>
<td>16.554</td>
<td>.000</td>
</tr>
<tr>
<td>Within Groups</td>
<td>.121</td>
<td>27</td>
<td>.004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>.269</td>
<td>29</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Analysis results in Table 6, the value of F count of 18.554 with sig. 0.000 < 0.05, so it can be concluded that there are differences in the increase in student learning achievements (gain scores) using virtual lab media with Problem Based Learning models terms of the Learning Style test.

To find out which group gives a better influence (based on the learning style test), then do the Tukey test. Tukey test results are presented in table 6.

Table 6. Tukey Test Results Based on Learning Style Test

<table>
<thead>
<tr>
<th>Sig.</th>
<th>Visual</th>
<th>Auditory</th>
<th>Kinesthetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual</td>
<td>-</td>
<td>.015</td>
<td>.000</td>
</tr>
<tr>
<td>Auditor</td>
<td>.015</td>
<td>-</td>
<td>.028</td>
</tr>
<tr>
<td>Kinesthetic</td>
<td>.000</td>
<td>.028</td>
<td>-</td>
</tr>
</tbody>
</table>

The results of Tukey test show that there is a difference in the increase in learning achievements (gain scores) between students who have Visual learning styles with Auditory learning styles (p = 0.015), between Visual learning styles and Kinesthetic (p = 0.000) and between Auditory learning styles and Kinesthetic learning styles (p = 0.028).

The results of study show that students with kinesthetic learning styles got an average increase in learning of achievements (0.85) higher than students with auditory (0.76) and visual learning styles (0.67). Students with auditory learning styles got an average increase in learning of achievements (0.76) higher than students with visual learning styles (0.67).

4 Conclusion

The result of this study contained differences in the increase in students' chemistry learning achievements in terms of the STIFIn test (p = 0.000). Students with the Intuiting type got an average increase in learning achievements (0.88) higher than students with the type of Feeling (0.77), Sensing (0.71) and Instinct type (0.63). Students with the Thinking type got an average increase in learning of achievements (0.81) higher than students with the Sensing type (0.71) and Instinct type (0.63). Students with the type of Feeling got an average increase in
learning achievements (0.77) higher than students with Instinct type (0.63). The difference in the increase in students' chemistry learning achievements in terms of learning style tests (p = 0.000). Students with Kinesthetic learning styles got higher learning achievements (0.85) higher than students with Auditory learning styles (0.76) and Visual (0.67). Students with auditory learning styles got higher learning achievements (0.76) higher than students with Visual learning styles (0.67). While the difference in the increase in students' chemistry learning achievements in terms of personality tests (p = 0.000). Students with Melancholy personality gain an average increase in learning achievements (0.84) higher than students with Plegmatic personality (0.70).

Acknowledgments. The authors would like to thank the Medan State University Research Institute for funding this research in accordance with contract No. 282 / UN33.8 / PL / 2018.

References

The Effect of Interactive Multimedia Based Learning Model with 4C Integrated and HOTS on Learning Results Instructional System Design (ISD)

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Abstract. This research aims to determine: (1) the effect of learning model based on interactive multimedia with integrated 4C towards ISD learning outcomes; (2) the effect of structured and unstructured HOTS abilities towards ISD learning outcomes; and (3) interaction between 4C-based learning models and HOTS abilities towards ISD learning outcomes. The research method using quasi-experimental with a 2 x 2 factorial design. The statistical test using descriptive statistics to present data and continued with inferential statistics using two-way ANOVA. The results of research obtained showed: (1) the ISD learning outcomes are taught using bay learning model based on interactive multimedia with integrated 4C was higher than the learning outcomes taught with a learning model not integrated with 4C; (2) the ISD learning outcomes that have structured HOTS abilities was higher than unstructured HOTS abilities; and (3) there was an interaction between model based on interactive multimedia with integrated 4C and HOTS abilities towards ISD learning outcomes.

Keywords: learning models, interactive multimedia, 4C integration, HOTS, instructional system design.

1 Introduction

Instructional system design learning (ISD) in the 21st century has objectives with 4C characteristics, namely: Communication, Collaboration, Critical Thinking and Problem Solving, Creativity and Innovation. The ability to thinking an ability to process mental operations which include perception and creation knowledge. An ability to thinking an ability to use the mind to find meaning and understanding of something to explore ideas, take decisions, think of solutions with the best consideration and revise the problems in the previous thinking process.

Low ISD learning outcomes for students in postgraduate programs, because;(1) the ability to think high-level or through the stages of 4C and HOTS was rarely done in organizing and constructing learning and developing learning by using models that are suitable for students;(2) lack of in-depth understanding of the concept and implementation of ISD in classroom learning applications; and (3) the use of interactive multimedia-based learning to make it easier to absorb knowledge on the basis of construction against ISD. The tendency of change and innovation in the world of education will continue to occur and develop in the 21st century. According to Saud (2011) that innovation in the field of education was attempt to make changes with the aim of getting good things in the field of
education. These changes include: easier to find learning resources, more choices to use and utilize ICT, the increasing role of media and multimedia in learning activities, more flexible learning time, computer-based instruction (CBI), computer assisted instruction (CAI), the use of television/video media, mobile learning, e-learning, learning management systems, on-line curriculum, e-library, learning models with individual learning systems, competence references. Some education researchers state that technology has the potential to improve the quality of learning. (Liao, 1992). The use of media creatively can facilitate and improve learning efficiency so that learning objectives can be achieved. Learning media, one of the important aspects in the education process, according to Schramm in Sudrajat (2008) learning media was a messenger technology that can be used for learning purposes. In addition, the media has various benefits including helping teachers to deliver their teaching material, the media also seen as a communication tool that bridges abstract ideas with the real world. The use of media also makes the process of interaction, communication and delivery of material between lecturers and students so that it can take place appropriately and efficiently. Along with the development of technology, nowadays there are various kinds of learning media, one of the media that has many advantages from other media, namely computer multimedia because every information in the form of writing, audio, and images can be shown simultaneously. Some studies show that the use of interactive multimedia can improve mastery of concepts (Ferawati, 2011), learning achievement (Prastika, et al, 2015), and critical thinking skills (Wiyono, et al, 2009).

Arsyad (2011) argues that interactive media was a delivery media system that presents video recording material with computer control to the audience who not only hear and see video and sound, but also provide an active response and response that determines the speed and presentation sequence. Interactive media has an audio-visual element and called interactive because the media was designed to actively involve the user response. The definition of multimedia varies depending on the scope of the application and the development of multimedia technology itself. Multimedia not only has the meaning between simple text and graphics, but also comes with sound, animation, video, and interaction. While listening to explanations can see pictures, animation or read explanations in the form of text (Sutopo, 2008). Multimedia combines text, art, sound, images, animation, and videos delivered with a computer and can be delivered interactively. Suyanto (2003) describes multimedia as the use of computers to create and combine text, graphics, audio, moving images (video and animation) by combining links and tools that allow users to navigate, interact, create and communicate. According to Vaughan (2011), there are three types of multimedia, namely interactive multimedia, hyperactive multimedia, linear multimedia, and multimedia. Meanwhile, according to Sigit (2008), multimedia was divided into two categories, namely: linear multimedia and interactive multimedia. Interactive Multimedia tool that was equipped with a control device that can be operated by its users in choosing something they want. Examples of interactive multimedia are: interactive multimedia learning, game applications and others. The preparation of the learning model was done by paying attention to the components as proposed by Seels and Richey (1994), namely: Design, development, utilization, management, and evaluation. The development of interactive multimedia-based learning models as stated contains the principles of learning, namely: (1) learning and knowledge are in the diversity of opinions; (2) Learning a process of connecting information sources, especially special nodes; (3) Learning can occur from something outside of humans; (4) the ability to understanding more important than understanding now; (5) maintaining continuity in learning was very necessary for the continuation of learning; (6) the ability to see the relationship between ideas and concepts.
as a core skill in learning; (7) updates (accuracy and up-to-date knowledge) are the main things in learning; and (8) decision making in choosing what to learn was very important in the learning process in dealing with a large amount of information. ISD learning was held in the hope that students are able to capture/receive, process, store, and release information that has been processed. Media that can accommodate these requirements a computer. Computers are able to present information that can take the form of video, audio, text, graphics, and animation. For example, in ISD learning, some topics that are difficult to convey conventionally or require high application, can be implemented with the help of computer/multimedia technology, such as graphics and diagrams can be presented easily and quickly, the appearance of images, colors, visualization, video, Animation can optimize the role of the senses in receiving information into the information system (Kariadinata, 2010). Based on this explanation, it can be concluded that multimedia-based learning was learning that uses computer/multimedia assistance using Android.

There are several presentation formats of Interactive multimedia based learning according to Nandi (2006) as follows: (1) the tutorial modeling one of the interactive learn of models used in the teaching and learning process using software in the form of computer programs containing course material; (2) the Drills model was a form of computer-based interactive learning model; (3) the simulation model was basically one of the learning strategies that aims to provide real experience through the creation of imitations of experiences that approach the real atmosphere and take place in an atmosphere without risk; and (4) the instructional games model was one of the learning models using computer-based interactive multimedia. Based on research conducted by Ferawati (2011), Interactive multimedia learning models can improve mastery of the concepts of physics teachers. In addition, it was also supported the results by Sriyanti (2012) research that utilizes multimedia in learning blended elearning models as well as student learning outcomes. Other research also shows that the development of interactive multimedia learning can improve the mastery of student concepts (Gunawan, et al, 2014). From both studies, it was clear that interactive multimedia learning provides benefits to learning. In interactive multimedia learning, students can learn certain material independently by using computers equipped with multimedia-based programs (Kadir and Triwahyuni, 2003).

The role of education in universities was contained in the IQF-based curriculum, focusing on developing students in learning outcomes such as cognitive, affective and psychomotor, or spiritual attitudes, social attitudes, knowledge and skills. Higher order thinking skills are one indication of the success of improving the competence of students in the education sector in the 21st century. Two very simple reasons that make why HOTS was important, that students will succeed (achieve) and grow into adults who make positive contributions to society (Conklin, 2012). There are several characteristics of HOTS according to Conklin (2012), namely "characteristics of higher-order thinking skills: higher-order thinking skills encompass both critical thinking and creative thinking." The purpose of the passage was the characteristic of high-level thinking abilities including critical thinking and creative thinking. Critical and creative thinking are two very basic human abilities because critical thinking and creative thinking can encourage someone to always look at every problem faced critically, and try to find a solution creatively, so that a new thing was better and useful for their life.

Resnick (1987) said, HOTS has characteristics, as expressed that was non-algorithmic, complex, multiple solutions, involves a variety of decision making and interpretation, application of multiple criteria, and effortful (requires a lot of business). It was called effortful because when it comes to solving HOTS, it requires more and deeper thinking.
Critical Thinking was a mental process for analyzing information obtained. This information was obtained through observation, experience, communication, or reading. In addition, Brookhart (2010) mentions that including critical thinking includes covering reasoning, questioning and investigating, observing and describing, comparing and connecting, find complexity, and explore perspectives. Critical thinking was an organized process that allows students to evaluate evidence, assumptions, logic, and language that underlies the thinking of others (Johnson, 2013). The ability to think creatively includes creating, discovering, imagining, guessing, designing, proposing alternatives, creating and producing something (Thomas, 2010). Forming creative ideas means coming up with something unusual, new, or creating solutions to a problem. A person's ability to think creatively can be demonstrated through several indicators, for example being able to propose new ideas, ask questions, dare to experiment and plan strategies.

The research problem: (1) The ISD learning outcomes in education for students taught using integrated interactive multimedia learning models 4C and HOTS (MPMI4C-HOTS) higher than those taught using expository learning models with HOTS; (2) The ISD learning outcomes in the education of students who have high critical thinking skills higher than students who have low critical thinking skills; and (3) Are there interactions between learning models and the ability to think critically affect student learning outcomes of ISD?

2 Methods

This research was conducted in the Education Technology postgraduate program, in the ISD course in Education. The population of this study were all students who took ISD subjects, which consisted of 3 classes, and with cluster random sampling technique. This research using Quasi Experiment 2x2 factorial design. The learning model was divided into two, namely the MPMI4C-HOTS learning model and the expository learning model with HOTS. Critical thinking skills are also divided into two, namely high critical thinking skills and low critical thinking skills.

Data collection techniques use ability tests on ISD mastery on aspects of Dick & Carey learning system design with ten instructional stages based on learning outcomes according to the IQF in the Educational Technology learning program. The second using the instrument of knowing students' critical thinking abilities. This analysis was carried out using 2 x 2 factorial Anova technique with F test. Before the hypothesis was tested, the requirements for the collected data were tested by using the normality test using the Liliefors test and homogeneity test using the F test and Bartlett test. Because the third hypothesis was significant, meaning there an interaction, then the research test was continued using the Scheffe test.

3 Results And Discussion

Based on the results of the normality test the data shows that all groups of subjects are normally distributed, thus it can be concluded that the research sample comes from a population that was normally distributed and thus the subject group taught with MPMI4C-HOTS learning model and taught by HOTS expository learning model based on high and low critical thinking abilities have homogeneous variance. After testing the requirements of
the analysis, it was necessary to have the results that all data in the subject group are normally distributed and have a homogeneous variance, thus the requirements related to the two-way variance analysis technique have been met.

ISD learning outcomes of students taught with MPMI4C-HOTS learning model are higher than students taught with HOTS expository learning model. From the results of calculations with Anova in table 1 it was obtained that Fcount = 6.15 and Ftable = 4.07 at a significance level of 0.05. This means that Fcount > Ftable shows that the null hypothesis (Ho) rejected and the alternative hypothesis (Ha) was accepted. Thus, it can be stated that ISD learning outcomes of students taught by MPMI4C-HOTS learning model are higher than ISD learning outcomes of students taught by HOTS expository learning model.

Table 1: The Calculation Results of ANOVA

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>d/k</th>
<th>Number of Squares</th>
<th>Average Number of Squares</th>
<th>Fcount</th>
<th>Ftable</th>
<th>α=0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Model (A)/column</td>
<td>1</td>
<td>28.69</td>
<td>27.69</td>
<td>6.15</td>
<td>4.07</td>
<td></td>
</tr>
<tr>
<td>Critical Thinking</td>
<td>1</td>
<td>87.07</td>
<td>86.07</td>
<td>19.13</td>
<td>4.07</td>
<td></td>
</tr>
<tr>
<td>Ability (B)/line</td>
<td>43</td>
<td>59.11</td>
<td>58.11</td>
<td>12.9</td>
<td>4.07</td>
<td></td>
</tr>
<tr>
<td>Interaction (A x B) Error</td>
<td>46</td>
<td>194.45</td>
<td>4.499</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td>369.32</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ISD learning outcomes students who have high critical thinking skills are higher than students who have low critical thinking skills. Based on the results of calculations with Anova in table 1 it was obtained the results of the ISD student learning outcomes data calculation based on critical thinking abilities, namely Fcount = 19.13 and Ftable = 4.07 at a significance level of 0.05. This means that Fcount > Ftable, shows that the null hypothesis (Ho) was rejected and the alternative hypothesis (Ha) was accepted. This it can be stated that ISD learning outcomes of students who have high critical thinking skills are higher than those with low critical thinking skills.

Interaction between learning models and the ability to think critically about ISD learning outcomes. In this case, the ability to think critically was divided into two categories, namely low and high. From the results of calculations with the Anova table in table 1 it was obtained that Fcount = 12.92 and Ftable = 4.07 at a significant level of 0.05. This means that Fcount > Ftable, shows that the null hypothesis (Ho) was rejected and the alternative hypothesis (Ha) was accepted. This it can be stated that there was an interaction between learning models and the ability to think critically about student learning outcomes of ISD.

Based on some of the most important research findings in the form of ISD learning principles shows that: (1) the learning model of MPMI4C- HOTS can improve student learning competencies in the cognitive, affective, and psychomotor domains, (2) through software skills students can improve the ability to collaborate in groups learning, able to apply various abilities skillfully when working on structured tasks. Furthermore, in the implementation of the learning process to achieve the learning objectives in accordance with the learning achievement, learning media that can motivate in learning, including: (1) interactive multimedia through interestingly designed animations that can improve learning, and not boring; (2) this interactive multimedia was designed based on parts and fragments into
the smallest unit, so that it can easily understand the contents of the material presented; (3) interactive multimedia with communicative language and containing interesting illustrations will be effective, stimulating for independent learning; (4) this interactive multimedia can improve learning outcomes, can easily check the success of learning independently; and (5) this interactive multimedia in each section / fragment there was reinforcement, can improve learning outcomes in the ISD subject. This supported by research results that the use of computer-based interactive media more effective in improving student knowledge and understanding compared to using conventional media in the eyes of ISD with HOTS. And also the results showed that the average ISD learning outcomes with HOTS students who had positive innovative attitudes were more positive than ISD learning outcomes with HOTS students who had negative innovative attitudes. The implementation of learning with the MPMI4C-HOTS learning model in ISD using of educational technology which can be summarized as follows: (1) the ability of lecturers to refer only to textbooks, with this interactive multimedia-based learning model requires the lecturers to master more developing ICT-based knowledge, abilities increasing, because the source of knowledge that needs to be known was unlimited; (2) internet access a sustainability requirement from the MPMI4C-HOTS learning model with the principles of learning technology. With the application of the MPMI4C-HOTS learning model with the principles of learning technology, it was increasingly maximizing the available facilities for the learning process and improving the quality of student learning. (3) has the opportunity to be further developed. According to Rusman, et al (2011), the advantages of computer-based learning are the application of the principles of complete learning or mastery learning. In the implementation of computer-based learning all students must be able to complete all learning experiences that are packaged in a computer-based learning program, whether it was understanding material and the task of doing tests or evaluations that must be completed correctly. If the student was wrong in doing the exercise questions, then the computer will give feedback, that the answer was wrong, so the student must return to the description of the material that has not been understood, after which the student can return to the practice question to do it correctly. Thus, students who have positive innovative abilities have tendency to easily adapt to new knowledge, they prefer to learn face to face with challenging knowledge. This direct interaction will facilitate and accelerate the response to what they are doing. The results showed that those with high critical thinking abilities and taught with the MPMI4C-HOTS learning model turned out that ISD mastery in education was higher than those using direct learning models without 4C and HOTS integration. This condition was appropriate, that those with high critical thinking skills are more likely to obtain information based on feedback and assimilate to previous experience. Critical thinking skills of students, are considered important to be developed at every level of education, to create and produce students who have good cognitive abilities in following the learning process and ability formation in HOTS (Haryani, 2012). In addition to the response speed, the number of exercises to solve problems will be more for those who use the MPMI4C-HOTS learning model. The more problems that are resolved will add to the experience as a provision to solve the next problem. Learning by using interactive multimedia on ISD means training problem-solving skills by using the stages of learning design correctly through the acceleration of ICT-based learning. To accept new concepts in ISD that are formed together with problem solving efforts. The courage of students with high critical thinking skills to try
problem solving in various ways according to the rules of the system was a difficult step to take if they learn with direct learning strategies and without using interactive multimedia media. Synder and Synder (2008) asserted that teachers should instill critical thinking skills for students, students not only formed as recipients of information but must be information processors, this related to information in ISD. Because all systems in learning and education must first design and build knowledge about learning that was formed in the correct order and organized well by seeing and constructing students' thinking skills to realize the right and directed learning stages in all learning activities.

Other research results show that learning programs through critical thinking skills are very effective in improving students' academic abilities (Redhana and Liliasari, 2008). In another study also revealed that with good student thinking skills at the level of analysis, evaluation, and creation with HOTS achievements will increase the classical completeness of students beyond the minimum completeness criteria (Rahayu and Yonata, 2013). The ability to think critically high in the realm of HOTS was a problem-solving step in the learning process that was formed based on the level of competence skills, new concepts that they find themselves will add experience to solve the problem of ISD. According to Lambertus (2009), the development of students' critical thinking skills can be done through the application of student-centered learning, because they are given the freedom to build their own knowledge, discuss with friends, be free to submit opinions, be able to accept or reject the opinions of friends, and with the guidance of the teacher formulate conclusions.

4 Conclusion

The conclusions in this study: (1) The average learning outcomes of students on ISD taught using the MPMI4C-HOTS learning model was superior to using the expository learning model with HOTS; (2) The average learning outcomes of students in ISD who have high critical thinking skills are superior to those with low critical thinking abilities; (3) there are differences in student learning outcomes in ISD between classes that use MPMI4C-HOTS learning models with classes that use expository learning models with HOTS, (4) there are differences in ISD learning outcomes of students with high critical thinking skills with students who have the ability low critical thinking. (5) there was interaction between the use of MPMI4C-HOTS learning model with the ability to think critically about ISD learning outcomes.
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The Implementation of Guided Inquiry Model to Increase Student Achievements and Science Process Skill on The Practicum of Analysis and Identification of Cations Ag+, Hg22+ and Pb2+

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Abstract. This research was purposed to find out the effect of guided inquiry learning model to increase student achievement and science process skill on the practicum of analysis and identification of cations Ag⁺, Hg₂²⁺ and Pb²⁺. Experimental research method which named as one group pretest-posttest design was used. This research was done in Universitas Negeri Medan involved Chemistry study program students, which consisted of 35 person. The instrument which was used is essay test, student worksheet and observation sheet. The result of this research which was gained from average test of student process science skill indicated guided inquiry learning model on the practicum of analysis and identification of cations Ag⁺, Hg₂²⁺ and Pb²⁺ was able to increase student achievement and science process skill significantly. The high categorized indicators were ability of planning the practicum and communicating, hypothesizing and applying the concept. The medium categorized indicators were ability of grouping, interpreting, observing and predicting. The achievement of student which was taught by using guided inquiry model on the practicum of analysis and identification of cations Ag⁺, Hg₂²⁺ and Pb²⁺ increased from pretest 46.05 became posttest 89.66. The highest percentage of student worksheet was in communicating ability, i.e. 90%.

Keywords: Guided inquiry, science process skill, cations Ag⁺, Hg₂²⁺ and Pb²⁺.

1 Introduction

The Qualitative Analytical Chemistry Practicum course is one of the compulsory subjects in the Undergraduate Program of Chemistry Department at Mathematics and Natural Sciences Faculty, Universitas Negeri Medan. This course is given in the third semester. This course provides students with knowledge about analysis and identification of cations and anions in chemical-based industries also the food and plantation industries in North Sumatra. However, this course is prepared such that students will able to apply the development of strengthen chemical materials in their daily lives, which support jobs in a chemical-based industry.

Learning by practicum is an important part which undeniable to be separated from teaching and learning activities in analytical chemistry. Practicum is the best media to develop science process skill because learning with practicum may provide opportunities for students to experience or do their own experiences which is processed according to their cognitive abilities (Nugroho et al, 2013 and Juniar et al, 2017). According to Harlen and Elstgeest
(1999), science process skill is consisted of: (1) observing, (2) asking questions, (3) formulating hypotheses, (4) predicting, (5) finding patterns (relationship), (6) communicating effectively, (7) designing experiments, (8) carrying out experiments, and (9) measuring and calculating. So far, the practicum which is carried out in schools still doing verification only, which is proving the calculate. So far, the practicum carried out in schools was still verification in nature, which is only proving the concept or principle which has been studied (Rahmawati et al, 2014), therefore it is necessary to integrate the learning model with practicum activities for mini research for implementation of assignments which KKNI-based.

One of the effective learning models in mathematics and natural sciences which applicable in the development of chemical learning models is Guided Inquiry which consisted of formulating problems in the form of questions, formulating hypotheses, designing experiments, collecting data, analyzing data and formulating conclusions also developing science process skill. This learning model requires active involvement of students, because it cultivates the basics of scientific thinking in students, such that students learn more independently in the learning process and develop creativity in solving problems (Lawson, 2010 and Abdi, 2014). The influence of Guided Inquiry with Science Process Skills in science learning may increase students' motivation to learn, activity, elaboration and understanding of science learning (Nworgu, 2013 and Juniar et al, 2017). In addition, the influence of guided inquiry model on learning qualitative analytical chemistry is improving students' critical and positive thinking skills both by using video clip strategies, case studies and using popular science rubrics (Gupta et al, 2015) also student activities in the laboratory are more positive, effective and can be improved (Ceylan, 2016).

In the Qualitative Analytical Chemistry practicum with the topic of analysis and identification of cations Ag+, Pb2+ and Hg22+, the implementation of guided inquiry learning may create an atmosphere which is familiar to students so that improving science process skills, transfer skills, motivation and understanding of important concepts in learning and Qualitative Analytical Chemistry practicum which is equipped with LKM (Student Worksheet) (Uma et al, 2015)

2 Research Methodologi

This research was conducted by using experimental method with one group pretest-posttest design. Finding out the increasing of learning outcomes is done by implementing the guided inquiry and qualitative descriptive learning model to determine the effectiveness of the guided inquiry model in developing student science process skills. Research design is given in Table 1.

<table>
<thead>
<tr>
<th>Pretest</th>
<th>Treatment</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>X</td>
<td>T2</td>
</tr>
</tbody>
</table>

Explanation:
T1: pretest to measure initial capability of students.
T2: posttest to measure final capability of students.
X: implementation of guided inquiry learning model.
This research was conducted at the Laboratory of Analytical Chemistry, Universitas Negeri Medan. The subject of this study is 35 students of chemistry study program who were taking the course of Qualitative Analytical Chemistry Practicum. The procedure is given in Figure 1 below.

Figure 1: Procedure of research to measure students’ achievement and science process skill in the practicum of analysis and identification of cations Ag⁺, Hg₂⁺ and Pb²⁺. Data collection of student science process skills is done by using written tests and LKM (Student Worksheets). For the implementation of guided inquiry model, an observation sheet is used. Meanwhile, the data analysis to done by using normalized gain which obtained by calculating the difference in scores between the final test score (posttest) and the initial test score (pretest) divided by the difference between the maximum score and the initial test score. The result of normalized gain is divided in three criterions as follow:

0.00 – 0.29 = low level,
0.30 – 0.70 = intermediate, and
0.71 – 100 = high level.
The development of students' science process skill during the learning process is observed by using observation sheets in the form of rubrics with observers. One observer observed and recorded approximately 10 students. To facilitate the observation of the development of students' scientific process skills, in each learning students must use clearly visible identities. Effectiveness of guided inquiry learning model which is integrated with Student Worksheets in developing science process skills are assessed using formula below.

\[
\text{Effectiveness} = \frac{\text{Amount of Score}}{\text{Total Score}} \times 100\% \tag{1}
\]

### 3 Results And Discussion

The science process skill of students in the Qualitative Chemistry lecture material was measured by using a description test and student worksheet (LKM). This description test consists of 10 questions which carried out twice, namely before giving the treatment is pretest and after being treated is posttest. The question of pretest and posttest is developed according to science process skill (8 indicators). The pretest and posttest questions which were developed were made equal, which was adjusted to the students' understanding needs in the process of practicum analysis and identification of the cations of Ag\(^+\), Hg\(^{2+}\) and Pb\(^{2+}\). The results of the assessment of the average pretest and posttest of student science process skill is presented in Table 2.

<table>
<thead>
<tr>
<th>No</th>
<th>Indicators</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Observing</td>
<td>43.34</td>
<td>83.34</td>
<td>70</td>
</tr>
<tr>
<td>2</td>
<td>Grouping</td>
<td>45.46</td>
<td>82.20</td>
<td>67</td>
</tr>
<tr>
<td>3</td>
<td>Interpreting</td>
<td>45.63</td>
<td>82.57</td>
<td>67</td>
</tr>
<tr>
<td>4</td>
<td>Predicting</td>
<td>46.74</td>
<td>84.46</td>
<td>70</td>
</tr>
<tr>
<td>5</td>
<td>Hypothesing</td>
<td>44.51</td>
<td>86.34</td>
<td>75</td>
</tr>
<tr>
<td>6</td>
<td>Planning the experiment</td>
<td>47.51</td>
<td>89.11</td>
<td>79</td>
</tr>
<tr>
<td>7</td>
<td>Implementing the concept</td>
<td>47.46</td>
<td>86.31</td>
<td>73</td>
</tr>
<tr>
<td>8</td>
<td>Communicating</td>
<td>47.77</td>
<td>89.66</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td><strong>Average</strong></td>
<td><strong>46.05</strong></td>
<td><strong>85.49</strong></td>
<td><strong>72.62</strong></td>
</tr>
</tbody>
</table>

Based on Table 2 above, the average value of students' science process skill has increased from pretest to be posttest. This means that overall there is an increase in students' science process skill. The diagram that illustrates the improvement of students' science process skill is shown in Figure 2 below.
Figure 2: Comparison of pretest, posttest and n-gain result of students’ science process skill on the practicum of analysis and identification of cations Ag⁺, Hg²⁺ and Pb²⁺.

Figure 2 shows that skills of communicating the experiment result, planning the experiment, hypothesizing and applying the concept have high criteria meanwhile predicting and observing, classifying and interpreting skills have intermediate criteria. The highest gain is reached in communicating and planning experiment. This is possible because in the implementation of the KKNI curriculum, students have obtained six assignments namely Routine Tasks (TR), Critical Journal Reports (CJR), Critical Book Reports (CBR), Mini Research (MR), Engineering Ideas (RI) and Projects (P). Students also have often been trained in writing separation schemes and identification reactions for the cations of Ag⁺, Hg²⁺ and Pb²⁺ such as the following reactions (Slowinski, 1990):

$$\text{Ag}^+ (\text{aq}) + \text{Cl}^- (\text{aq}) \leftrightarrow \text{AgCl(s)} \text{ white}$$
$$\text{AgCl(s)} + 2 \text{NH}_3(\text{aq}) \leftrightarrow [\text{Ag(NH}_3)_2]^+ (\text{aq}) + \text{Cl}^- (\text{aq})$$
$$[\text{Ag(NH}_3)_2]^+ (\text{aq}) + \text{H}^+ (\text{aq}) + \text{Cl}^- (\text{aq}) + 2 \text{NH}_4^+ (\text{aq}) \leftrightarrow \text{AgCl(s)} + 2 \text{NH}_3(\text{aq})$$

$$\text{Pb}^{2+} (\text{aq}) + \text{CrO}_4^{2-} (\text{aq}) \rightarrow \text{PbCrO}_4(s) \text{ yellow}$$
$$\text{PbCrO}_4(s) + \text{NaOH}(\text{aq}) \rightarrow \text{Pb(OH)}_3^- + \text{SO}_4^{2-} (\text{aq})$$

$$\text{Hg}^{2+} (\text{aq}) + \text{H}_2\text{S(aq)} \rightarrow \text{HgS(s)} + 2\text{H}^+ (\text{aq})$$
$$\text{Hg_2Cl_2(s)} + 2 \text{NH}_3(\text{aq}) \rightarrow \text{Hg(s)} \text{ black} + \text{HgNH}_2\text{Cl(s)} \text{ white} + \text{NH}_4^+ (\text{aq}) + \text{Cl}^- (\text{aq})$$
$$\text{Hg_2Cl_2(s)} + \text{NaOH(aq)} \rightarrow \text{Hg(s)} \text{ black} + \text{HgO}$$

4 Conclusions

The result of this research especially from the average test on students’ science process skill stated that the guided inquiry learning model in the lecture of the practicum of analysis and identification of cations Ag⁺, Hg²⁺ and Pb²⁺ could significantly improve student learning outcomes and process science skill. The indicators which are categorized as high: planning practicum and communicating, hypothesizing and applying concept. The intermediate categories are the skill of grouping, interpreting, observing and predicting. The student achievement which learned by applying the guided inquiry model in the practicum analysis and identification of Ag⁺, Hg²⁺ and Pb²⁺ was increased from pretest 46.05 to posttest 89.66. The highest percentage of student worksheet is on communication skills which is 90%.
References


The Effect of Learning Model Based on Character Education Through Multicultural Scientific Approach and Thinking Style on Learning Outcomes of Local History Lessons

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Abstract. This research aims to determine learning outcomes of local history lessons taught with learning models based on character education with a multicultural scientific approach higher than learning outcomes of local history lessons taught by the expository learning model, knowing learning outcomes of local history lessons that have a higher abstract sequential thinking style than students who have concrete sequential thinking styles and knowing the interaction between learning models and students' sequential thinking style on learning outcomes of local history lessons. The research method using quasi experiment with 2 x 2 factorial design, data analysis techniques using ANOVA. The results of research obtained showed: (1) the average learning outcomes of local history lessons for students taught with the character-based learning model of the character of the multicultural scientific approach was higher than lessons with an expository learning model; (2) the average results of learning outcomes of local history in students with abstract sequential thinking styles are higher than in concrete sequential thinking styles; and (3) There’s an interaction between the character-based learning model of the multicultural scientific approach and the sequential thinking style.

Keywords: learning model, characters based, scientific approach, multicultural, thinking style, local history

1 Introduction

One of the impacts of the crisis in a scientific manner, almost all scientific disciplines are questioned "the efficacy contribution" to restore the multidimensional crisis, including the role of history learning in maintaining national integration. Some historians and social observers have argued that nationalism which concerns national clemency needs to be "revitalized" in the broadest sense regarding the shifting of historical views to historical, developing towards egalitarianism, justice, clean governance and clean government which accelerates the realization of civil society so as not to lose its actuality (Abdullah, 2001; Kleden, 2001; Simatupang, 2002).

The importance of the change in the paradigm of historical education is not solely because of the recent reform movement, the reform movement itself was only a trigger for the movement in that direction. Robinson (1965) has pioneered changes from Old History to New History, was a reaction to Old History that’s too rigid to limit itself to political history. The
expansion of studies on New History includes aspects of the economy, socio-culture, agriculture, education, psychology, technology, and so on inter / multidisciplinary. This new history was thus broader, and only as a trigger factor for the movement in that direction. Robinson (1965) has pioneered changes from Old History to New History, a reaction to Old History that was too rigid to limit itself to political history.

The learning of national history as an element of the development of cultural nationalism was very useful to be a mediation in strengthening relations between plural society elements. Anderson (1983) mentions the role of national history as a national identity and the development of national consciousness. Furthermore, he also saw the importance of national identity as the most powerful and long-lasting influence in collective cultural identity. Through learning national history, it also attempts to form behavioral models that foster cultural nationalism to create patterns of relationships that transcend the temporal and spatial environment and other dimensions.

In order to develop historical learning to be more functional and integrated with various other scientific fields, there are various fields that should receive attention, namely: first, to answer future challenges, innovative creativity and power are needed so that a nation was not just a consumer of science and technology, cultural consumers, as well as passive recipients of external values, but have a competitive advantage in terms of mastery of science and technology. Therefore, attitude, motivation, and creativity need to be developed through the creation of a dynamic teaching and learning situation where the teacher encourages the vitality and creativity of students to develop themselves. Second, students will be able to develop their creativity when the teaching and learning processing carried out in a programmed, systematic and systematic manner, and was supported by the availability of adequate facilities and infrastructure. Third, in the process of developing intellectual maturity, students need to be encouraged to think logically and systematically.

To realize this multicultural-based historical education mission, among the experts emerged 3 typologies of multicultural education programs that were integrated into the curriculum. The three typologies of the program are: content-oriented programs; program oriented to students (student-oriented programs); and socially-oriented programs. Experts who are proponents of this new movement are Banks (1995; 1997; 1999); Banks, Cortes, Gay, Garcia & Ochoa (1992). This academic discourse, became the beginning of the emergence of thinking about multicultural history-based education and educators as intellectuals and multicultural curriculum developers.

In developing character education in universities, educational institutions or schools must be a conducive environment. According to Lewis (1996:8) character education will always develop noble character and good habits for students. Bulach (2002) explains lecturers and parents need to make an agreement about the main values that need to be learned, for example: respect for self, others, and property; honesty; self-control / discipline. In this connection, Lickona (2014) mentions several values of goodness that need to be lived and familiarized in the lives of students so as to create a harmonious life in the family and society. Some of these values include honesty, compassion, self-control, mutual respect or respect, cooperation, responsibility, and perseverance. Character education does not merely have an integrative dimension, in the sense of strengthening the intellectual moral of students on the basis of virtue values so that they become a solid and enduring person, individuals who are scholarship, independent, and conscientious but also curative personally and socially.

Scientific multiculturalism in practicing a strategy of social integration where cultural diversity was truly recognized and respected, so that it can function effectively in identifying every issue of separatism and social disintegration. Experience teaches, not the spirit of
oneness or singleness (singular ika) that has the most potential that can give birth to strong unity, but it was precisely this recognition of the existence of a plurality of national culture that guarantees national unity towards democratic social reform. The experience of sufficient conflict that occurs in several places can be used as a benchmark that the country was still crawling in understanding the substance of multiculturalism.

Multicultural education was an educational strategy that utilizes the diversity of cultural backgrounds of students as one of the forces to shape multicultural attitudes. This strategy was very useful, at least for schools as educational institutions can form a shared understanding of the concepts of culture, cultural differences, balance, and democracy in a broad sense.

Based on the grand design developed by the Ministry of National Education (2010), psychologically and socio-cultural character formation within individuals was a function of all individual human potentials (cognitive, affective, conative, and psychomotor) in the context of social cultural interactions (in families, schools, and communities) and lasts a lifetime. Character configuration in the context of the totality of psychological and socio-cultural processes can be grouped into: Heart and Spiritual Development, intellectual development, exercise and kinesthetic (physical and kinetic development), and feeling and intention (affective and creativity development) (Ministry of National Education, 2011).

Character-building values that must be developed in each educational institution are basically a form of universal human character. Amid the diversity of nations in the world, Indonesian people must have an Indonesian character. Marking of the Indonesian nation that has a different identity from other nations
According to De Porter and Hernacki (2011) the style of thinking was a way of remembering and paying attention to details easily and remembering facts, specific information, formulas and various regulations easily. Thinking style was consistent way that individuals do in finding information, ways of remembering and thinking about ways to solve a problem.

Gregore as quoted by Idea distinguishes thinking styles into two types, namely sequential (linear or regular) and random (irregular) based on the hemisphere of the human brain, the right and left hemispheres. The sequential thinking style tends to be dominated by the left brain, while the random thinking style was dominated by the right brain. Teiller in DePorter and Hernacki (2011) states that sequential thinking in the process of thinking logical, orderly, linear, and rational. The way of thinking in accordance with regular tasks, verbal expressions, writing, reading, counting, auditory associations, placing details and facts, phonetics and symbolic. Gunawan (2004) states that sequential thinkers have a special way of learning, namely: (1) likes things sequentially, (2) learns maximally from things that are detailed first and then to things that are global, (3) like a phonetic-based reading system, 4) likes words, symbols and letters, (5) likes something there was structured and predictable, (6) experiences a lot of internal focus, and (7) wants to gather factual information.

The problems that will be examined in this study can be formulated as follows: (1) Are local history learning outcomes taught by the character-based learning model of the character of the multicultural scientific approach higher than those taught with expository learning strategies ?: (2) Are local history learning outcomes that have an abstract sequential thinking style higher than results that have a concrete sequential thinking style ?: and (3) Are there any interaction effects between the education-based learning model character of the multicultural scientific approach and students' thinking style on local history learning outcomes?

2 Methods

The population in this study were all students who took history courses in the history education S1 program at T.A. 2017/2018. The sampling technique in this study was to use a purposive sampling technique where this research was conducted on the entire population, which was directly focused on the target. The design of this study uses an experimental approach which a research that seeks to find and examine the effect of a variable or more on other variables.

The research method using quasi-experimental because the class using a class that has been formed before. In this study there were two treatment groups, namely one group as the treatment class of character education based learning model of the multicultural scientific approach, one group as the treatment class of the expository learning model.

The treatment was carried out in the history of learning by comparing the education-based learning model of the character of the multicultural scientific approach with the expository
learning model and carried out in the predetermined treatment class. Before the treatment was carried out a test of learning outcomes test instrument. Furthermore, in each treatment class a thinking style instrument was given to find out the distribution of concrete abstract and sequential thinking styles for students. In this study tried to see the differences in the learning outcomes of local history students due to the use of different learning models. The research design used in this studying an experimental design with factorial 2 x 2.

3 Results And Discussions

Table 1: Summary of Data from Descriptive Analysis Calculation Results

<table>
<thead>
<tr>
<th>Summary Data</th>
<th>Local History</th>
<th>Learning Model Based on Character Education</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Coooperative</td>
<td>Expos-itory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N = 25</td>
<td>N = 19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$\bar{x}$=32.02</td>
<td>$\bar{x}$=28.81</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$S$ = 3.23</td>
<td>$S$ = 2.79</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N = 17</td>
<td>N = 16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$\bar{x}$=24.8</td>
<td>$\bar{x}$=24.17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$S$ =2.27</td>
<td>$S$ = 2.54</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N = 42</td>
<td>N = 35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$\bar{x}$=29</td>
<td>$\bar{x}$=25.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$S$ = 4.2</td>
<td>$S$ = 3.62</td>
</tr>
</tbody>
</table>

Testing the requirements of data analysis was carried out on normality and homogeneity tests. Next for the purpose of testing hypotheses using the 2x2 factorial two-way variance analysis technique, the Scheffe test was needed to calculate the average price of each group presented in Table2.
Table 2: Factorial ANOVA Summary 2 x 2

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>dk</th>
<th>Jk</th>
<th>Rjk</th>
<th>Fhitung</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning</td>
<td>1</td>
<td>114.0</td>
<td>114.0</td>
<td>17.87</td>
</tr>
<tr>
<td>model</td>
<td>7</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequential Thinking Style</td>
<td>810.8</td>
<td>810.8</td>
<td>118.93</td>
<td></td>
</tr>
<tr>
<td>Interaction</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>5.16</td>
</tr>
<tr>
<td>Error</td>
<td>75</td>
<td>507.6</td>
<td>6.76</td>
<td></td>
</tr>
</tbody>
</table>

The results show that multicultural education (multicultural education) is an educational strategy that utilizes the diversity of cultural backgrounds of the students as one of the strengths to shape multicultural attitudes. This strategy is very useful, at least for universities as educational institutions can form a shared understanding of the concepts of culture, cultural differences, balance, and democracy in a broad sense. So that it greatly influences the ability of students in learning local history.

The importance of the findings of this study is that multicultural-based local history learning is built on the concept of education for freedom which aims to: (1) help students or students develop knowledge, attitudes and skills to participate in democracy and freedom of society; (2) promote freedom, skill, skills across ethnic and cultural boundaries to participate in several groups and cultures of others. So that the understanding and problem solving of history learning can be easily interpreted by students.

Through this research shows that multicultural education also helps students to recognize the accuracy of diverse cultural views, helping students to develop pride in their cultural heritage, making students aware that value conflicts are often the cause of conflicts between community groups (Savage & Armstrong, 1996). Multicultural education is organized in an effort to develop students' ability to view life from various cultural perspectives that are different from the culture they have, and to be positive about cultural, racial and ethnic differences. (Farris & Cooper, 1994).

The results of the study on the application of education-based learning models of the character of the multicultural scientific approach illustrate that multicultural-based education
can be identified: (1) to function the role of schools in viewing the existence of diverse students; (2) to assist students in establishing positive treatment of cultural, racial, ethnic, religious groups; (3) providing student resilience by teaching them to take decisions and social skills; (4) to help students build cross-cultural dependencies and give them a positive picture of group differences (Skeel, 1995).

The high learning outcomes of student history with the application of an education-based learning model of the character of the multicultural scientific approach has an impact on the nation's education program so that the multicultural community can participate in realizing an ideal democratic life for its nation, this is in accordance with the opinion of the Bank (1997). In a broad context, this shows that multicultural education tries to help unite the nation democratically, by emphasizing on the perspective of plurality of people in various nations, ethnic groups, and different cultural groups. Thus higher education institutions are conditioned to reflect the practices of democratic values. The curriculum shows a variety of different cultural groups in society, language, and dialects; where students better talk about respect between them and uphold the values of collaboration, rather than discuss competition and prejudice among a number of students who differ in race, ethnicity, culture and social status groups.

Students in the learning process with the application of an education-based learning model of the character of the multicultural scientific approach aims to shape and build the mindset, attitudes, and behavior of students so that they become positive, moral, noble, and responsible individuals. In the context of education, character education is a conscious effort made to shape students into positive personalities and have a moral character according to graduate competency standards so that they can be implemented in daily life (Fitri, 2012).

So that in the research on the application of character education based learning models the multicultural scientific approach should apply the principles of integrative, compact, and consistent. Such model development has the following characteristics. First, integrative namely integrating multicultural-based character education into all activities in schools, both curricular, extracurricular and self-development activities. In addition, integrating multicultural-based character education also into program planning, implementation and evaluation.

The results of the study on the application of learning models show that the components of responsive teaching in the application of character-based learning models of the multicultural scientific approach are summarized as follows; (1) Creating a positive classroom environment where all students are valued and respected; (2) Communicate positive expectations for the learning of all students; (3) Recognizing cultural diversity within students and integrating this diversity into the curriculum; (4) Using teaching strategies that empower students’ backgrounds and strengths. Effective multicultural lecturers actively introduce cultural diversity and respond to it in the classroom through learning models that involve all students from various backgrounds and experiences.

The implementation of learning in history courses, especially in local history the application of character-based learning models with a multicultural scientific approach can; (1) training students' critical power to understand historical facts correctly based on scientific approaches and scientific methodologies developed is important for education; (2) building student awareness about the importance of time and place which is a process from the past, present, and future in history. Has the possibility to be developed; (3) train students' critical power to understand historical facts correctly based on scientific approaches and scientific methodologies; (4) fostering appreciation and appreciation of students for historical heritage as evidence of Indonesian civilization in the past; (5) fostering students' understanding of the
process of forming the Indonesian nation through a long history and still proceeding to the present and the future; and (6) fostering awareness in students as part of the Indonesian nation that has a sense of pride and love for the country that can be implemented in various fields of life both nationally and internationally.

The increase of the use of character-based multicultural history learning models in this study is due to, using a variety of approaches, that is broadly using a learning system approach that is oriented to the needs of the community by making students as subjects of learning, using multicultural learning processes, making students as learning citizens and invites students to solve various problems that occur in their environment by using local history and cultural learning materials that are familiar to students. The results of Rondli's research (2014) also show that multicultural-based learning strategies implemented in the learning process can improve student learning outcomes and also have to have the same understanding of multicultural to achieve learning objectives in Pkn subjects.

The expository strategy in this study was carried out as a form of teacher-oriented learning approach. In expository learning the delivery of material is final, so that in practice the teacher only lectures and gives notes to students as a result the students are less empowered and involved to express experiences they have experienced in learning. Learning strategies based on expository do not encourage the growing sense of curiosity and sense of responsibility of students in planning and organizing ways of learning. As a result, knowledge and skills possessed by students are only on short-term memory, and will tend to be incapable of improving students' retention in their subject matter. In learning, the communication that takes place in a one-way learning process tends to cause students to misunderstand certain concepts and terms.

From the results of research on thinking styles, it shows that students who have abstract sequential thinking are better able to utilize existing learning resources to the maximum in order to accelerate the process of solving learning problems, which in turn students' thinking style will also have a significant influence on improving student learning tasks. Therefore, if the student has an abstract sequential thinking style, the student is expected to have a better performance in learning history. Whereas students who have a concrete sequential thinking style are less able to utilize existing learning resources and are unable to work more effectively and efficiently to solve problems, so that students' concrete sequential thinking style will also affect student achievement improvement relatively lower. Therefore, if the student has a concrete sequential thinking style, then the student is expected to have low achievement.

The application of an education-based learning model of the character of a multicultural scientific approach that has abstract sequential thinking in this study will give each other strengths in studying local history. So that students who have abstract sequential thinking have thinkers in a logical sequence in analyzing ideas in ways to achieve goals in learning history. So as to be able to use existing facts such as those obtained in the mass media, television, the internet and the real conditions of the environment related to history, from these facts students can analyze it and make decisions to act well.

Based on the results of the study it can be stated that the model of education-based learning character of the multicultural scientific approach must be adapted to the characteristics of students namely the style of thinking. Selection of the right learning strategies needed must be adapted to the characteristics of students so that it can help in determining learning strategies, learning theories and learning media that are suitable for use. This is done so that the lessons presented by the teacher can attract attention and make students feel bored.
4 Conclusions

Based on the results of the research and the discussion presented earlier, then it can be concluded:

First, the average student's local history learning outcomes taught by the education-based learning model of the character of the multicultural scientific approaching higher than the average student's local history learning outcomes taught with the expository learning model. Thus the education-based learning model of the character of the multicultural scientific approaching more effectively applied in the learning of local history in order to improve student learning outcomes.

Second, the average learning outcomes of local history students with abstract sequential thinking style was higher than the average results of local history learning with concrete sequential thinking styles.

Third, there was interaction between the character of the education-based learning model of the multicultural scientific approach with sequential thinking style where students with abstract sequential thinking style are more appropriately taught to use the character-based learning model of the multicultural scientific approach, while students with concrete sequential thinking style are more appropriately taught with the learning model expository.

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The Effect of Constructivist Learning Models with Character Through Lesson Study and Critical Thinking on Learning

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Abstract. This research aims to determine: (1) the influence of constructivistic and expository learning models on lesson study towards learning outcomes in teaching planning; (2) the influence of high and low critical thinking skills on learning outcomes in teaching planning; and (3) interaction between learning models and the ability to think critically about learning outcomes in teaching planning. The research method using quasi-experimental with a 2 x 2 factorial design. The statistical test using descriptive statistics to present data and continued with inferential statistics using two-way ANOVA with a significant level of α = 0.05 followed by further testing. The results of research obtained showed: (1) learning outcomes in teaching planning taught using constructivist learning model with character by lesson study are higher than learning outcomes taught by expository; (2) learning outcomes in teaching planning that have high critical thinking skills are higher than those with low critical thinking skills; and (3) there's an interaction between the learning model and the ability to think critically about the learning outcomes of teaching planning.

Keywords: learning model, character based, constructive, lesson study, critical thinking, learning planning.

1 Introduction

Lesson study was a model for educating professional development through collaborative and ongoing learning assessment based on the principles of collegiality by a group of teachers to build a learning community. Lesson Study was not a strategy or method of learning, but lesson study activities can apply various strategies and learning methods that can be adapted to the situations and conditions and problems faced by teachers in each learning process (Rusman, 2011).

During this time, the learning process in the mechanical engineering study program in the Teaching Planning course was seen from the learning completeness and student learning outcomes, there was no indication of a significant problem as in the courses in the education family. However, in the learning process that takes place in the classroom to date, it was still centered on lecturers or often called teacher centered or known as traditional approaches...
In that learning, lecturers as individuals who are more active in teaching and students act as objects that receive passive knowledge. Although several methods have been tried to be applied like the discussion method, but students still have not responded well. They are still passive in expressing their opinions, discussions are dominated by lecturers. If this was left unchecked, it was feared, students will bring their learning experience when they go to college to the field, namely their classes later when they become teachers.

Planning learning was the most important thing for teachers in carrying out their duties. Learning planning was a projection of something that will be done by the teacher in the teaching and learning process. Learning will be optimal if the teacher first prepares learning planning. Learning planning needs to be done by the teacher to coordinate the learning components. Character-based learning planning means preparing learning plans that prioritize aspects of attitude, behavior, and character that will be internalized into students.

Constructivism was born from the ideas of Piaget and Vigoisky. Both emphasize that cognitive change only occurs if conceptions that have been previously understood are processed through a process of disequilibrium in an effort to understand new information (Nur, 2000). Constructivism considers that knowledge was cognitive construction through one's activities. Constructivism emphasizes that humans construct objects and the relationships they feel to expand their conceptions that are appropriate to the environment. Brown quoted Duffy (1992: 4) arguing that constructivists emphasize “situating” cognitive experiences in authentic activities.

To overcome the problems above, in this study active actions were carried out that applied the learning approach to constructivism. In directing lecture material and giving examples of quality learning and tasks that must be done by students a simulation was done, so that students can really see clearly what kind of learning will be trained in the student. So students will be truly trained to make contextual learning tools and implement them in front of the class so as to make learning interesting.

Lesson study was a model for educating professional development through collaborative and ongoing learning assessment based on the principles of collegiality and mutual learning to build a learning community (Hendayana, 2007). The lesson study coaching model can be used as a teaching guidance model for lecturers towards students (Rustono, 2008). One effort to improve the quality and professionalism of teachers in facilitating the learning process. Teaching Planning courses are deliberately chosen because the content of this course was an effort to provide skills to prospective teachers to be able to design learning. Of the various learning planning courses, how are prospective teacher students able to design various components that support the implementation of learning so as to produce references that are in line with the willingness of stakeholders and the government through its curriculum.

Lesson study was carried out in three stages, namely: planning, implementation and reflection stages. The planning phase aims to design learning that can teach students how to actively participate in learning activities. The implementation phasing the implementation stage of the learning design that has been prepared previously. During the learning process the observer focuses attention on student activities, namely the interaction of fellow students, students with lecturers, students with teaching materials and student interaction with the environment.

After completing the learning process, a discussion between model lecturers and observers was immediately carried out. At first the model lecturer conveyed impressions during the learning process, then continued by observers. Observers must convey the facts of their findings in class honestly and wisely in order to improve the learning process. Model
lecturers must be able to receive input from observers to improve learning in the next stage. In principle, all the people involved in the lesson study activities must obtain lesson lessons. Thus lesson study activities can be used to build a learning community (Rusman. 2011).

Character can be interpreted as a basic value that builds a personal person, formed either because of the influence of heredity or environmental influences, which distinguishes it from others, and was manifested in attitudes and behavior in everyday life. In simple terms, character education was defined as anything positive what the lecturer does and influences the character of the students he teaches. Character education was only part of good learning and fundamental part of good education (Samani and Hariyanto.2011).

According to Ennis (1996), critical thinking reasoned and reflective thinking by emphasizing decision making about what to believe or do. Indicators of critical thinking derived from critical activities according to Ennis (1996) are five, namely (1) able to formulate the main issues; (2) able to reveal the facts needed to solve a problem; (3) able to choose logical, relevant and accurate arguments; (4) able to detect biases based on different points of view; and (5) able to determine the consequences of a statement taken as a decision.

Iakovos (2011) explains that critical thinking and creative thinking have an important role in education and the main goal in learning where there are four important components for building these abilities, namely (1) explaining and clarifying; (2) asking the right questions to clarify or challenge; (3) consider the credibility of the source; (4) problem solving and drawing conclusions.

The problems that will be examined in this study, can be formulated as follows: (1) Are there differences in teaching planning learning outcomes taught by constructivistic and expository learning models in lesson study; (2) Are there differences in learning outcomes of teaching planning that have high critical thinking skills and who have low critical thinking skills; and (3) Are there any interactions between the learning model and the ability to think critically about the learning outcomes of the pursuit planning?

2 Methods

This research was carried out Mechanical Engineering education study program, Odd semester 2017/2018 academic year. The research population were students of mechanical engineering education who took teaching planning subjects, which consisted of 4 classes, and each class consisted of 22 students, which means the population of this study consisted of 88 students. Whereas the sample of this study was set in 4 classes with the technique (Cluster Random Sampling). The design of the study was a 2x2 factorial experiment. The learning model was divided into two, namely the elaboration learning model and the direct learning model. Critical thinking skills are also divided into two, namely high critical thinking skills and low critical thinking skills.

Data collection techniques used are test techniques. The test used for data collection, which was a test to measure the learning outcomes of teaching planning through lesson study that was prepared based on learning outcomes according to the IQF. The second testing to measure critical thinking skills. Validity testing done using biserial correlation. While the valiadity test was carried out using K.R-20. Data analysis techniques are carried out using descriptive and inferential statistics. Descriptive techniques are to describe data (mean, median, and standard deviation). While inferential
techniques are to test hypotheses. The inferential technique used to test the hypothesis of this research was 2-way variance analysis (ANAVA) technique and continued with further testing.

3 Results

Description of statistical data learning outcomes planning based on variations in learning models are as follows.

Description of learning outcome data based on variations in learning models. The learning outcomes of student teaching planning in the experimental group taught using constructivist learning models are better than the learning outcomes of the control group students who are taught using the expository learning model in lesson study.

Description of learning outcome data based on variations in critical thinking skills. Learning outcomes of teaching planning for students who have high critical thinking skills are better than the learning outcomes of students who have low critical thinking skills.

Based on the calculation that the value of $0.227 > 0.05$, the standard residual was normal. Based on the calculation results show that the significance value was 0.217. And because the significance value $0.217 > 0.05$, it can be concluded that the variance in the learning outcome planning variable was homogeneous. So it was assumed that homogeneity in the two way ANOVA test was fulfilled.

Table 1: Descriptive Analysis Calculation Results

<table>
<thead>
<tr>
<th>Learning Model</th>
<th>Critical Thinking Ability</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructivist Model</td>
<td>High Critical Thinking Ability</td>
<td>84.23</td>
<td>3.449</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Low Critical Thinking Ability</td>
<td>71.82</td>
<td>3.473</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>78.02</td>
<td>7.148</td>
<td>44</td>
</tr>
<tr>
<td>Expository Model</td>
<td>High Critical Thinking Ability</td>
<td>80.55</td>
<td>2.773</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Low Critical Thinking Ability</td>
<td>67.23</td>
<td>3.085</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>73.89</td>
<td>7.333</td>
<td>44</td>
</tr>
<tr>
<td>Total</td>
<td>High Critical Thinking Ability</td>
<td>82.39</td>
<td>3.610</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>Low Critical Thinking Ability</td>
<td>69.52</td>
<td>3.991</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>75.95</td>
<td>7.494</td>
<td>88</td>
</tr>
</tbody>
</table>
Table 2: Results of Average Score of Learning Outcomes of Teaching Planning in Constructivistic and Expository Learning Models

<table>
<thead>
<tr>
<th>Learning Models</th>
<th>Mean</th>
<th>Std. Error</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constructivistic Model</td>
<td>78.023</td>
<td>0.484</td>
<td>77.061 - 78.984</td>
</tr>
<tr>
<td>Exploration Model</td>
<td>73.886</td>
<td>0.484</td>
<td>72.925 - 74.848</td>
</tr>
</tbody>
</table>

Based on the results of calculations in Table 4 shows that there was a difference in the average value of learning outcomes of student planning teaching groups based on the application of constructivistic learning models in the lesson study. The average learning outcome group teaching planning of students taught by constructivistic learning model was 78.023 higher than the average learning outcome group teaching planning of students taught by exploration learning model was 73.886.

Table 3: Difference in Average Value of Learning Outcomes of Teaching Planning on Critical Thinking Ability

<table>
<thead>
<tr>
<th>Critical Thinking Ability</th>
<th>Mean</th>
<th>Std. Error</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Critical Thinking</td>
<td>82.386</td>
<td>0.484</td>
<td>81.425 - 83.348</td>
</tr>
<tr>
<td>Ability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Critical Thinking</td>
<td>69.523</td>
<td>0.484</td>
<td>68.561 - 70.484</td>
</tr>
</tbody>
</table>

Based on the results of calculations in table 5 shows that there was a difference in the average value of learning outcomes of the planning of student groups based on the ability to think critically. The average learning outcomes group planning machine teaching students with high critical thinking ability was 82.386 higher than the average learning outcome group teaching planning students with low critical thinking ability 69.523.

Calculation of inferential statistical analysis uses (ANOVA) two lines 2 x 2. Below was a summary table of the results of the two-track ANOVA test in table 6 below.
<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>4021.364a</td>
<td>3</td>
<td>1340.45</td>
<td>130.25</td>
<td>0.00</td>
</tr>
<tr>
<td>Intercept</td>
<td>507680.18</td>
<td>1</td>
<td>507680.18</td>
<td>31.84</td>
<td>0.00</td>
</tr>
<tr>
<td>Model</td>
<td>376.41</td>
<td>1</td>
<td>376.41</td>
<td>36.57</td>
<td>0.00</td>
</tr>
<tr>
<td>Think</td>
<td>3640.41</td>
<td>1</td>
<td>3640.41</td>
<td>353.74</td>
<td>0.00</td>
</tr>
<tr>
<td>Model * Think</td>
<td>4.54</td>
<td>1</td>
<td>4.54</td>
<td>0.44</td>
<td>0.51</td>
</tr>
<tr>
<td>Error</td>
<td>864.455</td>
<td>84</td>
<td>10.291</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>512566.000</td>
<td>88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>4885.818</td>
<td>87</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared = .823 (Adjusted R Squared = .817)

Based on the ANOVA calculation results in table 6, it can be used to answer the research hypothesis proposed:

Hypothesis 1. The results of the analysis of two-way variants of the data of learning outcomes of teaching planning are reviewed based on the learning model obtained the value of F count value of 36.576 with a significance of 0.000 (Sig < 0.05). Because Fcount has a significance of less than 0.05 (Sig = 0.000 < 0.05), then H0 was rejected and Ha was accepted. Thus it can be concluded that there are differences in learning outcomes between classes that use constructivist learning models with classes that use an exploratory learning model on lesson study.

Hypothesis 2. The results of the analysis of two-way variants of the data of learning outcomes of critical thinking ability and low critical thinking ability obtained Fcount value of 353.743 with a significance of 0.000 (sig < 0.05). Because Fcount has a significance of less than 0.05 (sig = 0.000 < 0.050), then H0 was rejected and Ha was accepted. Thus it can be concluded that there are differences in learning outcomes of teaching planning students who have high critical thinking skills with students who have low critical thinking skills.

Hypothesis 3. The results of the analysis of two-way variants of the data of teaching planning learning outcomes are reviewed based on the interaction between constructivist learning models and critical thinking ability obtained Fcount value of 0.442 with a significance of 0.508 (sig > 0.05). Because Fcount has a significance of more than 0.05 (sig = 0.254 > 0.050), then H0 was accepted and Ha was rejected. Thus it can be concluded that there was no interaction between the use of learning models (elaboration and direct in the context of text content) with the ability to think critically about the learning outcomes of teaching planning on the lesson study.
4 Discussions

Are the learning outcomes of the teaching planning of students taught using constructivistic learning models higher than those taught using the expository learning model in lesson study.

The first research hypothesis about the difference in the influence of constructivistic and expository learning models in the lesson study of students was accepted. This shows that the two learning models used in the study will influence student learning outcomes. From the mean value of the students' teaching planning learning outcomes can also be seen the difference between students taught using constructivist learning models and students taught using the expository learning model in lesson study.

The results showed that the use of character and constructivist teaching planning learning models through lesson study allows students to improve their ability to think carefully about learning goals, subject matter, and the field of study not only to pay attention to learning for one meeting or one subject, but how to teach one the subject matter unit and even the field of study, and also pay attention to the development of students in the longterm.

The use of constructivist learning models in character teaching planning through lesson study allows students to also design collaborative learning and provide opportunities for students to design learning. According to Lewis (2002), as an illustration that the average teacher in Japan observed about 10 lessons studied each year. Teachers in Japan perceive that collaborative activity was very beneficial. Collaborative activity can provide opportunities for teachers to think about their own learning after considering it with the experience of other teachers. Through lesson study the teacher can learn from each other through shared knowledge activities.

Through lesson studying coaching model for students in collaborative and ongoing learning assessment, based on the principles of collegiality that helps each other in learning to build a learning community. The principle of collegiality and mutual learning are applied in collaborating when implementing lesson study activities. In other words, students of lesson study activities carried out in teaching planning learning should not feel superior (feel smartest) or inferior (feel inferior) but all must have the intention to learn from each other. Students who already understand or have more knowledge must be willing to share with students who do not understand, otherwise students who do not understand must want to ask students who already understand. The study activities for learning through lesson studies like this will improve the learning community.

The learning process in teaching planning conducted by students in practice with constructivistic and expository based on the characters in the application of lesson study was superior which carried out through constructivist learning models. By constructing thinking skills and developing pursuit plans tailored to learning problems and learning conditions requires a solution to make learning activities run well and constructively. In line with what Lewis (2002) explained, that the learning process must be well designed to make teachers professional and innovative. By implementing lesson study the teachers can (1) determine the competencies that students need to have, plan and implement effective lessons; (2) reviewing and improving lessons that are beneficial for students; (3) deepening knowledge of subjects presented by teachers; (4) determine the competency standards that will be achieved by students; (5) collaborative lesson planning; (6) examine students’ learning and behaviour carefully; (7) develop reliable learning knowledge; and (8) reflecting on the teaching carried out based on the views of students and colleagues.
Through Lesson Study, the students involved in the teacher realized the importance of lesson study in improving teacher professionalism because it can improve pedagogic competence by looking at the various methods implemented during learning, academic competency by collaborative learning plans, social competence by giving each other, accept the results of reflection, and share the concept of material, and professional competence by always having a desire for lifelong learning. Lesson studying one of the efforts to improve teacher professionalism to improve the quality of learning so that its implementation needs to be continuously carried out and developed in various schools. (Chotimah, 2015). Supported by the results of research by Rahayu, Mulyani, and Miswadi (2012), showed that the results showed that using the Problem Base learning model through lesson study could help teachers to develop a set of learning tools and provide better learning. The research shows that through the lesson study activities the aim was the same to increase teacher professionalism through improving teaching methods and increasing knowledge (Cerbin & Kopp, 2006). Observation of student learning activities aims to find out the teaching method or method of teaching that can be done or not, so that from observation of students can be used to correct and improve the learning method used in teaching planning courses.

Are the learning outcomes of teaching planning for students who have higher thinking skills higher than students who have low thinking skills.

The second research hypothesis about the difference between high critical thinking abilities and low critical thinking skills in planning student learning was accepted. This shows that both critical thinking skills used in research will influence student learning outcomes. From the mean value of learning outcomes of student teaching planning can also be seen the difference between students who are taught with high critical thinking skills and students who are taught using low critical thinking skills in lesson study.

Students who have high critical thinking skills are more creative and active in learning. With high critical thinking skills students are more eager to learn and like challenges, and they will be able to learn something well, so that through problem-based learning strategies students who have high critical thinking skills tend to be better at solving problems and through solving these problems students can develop critical thinking skills to be even better.

This consistent with the opinion of Sardiman (2010:75) that in learning activities critical thinking skills can be said to be the overall power in the student which leads to learning activities, which ensures the continuity of learning activities and which gives direction to learning activities, so that desired by the subject of learning can be achieved.

The results show that students who have critical thinking dispositions are sensitive to critical thinking moments, feel compelled to think critically, and have basic skills for critical thinking. Although included in the element of ability in the disposition concept, Perkins (Suriadi, 2006) states that in reality the use of critical thinking dispositions was only an element of tendency and sensitivity. While the element of ability was only a clue that people who have a critical thinking disposition must also have the ability (cognitive skills). Therefore, good critical thinkers always try to equip themselves with the disposition of critical thinking, not just cognitive skills. Critical thinking in every discipline varies. Poedjiadi (1999) states that in order to be able to carry out critical thinking in certain disciplines, must first master the terminology, concepts, and methodologies of the science.

To make students think critically, it can be through observation of a constructivist learning model with character in an effort to make critical thinking. By observing a model we can help students imagine, explain and carry out the behavior that will be done. People who are considered models in critical thinking show the nature of being able to explain the reason for the action clearly so that it can be understood by those who observe it. Be responsible and
acknowledge the shortcomings, or the success that was done. This can be conditioned in the classroom in the presentation of the results of the completion of the task by providing an opportunity for students to provide opinions and critics according to what they think.

To be a critical thinker, students need to familiarize themselves with open mindedness, using logical evidence and correct logic to be able to understand in depth the events so that they can act and draw conclusions appropriately (Elaine, 2011). Through the application of constructivist learning models through lesson study can be seen increasing critical thinking skills by: reading critically, improving analytical skills, developing observing/observing skills, increasing curiosity, ability to ask questions and reflection, metacognition, observing "models" in critical thinking, "rich" discussion, critical thinking evaluation (Zaleha IH, 2004:95).

5 Conclusions

The conclusion of this study shows that: (1) The average learning outcomes of the teaching planning of students taught using constructivist learning models are superior to using expository learning models in lesson study; (2) the average learning outcomes of students' teaching planning with high critical thinking skills are superior to those with low critical thinking abilities; (3) there was a difference in the results of students learning mechanical drawing between classes using constructivist learning models with those using expository learning models in lesson study, (4) there are differences in learning outcomes of students' teaching planning on those who have high critical thinking skills with students who have the ability low critical thinking. (5) there was no interaction between the use of constructivist and expository learning models in lesson study with the ability to think critically about the learning outcomes of teaching planning.
References


The Innovation of Learning Media in Web-Based Dance Teaching Techniques in Dance Education FBS UNIMED Students

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Abstract. Nias Dance Technique is one of the courses which are included in the presentation group, but the learning is included in the education group. The aim is to innovate web-based learning tools and learning media in Nias dance engineering courses for students of Unimed FBS dance education program. This Learning and Media Learning Tool is to facilitate students in learning Nias Dance Engineering courses through the web schoology in the Sendratasik department. Innovations in learning devices ranging from RPS, LK, Assessment Rubrics, Teaching Materials, VCDs with No Tatema Mbola dance material.

Keywords: Learning Innovation, Nias Dance Engineering, Tari No Tatema Mbola.

1 Introduction

Education is not merely the science of curriculum or mere teaching methodology. But how can this curriculum work well according to the methodology that is run. One component of the education system is the curriculum, because the curriculum is a component of education that is used as a reference by the organizers, especially by lecturers and leaders because the curriculum as a reference must be able to grow to compensate for changing times. In the past few years, there have been several changes to the educational curriculum, solely aimed at adjusting to the times. The substitution is a form of innovation in the curriculum, so that the substance of the related substance has a better quality improvement than before. According to Law No.11 of 1989 concerning the national education system, the Curriculum is a set of plans and arrangements regarding the content and material of learning and the methods used as guidelines for the implementation of teaching and learning activities.

Curriculum and learning are intended as a particular idea, idea or action in the field of curriculum and learning that is considered new to solve educational problems. Curriculum innovation problems are related to the principle of relevance between learning materials and student needs, between the quality of learning and the users of graduates in the work field etc. Related to the quality of cognitive, affective, and psychomotor, while equity is related to opportunities and opportunities, then efficiency in terms of internal and external.

Learning curriculum is related to learning that uses media. One of the ways to achieve learning is through the media. Media comes from Latin is the plural form of Medium which literally means an intermediary or an introduction, namely an intermediary or an introduction.
to a message source with the recipient of the message. Scramm (1977) argues that learning media is a messenger technology that can be used for learning purposes. Hamid (2014) states that learning media is a component of delivery strategies that can be loaded with messages that will be conveyed to students, whether it be people, tools or materials. Briggs (1997) argues that learning media includes all the resources needed to communicate with students, this can be in the form of hardware such as computers, televisions, projectors and software used in hardware.

Based on the understanding of various sources about media, learning media can be understood as one that can deliver from a source in a planned manner so that a conducive learning environment occurs where the recipient can be done with the process effectively and efficiently. This learning media is based on the Nias Dance Engineering course which will be displayed on websites that will first be uploaded to the Internet network. This is an alternative by implementing the learning tools of the IQF curriculum in Nias Dance Engineering courses.

Learning material is the core of the curriculum that serves as a means of achieving goals in the learning process. Learning material in the learning process occupies an important position in the learning process, it is because the teaching material is the material that will be delivered / presented. Without teaching materials, learning is impossible. Teaching materials must be in accordance with the objectives and competencies that are expected to achieve the expected learning.

2 Problem

We One of the reasons why this learning is displayed or uploaded via the web is to improve the ability of students to implement the learning tools of the IQF curriculum in Nias Dance Engineering courses. So that students can improve their technological understanding and creativity that can be channeled with critical and innovative thinking skills. This understanding of students is to improve the needs and resistance in learning. In this problem will reveal about matters related to thoughts about the constructs of character education and culture. Jagondzinski (1994) thinking in developing and disseminating knowledge that can help students in pursuing three core functions of education: Facilitating student learning, Encouraging personal development of students, Promote prosocial attitudes, habits, and behavior in students.

These three functions can help lecturers realize educational goals by giving important insight to students to develop learning, creative power in critical thinking. Currently the world of education is progressing with the advent of educational technology products that support the learning process in schools. One of them is Electronic Learning (E-Learning). According to e-learning experts, William Horton (2003) in his book Technology and Tools for E-Learning defines e-learning as all uses or use of internet and web technology to create learning experiences. It can be simplified into all forms of use of internet-based technology to support the learning process, such as in school.

This e-learning based learning has several types. Among them are independent learning based on e-learning, conventional learning based on e-learning, combination learning based on e-learning, fast response e-learning, and e-learning based training guidance. This type of e-learning has a very important role for student learning. Students and lecturers become aware of technology. The level of saturation in learning can be suppressed. The result is certainly
more effective and efficient as a support for the learning process, without reducing the role of
the lecturer in guiding students directly.

Learning with the media through technology whose dance material is No Tatema Mbola
in Nias Engineering courses will mean providing stimulation of student intelligence, when
dancing activities are designed based on Developmentally Appropriate Practice (Gestwicki,
2007). When learning through dance is designed with attention to the development and
creative needs of students in an active, creative, effective and fun participatory atmosphere,
learning to dance will be meaningful in developing students' intelligence in school.

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3 Discussions

Active learning as an innovation in the curriculum and learning can optimize the use of
all the potential possessed by students, so that all students can achieve satisfying learning
outcomes in accordance with the personal characteristics they have. Besides that, active
learning is also intended to keep the attention of students / students to remain focused on the
learning process. In learning with Active learning (active learning) empowerment of the left
and right brain is very important. Thorndike (Bimo Wagito, 1997) proposed 3 laws of
learning, namely 1. law of readiness, namely the readiness of someone to do can facilitate the
relationship between stimulus and response. 2. law of exercise, that is, with the repetitions that
are always done, the relationship between stimulus and response will become smooth. 3. the
law of effect, namely the relationship between stimulus and response will be better if it can
cause pleasant things, and this tends to be repeated.

Active learning basically strives to strengthen and facilitate the stimulus and response of
students in learning, so that the learning process becomes fun, not boring for them. By
providing an active learning strategy (active learning) in students can help their memory, so
they can be delivered to the learning objectives successfully. This is less noticed in
conventional learning. In the active learning method (active learning) each new subject matter
must be associated with various previous knowledge and experiences. New learning material
is actively provided with existing knowledge. In order for students to actively learn, teachers
need to create appropriate strategies in such a way that students have high motivation to learn.
(Mulyasa, 2004).

A. Factors Affecting Innovation in Learning

Innovations in the form of methods can have an impact on improvement, improve the
quality of learning and as a new tool or way of solving problems encountered in educational
activities. Thus new methods or new ways of implementing existing methods such as in the
learning process can be an effort to improve the effectiveness of learning. Meanwhile,
innovation in technology also needs to be considered given the many technological results that
can be used to improve the quality of education, such as its use for learning technology, supervision procedures and management of educational information that can improve the efficiency of educational implementation. As for the factors that influence educational innovation, namely:

1. Lecturer

Lecturers as the spearhead in the implementation of education in universities are very influential parties in the teaching and learning process. The expertise and authority of a lecturer greatly determines the continuity of the teaching and learning process in the classroom and its effects outside the classroom. Lecturers must be able to bring their students to the goals to be achieved. There are several things that can shape the authority of the lecturer, among others, is the mastery of the material being taught, teaching methods that are in accordance with the situation and conditions of students, relationships between individuals, both with students and between fellow lecturers and other elements involved in the education process such as administrators, such as chairmen study program and administration and the surrounding community, the experience and skills of the lecturers themselves. Thus, in the renewal of educational learning, the involvement of lecturers from planning of learning innovations to implementation and evaluation plays a huge role in the success of a learning innovation. Without involving them, it is very likely that they will reject the innovations introduced to them. This is as described previously, because they consider innovation that does not involve them is not theirs to be carried out, but instead they assume that they will disrupt the peace and smoothness of their duties. Therefore, in an innovation learning, the lecturer is the main and first involved because the lecturer has a broad role as an educator, as a parent, as a friend, as a motivator and so forth. (Wright, 1987).

2. Students

As the main object in the teaching and learning process, students hold a very dominant role. In the teaching and learning process, students can determine the success of learning through the use of intelligence, motor power, experience, will and commitment that arise in them without coercion. This can happen if students are also involved in the process of innovation in learning, by introducing them to the purpose of the change from planning to implementation, so that what they do is a shared responsibility that must be carried out consistently. The role of students in educational innovation is as important as the role of other elements, because students can be as recipients of lessons, giving material to their peers, instructions, and even as lecturers. Therefore, in introducing learning innovations to their application, students need to be invited or involved so that they not only accept and implement these innovations, but also reduce resistance as described previously.

3. Curriculum

Educational curriculum, the narrower the curriculum includes the teaching program and the tools are guidelines in the implementation of education and teaching in universities. Therefore the curriculum is considered as an inseparable part of the teaching and learning process so that in implementing this learning innovation, the curriculum plays the same role as other elements in education. Without the curriculum and without following the programs in it, then educational innovation will not run in accordance with the objectives of the innovation itself.
Therefore, in the renewal of education, the change should be in accordance with changes in curriculum or changes in curriculum followed by renewal of education and it is not impossible that changes from both will go in the same direction as other elements in education. Without the curriculum and without following the programs in it, then this learning innovation will not run in accordance with the objectives of the innovation itself. Therefore, in the education discussion, the changes should be in accordance with curriculum changes or curriculum changes followed by educational renewal and it is not impossible that the changes from both will go in the same direction.

4. Facilities

Facilities, including educational facilities and infrastructure, cannot be ignored in the education process, especially in the teaching and learning process. In education reformation, of course facilities are things that influence the continuity of innovations that will be implemented. Without the existence of facilities, the implementation of educational innovations will certainly not work well. Facilities especially in teaching and learning facilities are essential in making changes and education reforms. Therefore, in implementing an educational innovation, facilities need to be considered. For example with the availability of buildings, benches, tables and so on.

5. Social Scope of the Community

In applying learning innovations, there are things that are not directly involved in these changes but can have an impact, both positive and negative, in the implementation of educational reform. People directly or indirectly, intentionally or not, are involved in education. Because, what you want to do in education is actually changing the community to be better, especially the community where the students come from. Without involving the surrounding community, learning innovations in education will certainly be disrupted, even damaging if not notified or involved. Community involvement in this innovation will instead help innovators and implement innovators in implementing educational innovations.

B. Innovation in No Tatema Mbola Dance Learning

Learning through dance requires a process by giving children the opportunity to be full of fun and fun. For students, creativity should be a preferred process, and don't expect too much creative, meaningful and useful products. If the lecturer is too fast demanding creative products that meet certain quality standards, this will reduce the fun and fun of children to be creative. In bringing up dance activities, it is giving freedom to students to carry out various explorations in order to create or express themselves creatively. Dance lecturers can help stimulate students to involve themselves in creative activities to help by seeking a fun and exciting atmosphere.

Dance is an art of motion that belongs to visual arts where it can be enjoyed through the senses of sight. Dance learning aims to train motor sensory, train its sensitivity and coordinate between movements and sounds, interpret experiences around it in motion and so on. Studying dance, is a means to recognize and preserve the types of dance that exist in the area. Dance from the beginning is a collective art, because in the process and framework of its form a place is formed by various other art disciplines, and dance as an art form is not only an expression of motion, but has brought with it a sense of rhythm that can provide a touch of
aesthetic sense (Hidayat, 2005) The beauty of dance is not only the harmony of internal body movements in a room with certain music, but all expressions must contain dance intentions, so to judge something of dance, three aspects of wiraga, wirama, and wirasa are used.

1. Tari NoTatema Mbola

No Tatema Mbola can be interpreted as accepting betel nut, this dance is a social dance originating from the Nias region, North Sumatra. This dance depicts the joy and joy of the young people of Nias in establishing cooperation, harmony, intimacy and a sense of cohesiveness among them. The thing that is always maintained by the Nias community through the acceptance and giving of betel in social life as a symbol of the reception of incoming guests.

2. Dance can educate students through daily activities

Dance education can develop students’ natural intelligence. Daily activities with the environment that can make students unite with their surroundings. In dance learning activities, methods are motivations that can be said to be the overall driving force in each person. If the method of learning dance is fun, naturally it will form a ‘long term learning’, which raises motivation to keep finding out, to continue to explore. Of course we also have to pay attention to each individual’s talents of pleasure. And can’t generalize that all children must master the same dance movement because that’s where someone’s uniqueness is (individual difference). This power of thought and power is able to help develop intellectual intelligence. Because, with this movement can explore students’ insight into various knowledge. Develop emotional intelligence and between personal or group. With groups of students, they will hone their emotions so that tolerance and empathy arise for others, comfortable and familiar with the group. The pleasure of motion exploration makes students repeat activities tirelessly. If we do everything we are glad we are free from pressure and what we produce will be better. Likewise pleasure in dance. We must stimulate the child’s desire to explore, direct it without interfering, allowing students with their natural desire to learn and become independent. Every student and group will learn in their personal activities and learn to understand according to their unique needs and abilities. Joy arises in a specially created environment, the child’s spontaneous freedom, responsibility, social and intellectual development will develop, which is what we know as lifelong education.

Howard Gardner in De Porter, Bobbi, & Mike Hernacki stated that, a person will learn with all ability if he likes what he learns and he will feel happy to be involved in it. When creating active and meaningful learning situations for students (active learning). Students as learners are stimulated through learning activities to be able to build their knowledge through the active learning process they do themselves. Based on the foregoing, the intelligence of students is basically able to be optimized through dance art education which includes physical for motion, perception, power of thought and creativity in terms of processing motion.

4 Conclusions

Learning innovation is something that is important and must be owned or done by lecturers. This is because learning will be more alive and meaningful. Various innovations are
expected to provide motivation to be creative for students to be more active. The strategy for implementing innovative learning is as follows: 1. Mastering learning theory. 2. Enrich understanding of learning methods. 3. Review the material taught. 4. Get to know the class conditions and students. 5. Make observations on previous learning. 6 Evaluation of previous learning. Make improvements to previous learning.

Changes in the concept of learning from conventional to e-learning should be related to learning strategies in academic development. Without this connection and development, the innovation will fail. If the learning innovation developed is successful, it is likely that students and students will further improve their abilities, making students interactively learn, making tasks more diverse and faster in their completion, and can develop strategies in terms of strengthening and evaluation. However, changing the concept of learning like this is not an easy thing to implement. This is acknowledged by some lecturers who have difficulty in implementing e-learning, but students also experience problems, especially in using computers. This will result in low learning progress achieved because learning with the concept of not face to face directly is not easy when compared to learning systems where students and educators can face to face directly. Innovation eventually becomes something that must be tried.
References


Validation of Standard Test Instruments to Improve Mathematical Reasoning Capabilities of Mathematics Student

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Abstract. The achievement of learning outcomes must certainly be measured by the presence of tests. A test instrument must represent all the learning outcomes to be obtained. Standard tests are tests with a qualitative and quantitative analysis process. The test applied must be a test with a high level of validation. Based on these problems, a standard test instrument will be developed to improve student's mathematical reasoning ability. This research is an educational research and development to form valid essay tests in the form of a test instrument sheet. The preparation of the test instrument is adjusted to the indicators of the achievement based on the IQF curriculum. The validations procedure takes from the define and design steps of a 4-D model viz define, design, develop, and disseminate. Passed the validation phase of the expert, the initial revision, to the empirical validation of the result of the test trials on State University of Medan mathematics student. The outcomes obtained that the standard tests instruments developed are valid.

Keywords: The Standard Test Instrument, Mathematical Reasoning Ability, Learning Outcomes

1 Introduction

Learning at the tertiary level with the IQF curriculum is learning that focuses on learning outcomes. Learning outcomes are internationalization and accumulation of knowledge, skills, affections and competencies that are achieved through an educational process that is structured and covers a particular field of science / expertise or through work experience. The achievement of learning outcomes must certainly be measured by the presence of tests. The compiled test must cover all indicators of achievement of a competency. Standard tests are tests that have undergone a good qualitative and quantitative analysis process (Balitbang Puspendik Depdiknas, 2007). The test applied must be a test with a high level of validation. The quality of a test of learning outcomes is largely determined by the quality of the items (Kaerudin, 2015).

A test instrument must represent all learning outcomes to be obtained. In the test instrument there are skills to be built. Tri Kodiyono (2018) in his research said that there was a positive relationship between mathematical reasoning and the improvement of students' learning achievement. Mathematical reasoning is simply stated as a person's ability to carry out logical inferences based on existing facts or mathematical statements (Brodie, 2010). This ability is very necessary in the field of algebra.
Elementary Linear Algebra Course is a subject with material that is directly related to real-world problems and is also used in other subjects in the field of mathematics. Material Linear Equation System (SPL) and Matrix are materials that are closely related to the application of science in the real world. Tests that are used as a standard to test mathematics students already exist but have never been analyzed to see the quality of the test. The development of test instruments is felt to be very necessary to improve the quality of future learning. The development of the test instrument referred to in this study uses the development of test instruments to improve the mathematical reasoning of Medan State University mathematics students.

2 Review Of Literature

The main text should be written using Times New Roman, 10pt, fully justified. Italics can be used for emphasis and bold typeset should be avoided. Some important things that need to be considered before validating a test are how to construct the test so that it meets all the criteria that must be met, in this case related to learning outcomes that are in accordance with the curriculum. Halim (2016) in his research said that the development of test essay instruments is an instrument of High Order Thinking skills. This is why this research uses essay tests as instruments to be able to see clearly mathematical reasoning from mathematics students in studying matrix topic in Elementary Linear Algebra courses.

2.1 Test Intruments

The term test instrument is stated as a tool or procedure used in the framework of measurement and assessment. The test is a number of questions given to students to be answered. The test is a consideration of whether or not a competency is achieved. Hadijah et al. (2016) in his research said that students were interested in using cognitive learning outcome test instruments with various variations of questions, so that the criteria for the effectiveness of test instruments were achieved. Success of an evaluation activity will also be influenced by the success of evaluators in carrying out evaluation procedures. The procedure in question is the main steps that must be taken in the evaluation activity. What is meant by the evaluator is the educator in planning, compiling and producing a good test instrument, of course based on the things that must be considered in the development of learning outcomes tests.

Mardapi in Widoyoko (2012) states that there are nine steps taken in the development of learning outcomes tests, such as:

1. Compile test specifications. The things that are done when preparing the test specifications are determining the purpose of the test, arranging the grid, selecting the form of the test, and summative tests. This is done to make it easier to write questions and anyone who writes questions will produce a relatively similar level of difficulty.

2. Write test questions. Writing questions is a description of the indicators into questions whose characteristics are in accordance with the details of the grids that have been made.

3. Review test questions. This is done to minimize errors or shortcomings.

4. Conduct test tests. Test trials are conducted as a means of obtaining empirical data about the level of goodness of the questions that have been compiled.
5. Analyze test items. With the analysis of test items can be known the difficulty level of the item, the distinguishing power, and the effectiveness of the deceiver.

6. Fix the test. This step is usually a test item, which is to fix each item that is still not good.

7. Assemble the test. In assembling questions, things that can affect the validity of the question such as the serial number of the questions, grouping the form of questions, layouts, and so on must be considered because even though the items that have been prepared are good but if any formulation can cause the problem to be bad.

8. Carry out the test. The test is carried out in accordance with the time determined and supervision is needed so that the test is truly done honestly.

9. Interpret test results. The test results produce a quantitative data in the form of a score. This score is then interpreted so that it becomes a value, which is low, medium or high. The high and low values are always associated with the reference. There are two assessment benchmarks that are often used in the world of psychology and education, namely the reference norms and reference criteria.

   The things that must be considered in the development of the test according to Arifin (2012), namely: aspects to be measured, parties compiler, purpose of using tests, samples, validity and reliability, administration, how to score, answer keys, raw score table, and interpretation .

2.2 Mathematical Reasoning Ability

Mathematical reasoning or commonly known as mathematical reasoning in some literature called mathematical reasoning Brodie (2010) states that "mathematical reasoning is reasoning about and with the object of mathematics". Which can be interpreted by mathematical reasoning is the ability of a person to carry out logical inferences based on facts / statements of existing mathematics.

According to Polya (1954), there are two kinds of reasoning deserves our attention, that are demonstrative reasoning and plausible reasoning. Meanwhile, Lithner (2006) said there are two types of reasoning that students often use in completing math tasks, namely Creative Reasoning (creative reasoning) and Imitative Reasoning (imitative reasoning).

Four criteria of creative reasoning are:
1. Novelty (Novelty). A new set of solutions (for reasoning) are created in problem solving or a series of solutions that have been forgotten, recreated. The answers that only follow the completion procedure are not included in the type of creative reasoning.
2. Flexible (Flexibility). A different approach and adapted for appropriate problem situations.
3. Reasonable (possible). There are arguments that support the choice and implementation of the strategy so that it reinforces the reason that the conclusions given are true and reasonable. In this case, it is not allowed to guess answers.
4. Mathematical (Mathematical foundation). The argument given is in the intrinsic mathematical properties of the components contained in reasoning.

2.2.1 The Indicator of Reasoning Ability

According to Sumarno (Yulia, 2012: 22) reveals that indicators of student has mastered the ability of mathematical reasoning is as follows,
1. Interest logical conclusion;
2. Give an explanation using pictures, facts, property, existing relationships;
3. Estimating answers and process solutions;
4. Using relationship patterns to analyze, make analogies, generalize, and develop and test expectations;
5. Sending examples of opponents;
6. Submit inference rules, check the validity of arguments, and compile valid arguments;
7. Develop direct evidence, there is no direct evidence, and evidence with mathematical induction.

In addition, indicators of reasoning ability are explained in the Technical Regulation of the Directorate General of Primary and Secondary Education Ministry of Education Number 506 / C / Kep / PP / 2004, describing that indicators of students’ reasoning abilities are able to:

(Yulia, 2012: 14)

1. Request an accusation
2. Perform mathematical manipulation.
3. Draw conclusions, gather evidence, provide reasons or proof of the truth of the solution.
4. Draw conclusions from the statement.
5. Check the validity of an argument.
6. Find a pattern or property of mathematical symptoms to make generalizations.

2.3 Validation

Azwar in Matondang Z (2009) said that validity has meaning from which the accuracy and accuracy of the measuring instrument (test) in performing its measuring function. Furthermore, he said that a test has a high validity if the tool performs the measuring function appropriately or provides a measurement result according to the purpose of doing the measurement.

In his journal Matondang Z (2009) said that the concept of test validity is divided into three types, namely content validity, construct validity, and empirical validity or criteria validity. The validity of the content of a test tests how much the ability of the test to measure the level of mastery of certain content or material that should be mastered in accordance with the purpose of teaching. Content validity shows the extent to which the test is able to represent or reflect the entire material proportionally. Therefore, the validity of the test is not measured statistically but based on the review of the test grid. While construct validity is carried out based on theoretical studies of theories about the concept of variables to be measured through a logical and careful analysis and comparison process. The third validity, which is empirical validity, which is also called the criteria validity, is the validity of the tests obtained through the results of test tests to the respondents which are equivalent to the respondents to be examined.

In this research, the validation only taken from the expert. Therefore, the validation covered only for the content validity.

3 Methodology

Refers to the needs to construct instrument tests, the chosen method to analyze is 4-D models. 4-D models is a development models of Thiagarajan, Summel and Summel (1974).
As the name, in 4-D methods, there are 4 step that given to analize, viz. define, design, develop and disseminate.

The steps taken are:

1. Define Stage.
   The purpose of this definition is to define and define the needs in preparing the test. Starting with analyzing the objectives and boundaries of the material contained in the indicators of learning achievement. The activities in this stage are initial analysis, student analysis, concept analysis, task analysis and specification of learning objectives.

2. Design phase.
   The purpose of this stage is to create a validation sheet and design the test that will be tested.

3. Development phase (develop)
   The purpose of the development is to produce a draft standard test instrument. Activities at this stage are: assessment of experts (expert) and readability test, if it is valid then it is continued at the trial stage in large groups to test its validity and reliability.

4. Dissemination Phase (disseminate)
   This stage is the final stage in the development of test instruments by carrying out limited implementation of mathematics student.

Figure 1. Research Stage
4 Result And Discussions

As we can see in the methodology above, the step in which we construct the test from preliminary analyzing to the step where we get the expert validation, is included in first and the second step namely ‘Define’ and ‘Design’ step. The outcomes for this steps is a draft of test instrument with revision under the expert validator suggestion.

In this research, the instrument test construct to measure the mathematical reasoning abilities of mathematical student in State University of Medan. The test are prepared in accordance with learning outcomes that we want to achieved based on our IQF curriculum.

4.1 Indicators of Learning Achievement from Matriks Subject in Elementary of Linear Algebra

In learning on the topic of the matrix there are 10 learning outcomes to be achieved. The following is a table of student learning outcomes and an indicator of mathematical reasoning abilities on the topic of the matrix.

<table>
<thead>
<tr>
<th>No.</th>
<th>Learning Outcomes</th>
<th>Some Kind of Indicator of mathematical reasoning ability</th>
</tr>
</thead>
</table>
| 1   | Understanding that elementary line operations (OBE) do not change the set of completion of a system of linear equations. | 1. Able to provide explanations using the properties of matrix operations and elementary line operations.  
2. Analyze the relationship between SPL and OBE  
3. Directly prove the nature of the OBE. |
| 2   | Able to complete a system of linear equations                                     | 1. Able to predict answers that might use the properties of a linear equation system  
2. Give a logical answer  
3. Give direct answers correctly |
| 3   | Understanding why the properties of matrix operations apply.                      | 1. Provide the right reasons according to the definition and nature of the matrix  
2. Have the right mindset in answering  
3. Complete the system of linear equations using matrix operations |
| 4   | Give an invers of a matrix definition                                             | 1. Using the basic properties of the matrix  
2. Find another way that is better than the old procedure in finding the inverse of a matrix  
3. Show the best step to fine the inverse of a matrix |
5. Recognize that OBE is equivalent to elementary matrix multiplication

6. Able to calculate the inverse with OBE

7. Understand the relationship between the inverse, SPL solutions and coefficients

8. Understand the link between OBE and changes in determinant values

9. Understand the characteristics of matrix determinant

10. Understand the relationship of matrix determinants to the existence of a solution of a linear equation system

From the learning achievement pair and the reasoning ability indicator, a test is prepared so as to produce a valid standard test. The scoring system or score of the test results is also based on the reasoning indicators that are addressed in each test.

Table 2: Example of the answer of tests based on indicators of creative reasoning ability

<table>
<thead>
<tr>
<th>Questions and answers</th>
<th>Creative reasoning abilities</th>
</tr>
</thead>
</table>
| 1. Show that the following matrix has no inverse | 1. Novelty  
2. Flexibility  
3. Possible |
The matrix has two columns with the same element. By the definition of Matrix which have an inverse says that a square matrix $A_{nxn}$ has an inverse if there is a matrix $B$ so that $AB=BA=I_{n}$. It can be seen that the inverse matrix must be the same as the identity matrix. Therefore, if above matrix has two same column, it can be ascertained that multiplication of the two matrix is impossible will get the identity matrix. Thats why $A$ has no inverse.

2. Given a system of linear equations as follows

$$
\begin{align*}
-3x &= 0 \\
(1 - b)y + z &= 0 \\
y + (1 - b)z &= 0
\end{align*}
$$

Determine the value of $b$ so that the homogeneous linear equation above has infinitely many solution

The answer could be as follows

$$\begin{bmatrix}
-3 & 0 & 0 \\
0 & 1 - b & 1 \\
0 & 1 & 1 - b
\end{bmatrix}
\begin{bmatrix}
x \\
y \\
z
\end{bmatrix} = \begin{bmatrix}0 \\
0 \\
0\end{bmatrix}$$

Observe that if the matrix has infinitely many solution. That implies the matrix not invertible

$$\det = (-b)\left((-1)^{1+2}\right)\begin{vmatrix}1 - b & 1 \\
1 & 1 - b\end{vmatrix}$$

$$= (-b)((1-b)^2-1)$$

$$= (-b)(b-2)=0$$

The solution is $b=0$ or $b=2$

From the table above we can see that the test constucted by creative reasoning abilities.
Validated student response questionnaires on tests with aspects based on format, language and content with a total average of 4.25 in good categories. Readability test was conducted twice with the results of questionnaires averaging 60% and 53.3%. It was seen that the response of student questionnaires was more than 50% (positive). Now the test has been improved from Draft A to Draft C. All tests have been completed with necessary revision.

5 CONCLUSIONS

By analyzing students, analyzing concepts, analyzing assignments, thirty test are arranged with 2 item each indicator as instrument draft A. This grid was validated by expert validators, with minor revisions. By continuing the step with focus on learning outcomes and indicators of students' mathematical reasoning abilities, the valid instrument will become draft B. From the results this test has been stated in a good category with an average of 4.25 and have received a positive response from more than 50% of student in the legibility test. Thus the valid test is ready to be used as a final tool that produces a test instrument that can improve the mathematical reasoning abilities of State University Of Medan mathematics students. Further more, this research still can be continued by developing test instrument not only by the mathematical reasoning abilities, but also includes the others abilities.
References

Learning Media Based on Techno Pedagogical Content Knowledge

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Abstract. The learning process without media will make students' learning outcomes tend to be low, because learning is monotonous and boring. It will be different, if learning is supported by technology-based learning media. Students will be passionate about learning and motivated to learn. Therefore, the development of TPACK-based learning media for this reading course will greatly assist lecturers in delivering learning material, in addition to motivating students to learn. This research & development research aims to find out how the development process of learning media in French Reading Courses is equivalent to A2 based on techno pedagogy content knowledge (TPACK) and how the quality of learning media developed is based on the results of content and construct validation tests. The development of learning media for reading courses needed to be conducted, given that current learning must be in contact with digitalization or Web-based. This research was conducted at the French Department of Language and Arts Unimed. Plomp's development model (1997: 6-15) was conducted as a methodology consisting of four stages, namely (1) the investigation phase, (2) the design phase, (3) the phase of realization or construction, (4) the test, evaluation and revision phases. Information gathering was associated with the importance of developing learning media for reading French as equivalent to A2. The stage also simultaneously carries out mapping of learning and material objectives, while data collection is the collection of materials or materials that are included in the learning media that are developed using the Edmodo application, namely the network used by teachers for various content, distributing quizzes, assignments, and managing communication with learners. At the planning stage it was mapped or compiled material that was appropriate to the learning objectives, as well as the preparation of the right design. At the development stage, the material preparation activities were carried out into the planned design. After reading learning media was developed, expert validation was carried out, namely by native speakers and design experts and instructional media experts. Based on expert opinion, revision or improvement of understanding reading text in French text based on TPACK was made. This paper presented that the results of data collection, namely the mapping of learning objectives, indicators, materials and technology that were used as a forum that was suitable for the learning objectives and students character.

Keywords: Teaching media, reading, TPACK

1 Introduction

Learning Media in learning French is needed to support the achievement of students' competence in mastering four language skills. French as one of the foreign languages taught at Medan State University requires having French language competence at level B1 after
graduation. Therefore, it is very important to provide good facilities, one of which is learning media. Based on the results of the interview the author explores the needs of the French Language Education Study Program. The media used during learning does not yet exist, specifically for reading skills. The learning process still tends to lecture using Power Point media or watching videos, and listening to audio. Interviews conducted to students also produce conclusions, that the learning process is still monotonous because it only deals with text, then other questions and exercises related to the text.

In order to expand exploration, the author sees the results of student scores on reading skills. The competence of the second semester students was apparently still low on average, especially on reading skills. If asked to answer questions about the text, the answer that can be given is if the answer is in the text. If the question is outside the text, but related to the text the student will difficult to answer. Students' insights about the themes given are still lacking. The following are student learning outcomes on reading skills.

<table>
<thead>
<tr>
<th>Students</th>
<th>UTS Score</th>
<th>Number of Students (%)</th>
<th>UAS Score</th>
<th>Number of Students (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd Semester</td>
<td>80 – 100</td>
<td>20</td>
<td>80 – 100</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>70 – 79</td>
<td>40</td>
<td>70 – 79</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>60 – 69</td>
<td>30</td>
<td>60 – 69</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>... – 59</td>
<td>10</td>
<td>10 – 59</td>
<td>10</td>
</tr>
</tbody>
</table>

Based on the data and the results of exploration need above, nowadays the author developed technology-based learning media. In addition, the KKNI curriculum is now being used at the State University of Medan, requiring the use of technology in accordance with the concepts and principles of learning. Techno-Pedagogical Content Knowledge abbreviated TPACK) is a demand for every learning. Therefore, through the development of reading learning media, it is expected that competence in reading skills can improve.

The author teaches reading courses for level A2. This course teaches students to be able to understand French text equivalent to A2 and be able to discuss the text according to the theme. Thus, the authors develop learning media in reading courses. Learning media has an important role in every learning. Usman (2001) stated that learning media provides many benefits for students, namely to put concrete foundations into thinking, increase attention, make learning more permanent or not easily forgotten, provide real experiences so as to foster independent learning, regular and continuous thinking, and help growing understanding and fostering language skills.

Especially for reading skills, learning media is very rarely found that can be a supplement to these skills. French learning media for other skills, such as speaking skills, listening skills, grammar, spelling, writing sentences, very much. However, for reading skills, understanding text is very rare. This strengthens the author to develop a "reading" learning media based on Techno-Pedagogical Content Knowledge.
It is not easy to enter long texts into an application so that they can be used as media. Therefore, the authors develop variations in the material on learning media. That is, in order to understand the text, students are assisted by presenting pictures, videos, or short sentences, to direct students' understanding. While the text will be presented per paragraph or by using hyperlink.

2 Literature Review

Learning media development is the process of describing learning objectives and learning material in a concise way by creatively becoming a single entity in one container. The container contains learning materials that are learning resources that are very useful for learners. Learning media is part of teaching material, which is useful as a support for learning material. Tomlinson (1998: 9) states that the development of teaching materials is everything that is used in learning, in the form of textbooks, text books, exercise books, cassettes, CD Roms, videos, handouts, etc., which of course contain information about the content of learning. In connection with the development of teaching materials, Tomlinson also argued that the development of teaching materials is everything that is done by authors, teachers and even students to provide input sources for learning that contain information about the content of learning. Based on Tomlison's explanation, it can be concluded that the development of learning media as part of the development of teaching materials.

Lire, c’est traiter un ensemble d’informations écrites (http://www.cndp.fr/crdpdijon/librairie/bonnes_feuilles/210b5370-que-est-ce-que-lire.pdf)

Savoir lire, c’est être capable d’oraliser avec précision, fluï-dité, en respectant la segmentation et en mettant l’emphase sur certains éléments (prosodie), en retenant des informations littérales et en faisant des inférences découlant des informations littérales. Lire, c’est réagir au texte ; lire, c’est raisonner.

The reading termis referred to as a process of combining information from a text and background of students' knowledge in order to build meaning. In building this meaning, students need reading skills that is a skill possessed by students in themselves so that they are able to apply it in an action as an implementation of the language's knowledge and cognitive abilities. According to Tagliante (1994: 35), l’apprentissage est un processus actif, ... "qui se déroule à l’intérieur de l’individu et qui est susceptible d’être avant tout influencé par cet individu. It means that learning is an active process, which takes place from within the individual and is likely to be influenced by the individual himself. Reading skills are one of the language skills needed to understand a text. Desmons (2005: 49) stated that understanding a foreign language text not only requires the reader to have linguistic competence but also cultural competence. Reading is often said to be passive language skills. Nunan (1999: 199) said that in the acquisition of second language, many people think that reading and listening are the second skill after speaking and writing.
3 Research Methods

This research is a qualitative descriptive study. In order to collect the desired data, the technique used is documentation technique that is the collection of documents related to important data for the development of reading teaching materials. Document analysis is useful to complement and clarify the results of information, namely by observing, recording and collecting what is implied and written in each document or archive that is the source of the data. Documents can take the form of writing, such as diaries, life histories, stories, biographies, regulations and policies. Documentation in the form of images, such as photos, live images, sketches and others. Documents in the form of monumental works from someone such as artwork, which can be in the form of pictures, sculptures, films, etc.

In the data presentation section, data distribution techniques are used in TPaCK. In accordance with the TpaCK image as follows.

![Figure 1. TpaCK Cycle in the Teaching Materials Development](image)

According to the picture, the data collected will be sorted into the content of the technology used, draw pedagogical lines and knowledge about pedagogical content and content of technology and information from the text. Data collected according to documentation analysis is then mapped in a table.

4 Discussions

In accordance with the purpose of the research, namely the development of TPACK learning media, what will be produced is a media. However, as the basic material of the media is data related to reading skills that will be supported by the media. The discussion of this paper contains the results of data collection and then mapped in the table. The preliminary data presented are related to KD-GPA and Material as follows.
Table 2. Mapping of KD, GPA, Material A2

<table>
<thead>
<tr>
<th>Basic Competencies</th>
<th>Indicator</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding the dialogue texts related to introducing others</td>
<td>2. Teks Dialog Introducing others Text Dialogue</td>
<td></td>
</tr>
<tr>
<td>Answering questions related to self-introduction dialogue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Able to introduce yourself with A2 level level language</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Able to introduce others to A2 level languages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retelling the identity of others verbally with A2 level language</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rewrite the other people's identities in text form with A2 level language</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rewrite the other people's identities in biographical form with A2 level language</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biography in Tablearis</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The materials in the table above are the first presentation on the initial learning in chapter one. The data needed from the table for the Techno element are Indicators and Materials, for Pedagogical elements are Indicators and Test Items to be developed, while Knowledge is the students' knowledge of the relationship between KD-GPA-Material and Test Items as well as the knowledge conveyed through the text.

The following is an explanation between the Indicator with the Material or Test Items and Techno. These elements will be described in a table, but in the development of materials, the table is the basis for developing the technology.

Table 3. Linkages between GPA-Pedagogic-Technology

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Pedagogical Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding the dialogue text related to self-introduction</td>
<td>Self Introduction</td>
</tr>
<tr>
<td>Understanding the dialogue texts related to introducing</td>
<td>Windows Movie Maker</td>
</tr>
<tr>
<td></td>
<td>Others</td>
</tr>
</tbody>
</table>
5 Conclusion

This paper was as the result of the initial data collection which still contained the content features of the teaching materials to be developed. In one chapter there was one Basic Competency, nine Indicators of Achievement of Competence, seven types of pedagogical that would be loaded and the number of technologies to be used. The tables displayed are features of the TPACK content that would be developed in developing TpaCK based teaching materials.
References


Development of Interactive Multimedia-Based Teaching Materials for Learning Technique Mechanical

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Abstract. The Research aims to find learning tools in the form of multimedia-based teaching materials for learning Engineering Mechanics courses in accordance with the profile of graduates of building engineering education. The results of this study are expected to produce (1) competency-based learning materials that can equip students in following Mechanical mechanics lectures in accordance with employment needs, (2) teaching materials in the form of Technical Mechanics learning modules, (4) guidebooks and student assignments, and (5) development of learning programs (software) in the form of Compact Disks that can be used as learning media to learn and teach Engineering Mechanics course materials. This research is planned to be carried out in the 2018 fiscal year. The population of this study includes all students of building engineering education at the Faculty of Engineering Unimed. Target populations include students, lecturers and the business world. The sampling technique used purposive random sampling. This research uses research and development (R & D) methods which begins with a survey, teaching material design, teaching material validation, and test the effectiveness of teaching materials. To determine the effect of instructional materials in learning developed on technical mechanics competencies used a quasi-experimental research approach with the design of the control group post test only. The research instruments used included questionnaires, document recording and tests. Data were analyzed using descriptive analysis techniques, T-Test and ANAVA.

Keywords: Development, interactive multimedia-based, teaching materials, learning technique mechanical.

1 Introduction

Global interaction causes the integration of values between communities, which shows the high need for quality human resources. The emerging trend is the growing use of industrial technology and information technology. Another challenge that arises in the wave of globalization is the universal of the value of competition. So the most important need is the availability of human resources capable of managing the progress of the technology.

The increase in the capacity of Vocational Schools (SMK) is accompanied by an increase in the quality and improvement of facilities / infrastructure. This means that in 2015 the number of vocational schools will be more than public schools which show that the development of resources that are more oriented to the world of work is a top priority. Meanwhile, it must be admitted that so far the implementation of vocational education has not...
paid attention to the learning system that is relevant to the knowledge and needs of the workforce that includes a complete cognitive, affective, and psychomotor competence. Reorientation of vocational education needs to be done by improving learning, learning models and tools that support it to produce learning innovations.

Thus, it is necessary to conduct research and development of learning models in the Engineering Mechanics course, namely a learning package with learning and programming strategies for teaching materials and packaged in modules that are integrated with learning that is suitable for effective and efficient lectures.

2 Literature Survey

2.1 Vocational Building Engineering Education Profile

Vocational education as part of education is indeed designed to prepare someone to enter the workforce (Calhoun and Finch, 1982). Explained that vocational education is part of an education system that prepares a person to be competent and skilled at working in one field of work rather than another (Evans, 1971).

Psychomotor competence and skills greatly influence student learning processes, including the learning concepts used (Stomes, 1983). This means that the concept of learning must consider the characteristics of these psychomotor skills. Therefore, an understanding of the psychomotor domain will be very helpful in the design of the learning model.

In relation to how vocational schools bring their programs closer to the world of work, vocational schools are categorized into five categories, namely (1) work briefing programs, namely vocational schools provide basic and general knowledge about various types of jobs in the community, (2) work preparation programs, namely vocational schools provide the basics of general work attitudes and skills, with both programs students have a greater chance of getting a job; (3) general work field preparation programs, namely vocational schools provide provisions to improve work skills for work fields that require knowledge of similar equipment; (4) specific work field preparation programs, namely vocational schools providing provisions that have led to certain types of work even though not yet in a particular company, and (5) special vocational education programs, namely educating students to meet the requirements requested by a particular company. Vocational education is to improve the ability of students, so they can get a better life than before (Finch and Crunkilton, 1979).

2.2 Multimedia Based Learning

The use of technology in learning is needed in the implementation of the education process. Technology that specifically provides alternative choices in the service of a form of learning. One form of learning in question is learning by utilizing the CAI (Computer Assisted Instruction) system and managing CMI (Computer Management Instruction) learning. Computer systems can present a learning process directly to certain individuals by interacting with the subject matter programmed into the system with a variety of possible uses that include learning models so that computers can provide the most effective facilities and the results to be achieved can be maximally obtained.
Training using computers is one part of technology-based training or often called Technology Based Learning (Reynolds in Kelly, 1995). This TBL (Technology Based Learning) is based on learning, management and support from computer devices.

### 2.3 Development of Learning Models

The model is a picture that arises from reality that has a sequence of specific sequences (Richey, 1986). According to him, the model can be used to organize knowledge from various sources and then use it as a stimulus to develop hypotheses and build theory into concrete terms/conditions to apply it to practice or test theory. The practical function of the model, namely: a means to facilitate communication, or regular instructions (algorithms) that are prescriptive for decision making, or planning instructions for management activities (Gustafson, 1984). Model is a model that can help the user to understand what the overall process is fundamentally (Nadler, 1988).

The connection with learning learning model serves to direct us to design learning that is used as a guide in the implementation of learning in order to achieve effective, efficient, attractive, and humanistic. Learning model as a plan or a pattern that is used as a guide in planning learning in a classroom or learning in a tutorial and to determine learning tools and direct us in designing learning to help students so that learning objectives are achieved (Joice, 1992).

### 2.4 Roadmap

Improving the quality of education organized by State University of Medan Research Institute of Research and Technology directed at expanding learning innovations to realize a more efficient, effective and enjoyable education process in accordance with the level of age, maturity and development of students. In the context of the realization of competitiveness, State University of Medan also encourages the development of learning innovations which are one of the strategic activities in improving quality and relevance whose concepts are aligned with the needs of students, especially the needs of the labor market.

![Figure 1: Research Roadmap](image)

Several results of research conducted over the past two decades have provided evidence of the impact of technology on student performance and learning environment. Cotton (1991), for example, has conducted a study of 59 research results regarding computer-aided learning and learning outcomes. Studies that focus on this technology are better than studies that discuss the impact of technology on the overall learning environment and student learning outcomes. The findings of this study also show that researchers who try to find answers directly to student...
learning problems, the results have not been satisfactory. However, teachers who understand the complexity of learning and teaching, the results of the study showed encouraging things and showed that new technology proved effective. In addition, technology has shown the impact of very positive results based on research studies. Innovative learning techniques (for example, question techniques included in the text, advance organizers, and the media) specifically show the progress of the average learning outcomes of students by 15.20 points or more. This means that the average student score reaches the 50th percentile in conventional learning, and the 65th percentile in the group is taught with technology (Heinich, Molenda, Russel, & Smaldino, 2002).

3 Research Method

3.1 Development Research Approach

This research approach uses the Borg & Gall (1983) development model combined with Dick & Carey's learning design model (2009). In accordance with the Research and Development approach model, the implementation of this research follows the steps, as follows: preliminary survey, textbook model design, textbook model testing, textbook validation and dissemination. This research was conducted in the Department of Building Engineering Education Faculty of Engineering State University of Medan in 2018.

3.2 Place and Time of Research

The implementation of this research will be carried out in the Odd Semester of 2018-2019 Academic Year. The research was carried out to collect data about Engineering Mechanics lectures, current learning conditions, validation and the implementation of the initial model trials in the classroom.

3.3 Population and Sample

The population of this study was all students and lecturers who were active in the prongs of lecture TA 2018/2019. As for the sample of this study, students planned to take Technique Mechanics 1.

3.4 Data Collection Techniques and Data Analysis Techniques

The implementation of research data collection is the preparation and development of research instruments used in data collection including questionnaires, interviews, and recording and documents. The data analysis technique used was descriptive and statistical analysis of research data conducted through group trials.
4 Conclusion

1. Behavior and type of competence in the Mechanica Technique I course which can provide students with the skills acquired based on the survey of employment needs of the business world is still very lacking and needs additional teaching materials.

2. Mechanica Technique I learning tools through programming instructional materials and the use of multimedia in learning Mechanical Engineering courses are very effective to do.

3. The initial design results of interactive multimedia-based learning models as shown above with six (6) stages of learning activities. Stages of learning activities: Introduction, Direction, Connection, Organization, Demonstration, and Evaluation.

4. Interactive multimedia-based learning models are suitable to be used to improve the development of Mechanica Technique I.

References


Needs Analysis of Blended Learning Media to Improve Students Mathematical Creative Thinking Skills of Mathematics Student by using the Mentimeter Application

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Abstract. This research is the first step (preliminary study) in the research of the development of learning media to improve students' creative mathematical thinking skills by using mentimeter applications. In general, the purpose of this research is to describe the needs of learning media based on Blended learning using a mentimeter application. In detail, the purpose of this research is to describe (1) the characteristics of the mathematics education curriculum (2) the early ability of students, is students' creative thinking abilities and (3) the use of Mentimeter applications in learning. This research was carried out at the State University of Medan with research subjects were 23 students and four lecturers from the mathematics department. The research method used is descriptive qualitative with the research instrument are a form of observation, the interview, and the student's creative thinking ability test. From the results of data analysis, it can conclude that it is necessary to develop learning media based on Blended learning to improve students' creative thinking ability by using mentimeter applications.

Keywords: Mentimeter Application, Mathematical Creative thinking Skills.

1 Introduction

We understand together that technology has progressed continuously, from the Baby Boomers generation to the generation which known as an alpha generation. The first goal of it developing this technology is to help human work become more effective and efficient, it can see with a handphone can do various things such as buying and selling transactions, sharing news or information can be only in seconds.

Seeing the reality of technology development, as experts and education technicians should be begun to change the educational projection. As said by the Governor of DKI Jakarta who is also a former Minister of Education, Mr. Anis Baswedan at the 2017 EXPO Education event at TMII, among his statements is that 21st Century Education Projections consist of 3 components, one of which is related to technology literacy. (Maryland State Department of Education, 2005) Technology literacy is the ability to use, understand, organize and assess an innovation that involves processes and knowledge to solve problems and expand one's abilities. In education, technology literacy is the ability that consists of aspects of science, critical thinking skills, and decision making to effectively utilize technology/innovation of human works, especially in the world of education.
One educator is a lecturer, who has responsibility for the quality of output from a college. Based on law no.14 of 2005, lecturers are professional educators and scientists with the main task of transforming, developing, and disseminating science, technology, and art through education, research and community service. This task is called the Tri Dharma college. But in the implementation it, the lecturer has problems. One of the problems is the limited time in the implementation of these three tasks. The researcher who is a lecturer in mathematics at the Medan State University found that there is often a similarity in the schedule of lecturers in the field of teaching with a schedule of researching or serving. There is the ineffectiveness of the lecturers' performance or task of the lecture, not accord rules and regulations.

This performance that not maximum certainly affects students, especially in the field of learning. Finally, made to the low level of student participation. One of the expected achievements is the high ability of students to think, especially for mathematics students, the ability to think creatively is processability that must be stimulated by a lecturer so that students are accustomed to creative thinking.

There are many ways that education experts have begun to develop to minimize these problems, one of which is by use technology such as Blended learning. Blended learning is a learning model that combines learning in class with online learning. So that theoretically a lecturer can teach online when the schedule is same with research or service. Blended learning can do by utilizing several applications such as web applications, Memntimeters and Whatsapp.

But the solution has not been implemented optimally, what are the obstacles? Is it true that learning with the blended model is needed specifically at Medan State University? Based on this, researchers are interested in analyzing the need for developing media to improve students' creative mathematical abilities using the Mentimeter application.

2 Review Of Literature

In analyzing the needs of media learning based on blended learning with the aim of improving students' creative thinking ability by using the Mentimeter application. The researcher will define some related things, namely Blended Learning, Mentimeter Application, Creative Thinking Ability.

2.1 Learning Media

Learning media is an important matter for improving the quality of education. Learning media according to some expert, (Rudi and Cepi, 2008) explains that learning media are "messenger technologies that can use for learning purposes." suggests that learning media are "physical means to share learning content/materials such as books, films, videos, slides, etc.".

Learning media is a tool in the learning process inside and outside the classroom, further explained that learning media is a component of learning resources or physical vehicles that contain instructional material at the student environment that can stimulate students to learn. (Azhar, 2011)

Learning media everything that can be used to channel messages from the sender to the recipient of the message. (Arief Sadiman, 2008). According to the exposure of some of these experts, the learning media in this study is a tool to share learning material from educators to students in the learning process, so that learning can do effectively and efficiently.
2.2 Blended Learning

Etymologically, Blended Learning consists of two words, Blended and Learning. "blend" means a mixture, or a combination of formula. "learning" is learning, so that Blended Learning means learning which has to combine one model with another model. According to saying (Graham, 2004): "The idea that Blended Learning is the combination of instruction from two historically separate models of teaching and learning: traditional face to face learning systems and distributed learning systems. It also emphasizes the central role of computer-based technologies in Blended Learning".

"Blended learning is defined as a mix of traditional face-to-face instruction and e-learning" (Koohang, 2009).

Then According to Mosa (Rusman, 2011) said that mixed learning has two main elements, first is learning in class and second is online learning. In the online learning use the internet network which there is web-based learning. Blended Learning is a combination of multimedia technology, CD-ROM, video streaming, virtual classes, e-mail, voicemail, and others with traditional classroom learning. Its conclude is merging or mixing two learning approaches that are used so that new learning is created and will not cause students bore.

In this research blended learning is a combination of two learning, is learning in the classroom with learning outside the classroom by utilizing the mentimeter application.

2.3 Creative Thinking Ability

Creative thinking is the ability to form new combinations, based on data or information, or elements that already know before, all the experience and knowledge that a person has got during life both in school, family, and community. (Munandar, 2012). Indicators of creative thinking abilities (Munandar, 2009), there are 4, (1) Fluency thinking if they can provide more than one relevant idea, and the solution is correct and clear, (2) Students have the ability to think flexibly, if it can provide answers more than one way (diverse), the calculation process and results are correct, (3) Students have the ability to think original (Originality), if they can give answers in their way, the calculation process and results are correct, and (4) Students have the ability to think in detail (Elaboration) if they can provide correct and detailed answers.

Assessment of the to creative mathematics think ability (creative mathematical thinking) according to Silver (Siswono, 2007) using The Torrance Tests of Creative Thinking (TTCT). Three key components assessed in using TTCT are fluency, flexibility, and novelty. Fluency refers to the number of ideas created in response to a command. Flexibility is seen in changes in approach when responding to commands. Novelty is the authenticity of ideas created in response to commands.

2.4 Mentimeter Application

Mentimeter is an application that is easy to download. By connecting devices both mobile and laptop to the network, its application can download. Mentimeter is used for percentages in seminars, workshops, or events with presenters and audiences. Different from powerpoint, this application is more fun, interactive, and productive. There are tools so that the audience can respond directly to the presenter. Like there are questions submitted by the presenter, the audience only gives answers to questions via cell phone or tablet. Answer results are displayed in real-time directly on the slide.
Using Mentimeter application in the class have to function are (Cikgusiber.com,2018)

1. Stimulate Thinking
   The use of Mentimeter can stimulate and attract students' attention to the material they want to learn. This application can be developed creatively to make learning interactive and meaningful.

2. To express opinions or views
   Orally giving opinions and views is the best way to improve oral communication skills. But this is difficult for shy students to share their ideas. with 'anonymous' at Mentimeter, students can share many their idea so that can develop quality data. They can quantify an idea.

3. Tools for Reflection
   With the Mentimeter, the teacher can measure and assess the overall learning that has been done. At the end of the meeting, students can give comments about their understanding, impressions in today's learning or give questions if something is not understood.

4. Tools for Research
   Students can use Mentimeter as a tool to collect design research as an outside learning activity in the classroom. Each experimental data is collected and then presented to the class.

3 Methodology

The method used in this research is qualitative descriptive. Qualitative descriptive research is research to understand the phenomenon of what is experienced by the research subject of such as behavior, perception, motivation, action, etc. holistically and with the description with words and language, in a special natural context and by utilizing various methods scientific.

This research was conducted in the department of mathematics, Medan state university. With the subject of his research were four mathematics education lecturers and 23 mathematics education students. Data collection techniques used are tests and non-tests, the tests given are tests of creative thinking skills while non-tests are in the form of questionnaires for learning needs using media based on blended learning, interviews, and observations.

The observation phase, the researcher analyzed the curriculum used in education units and student characteristics. Then at the interview stage and questionnaire, the need for learning media based on Blended learning was given for lecturers and students. The test is only given to students.

Questionnaires data analyzed using the following formula:

\[
\text{Percentage} = \frac{A}{B} \times 100\%
\]

Information:
A : The proportion that chooses
B : Amount (respondent)

The data of creative thinking ability was analyzed by classifying these abilities into the level of mathematical creative thinking ability (Very Creative, creative, quite creative, and not creative).
Table 1. The rubric of creative thinking ability.

<table>
<thead>
<tr>
<th>Level</th>
<th>Fluency</th>
<th>Flexibility</th>
<th>Novelty</th>
</tr>
</thead>
<tbody>
<tr>
<td>TKBK 4</td>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
</tr>
<tr>
<td>TKBK 3</td>
<td>☑️</td>
<td>☑️</td>
<td>-</td>
</tr>
<tr>
<td>TKBK 2</td>
<td>-</td>
<td>☑️</td>
<td>☑️</td>
</tr>
<tr>
<td>TKBK 0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

TKBK is the level of creative thinking ability

4 Result And Discussion

The results of this data analysis are divided into 2 data, questionnaire and students' creative thinking ability data.

4.1 Result of Questionnaire

The results of the needs questionnaire analysis of the learning media based on Blended learning-based from lecturers

Table 2. The need for learning media based on Blended learning.

<table>
<thead>
<tr>
<th>NO</th>
<th>Indicator</th>
<th>Percentage</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Availability of facilities for learning media based on Blended learning</td>
<td>85 %</td>
<td>Adequate</td>
</tr>
<tr>
<td>2</td>
<td>Availability of learning media based on Blended learning</td>
<td>34 %</td>
<td>inadequate</td>
</tr>
<tr>
<td>3</td>
<td>Response to the availability of learning media based on Blended learning</td>
<td>97 %</td>
<td>Agree</td>
</tr>
</tbody>
</table>

According to table 2., 85% of lecturers said the availability of facilities for learning media based on Blended learning was sufficient like there is wifi network provided by the university to every study program building. But learning media based on Blended learning inadequately with a percentage of only 34%, and the lecturers' strongly respond to the development of Blended learning based learning media agrees.
Table 3. The need for learning media based on Blended learning

<table>
<thead>
<tr>
<th>NO</th>
<th>Indicator</th>
<th>Percentage</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Availability of facilities for learning media based on Blended learning</td>
<td>87 %</td>
<td>Adequate</td>
</tr>
<tr>
<td>2</td>
<td>Availability of learning media based on Blended learning</td>
<td>30 %</td>
<td>inadequate</td>
</tr>
<tr>
<td>3</td>
<td>Response to the availability of learning media based on Blended learning</td>
<td>90 %</td>
<td>Agree</td>
</tr>
</tbody>
</table>

The following is the results of the questionnaire analysis of learning media needs based on Blended learning from students.

4.2 Result of Test

Following is the result of data analysis of students' creative thinking skills:

Table 2. The result of test creative thinking skills

<table>
<thead>
<tr>
<th>No</th>
<th>Creative level</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very Creative</td>
<td>2</td>
<td>9 %</td>
</tr>
<tr>
<td>2</td>
<td>Creative</td>
<td>3</td>
<td>13 %</td>
</tr>
<tr>
<td>3</td>
<td>quite Creative</td>
<td>5</td>
<td>22%</td>
</tr>
<tr>
<td>4</td>
<td>Not Creative</td>
<td>13</td>
<td>56 %</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>23</td>
<td>100 %</td>
</tr>
</tbody>
</table>

Based on table 4 it can be said that students have low creative thinking skills, with 56% of students not creative and 5% quite creative.

4.3 Discussion

Before the development of learning media on based Blended Learning by using the mentimeter application, first, the researcher analyzed the curriculum. The current curriculum that is used in the odd semester of 2018/2017 school year is the IQF curriculum. This curriculum has been implemented at Medan State University in the 2016/2017 school year. The IQF is a minimum reference framework which is a benchmark for recognition and education levels. This curriculum can integrate between the field of education and the field of training and work experience in the framework of providing recognition of work according to the work structure in every sector.

The implementation of this IQF was changing in the profile of graduates and learning outcomes. Such that it automatically demands changes in the learning model conducted by the lecturer in achieving that specified level. In its qualifications, undergraduate is an education level that is at level 6, with the abilities must have at this level are:
1. Able to apply their fields of expertise and utilize science, technology, and art in their fields in solving problems and be able to adapt to the situation at hand.

2. Mastering the theoretical concepts of certain fields of knowledge in general and the theoretical concepts of specific parts in the field of knowledge in depth, and able to formulate procedural problem-solving.

3. Able to make the right decisions based on the analysis of information and data, and able to provide instructions in selecting various alternative solutions independently and in groups.

4. Responsible for own work and can be given responsibility for the achievement of organizational work.

One of the achievements expected at this level is being able to apply their expertise and utilize technology. How can it be realized if during the learning process at university students are not accustomed to utilizing technology? Therefore, based on an analysis of this curriculum, the developer of learning media based on Blended Learning using the mentimeter application is a learning effort by utilizing technological. The habit of learning by using technology gives birth to students who are technologically literate.

The analysis was also carried out on the character of students, student's age average at 17-22 years belong to the age of “Y” generation or called Y generation. This generation was born when TV was colored; there were communication tools such as cell phones, Already was familiar with the internet, so that this generation was known as a generation of proficient in technology. This student's characters become big capital to change the style or model of lecturers learning, change to the learning which that can improve creative think them with utilizing technology. Based on it the development of learning media based on Blended learning by using a multimeter application is needed according to the character of the students.

Coupled with the results of the analysis, students' creative thinking skills, that have been described earlier in table 4, from 23 students only 5 students who are said to be creative, consisting of 2 students have very creative abilities, 3 in the category creative, the rest are categorized as not creative, 5 students are quite creative, and 13 students are said t no creative thinking ability.

![Diagram of mathematical creative thinking ability test result](image)

**Fig. 1.** Diagram of mathematical creative thinking ability test result

Surely this is a problem, why? Mathematical creative thinking ability is one of high order thinking skills, According to Presseisen (Devi, 2011) states that "HOTS (High Order Thinking Skills) are divided into four groups, namely problem solving, decision making, critical thinking, and creative thinking. This creative thinking skill is important for students because of its skill; the student can solve various problems. Assayed by (Sumarmo, 2013) Higher order thinking skills mean a capacity beyond the information provided, actions to critically evaluate, combine cognitive awareness, and can solve problems.
Therefore must there is a solution to improve creative thinking skills, namely with habituate students to think creatively, developing learning models or developing learning media that can stimulate students always to think creatively.

Both in the curriculum, the character of students and the value of creative abilities of students who need the development of Blended learning based learning media by using the Mentimeter Application.

This conclusion is strengthened by data analysis of questionnaire for needs learning media based on Blended learning. Based on the results of questionnaire data given to lecturers and students which have been described in table 1, and table 2. gives the same opinion from students and from lecturers about needs of media learning based on blended learning using mentimeter application.

Lecturers and students recognize that the facilities that support learning with blended learning are adequate at the State University of Medan, such as computer labs that meet standardization, internet networks that can access from all study programs. Everyone can easily access whatever information they need in learning.

But based on the questionnaire, the availability of learning media based Blended learning is not optimal. The average lecturer still uses media such as focus and utilizes the power point program during college. So the lecturer must be present in class at each lecture meeting when the lecturer collides with another task schedule such as researching or serving. Finally, no one studied in the lecture, and this is a problem. Supposedly with existing facilities, this problem can be minimized by changing the learning model. By utilizing the mentimeter application, students can still study although not at the same time and space with their lecturers.

Seeing the responses given by lecturers and students, they very agree with the availability of learning media based on Blended learning, in this study the application which is tated as blended learning media is the mentimeter application. The following picture is one of lecture material in set and logic, figure 3 is the view of mentimeter application at the laptop, while figure 4 is the view of mentimeter application at handphone.

To get a deeper analysis, researchers interviewed some lecturers and students, results of the interviews equivalent with the results of the questionnaire needs, both lecturers and students gave a positive response with the existence of media learning based on blended learning by using mentimeter applications.

5 Conclusions

According to analysis, blended learning based learning media to improve creative thinking skills by using Mentimeter application must be developed following reasons:

a. The curriculum used at UNIMED is the IQF curriculum, one of the results of the application of this curriculum is a student is technology literacy so that development this media learning is one of means to reach that goal.

b. The age characteristics of students who are in the “Y” generation, namely the generation that is in the era of technological sophistication are the basic capital that facilitates the application of blended learning by using the Mentimeter application.

c. The low student's creative skills, so that this media was developed to improve this ability.

d. The availability of facilities that support the availability of learning media and the positive response of lecturers and students to the availability of media.
References


The Development of the Instrument Reasoning Mathematics Courses Set and Logic

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Abstract. This research aims to (1) develop an instrument test, (2) describe the procedure for the development of assessment instruments, (3) demonstrate the feasibility of the evaluation instrument. This research was conducted up to a limited trial. This study uses the model Research & Development (R&D) consists of five activities, namely (a) introduction, (b) design a draft instrument, (c) instrument development assessment (d) a limited trial, and (e) the revision of the development product. Before a limited trial is conducted, the test is validated to the expert material and evaluation. This reasoning test consists of 7 questions. Validation of the items included of content validation regarding the article, construction, and language aspects and the suitability of the problems in the test with indicators obtained from expert considerations. Based on validation questionnaire data by a team of experts, it is known that the developed test instrument is declared feasible in the realm of material, construction, and language.

Keywords: Instrument, Reasoning Mathematics ability.

1 Introduction

Assessment is a series of activities conducted by teachers to assist students (Beverley & Education, 2002). Inappropriate test instruments will give incorrect results as well; proper test preparation techniques become a strong foundation for functional evaluation. According to Mardapi (2007) errors in measurement are divided into two types, namely random and systematic errors. Random errors are caused by physical and mental conditions being tested and tested, while systematic errors can be caused by measuring devices. Test making must be able to reduce the mistakes as small as possible from a measurement result produced by a measuring instrument.

According to Gronlund & Linn (1990), a suitable measuring instrument must have three main characteristics, namely the characteristics of validity, reliability, and usability. Test instruments are one of the things that must be in education. Like the word education without measuring devices such as eating without salt, Teachers must be able to evaluate the learning outcomes that have been carried out. Evaluation is done to make improvements in education, evaluation is intended for teachers and students. This is similar to what Reynolds, Cecil & Livingston (2009) stated “educational assessments also can provide important information that helps teachers adjust and enhance their teaching practices. For example, the assessment information can help the teacher determine what teach, how to teach it, and how effective their instruction has been”.

AISTSSE 2018, October 18-19, Medan, Indonesia
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DOI 10.4108/eai.18-10-2018.2287402
The effectiveness of learning programs must be measurable to be able to see students' understanding of facts, phenomena, principles, concepts, laws, theorems and applications that require the availability of valid and reliable assessments to measure the results and impact of learning carried out assessment has three main functions, namely: (1) knowing the gaps in knowledge possessed by students before learning begins; (2) knowing the learning outcomes of students as a whole; (3) Knowing the strengths and weaknesses of students. The test is a systematic instrument consisting of a set of questions to measure a particular behavior to students with specific categories (Koyan, 2011).

Higher order thinking is one of the priorities in mathematics learning. The demand for mathematics teacher professional competence is that teachers are expected to be able to understand, apply and analyze factual, conceptual, procedural and metacognitive knowledge based on their experience. According to Anderson and Krathwohl (2001), thinking ability is divided into low-level cognitive understanding and higher order thinking. Low-level think is remembering, understanding and applying, and the higher-order thinking is analysis, evaluating and creating. The reasoning is part of a higher order thinking process. The argument is a process or activity of thinking to make conclusions. The sentence above is supported by Kaur's statement (2009) "reasoning is the process of making inferences from a body of information" Similar opinion was expressed by Ball & Bass (Brodie, 2010) which states that reasoning is an essential ability that is needed to understand mathematical concepts, application in applying work ideas and procedures in mathematics, so that it can construct new knowledge.

Students must have reasoning skills. Improved reasoning ability is developed through the implementation of lectures. To develop reasoning skills, it is necessary to prepare supporting devices. Supporting lecture devices include the Lecture Program Unit (SAP), teaching materials, and reasoning instruments. Supporting tools to be developed must refer to the reasoning ability indicator. The reasoning is divided into two, namely inductive logic and deductive reasoning (Sumarmo, 2012). Inductive reasoning is the ability to conclude in general or individually based on observations with truth values that are true or false. Sumarmo (2012) also said that the knowledge of inductive reasoning belongs to higher-order thinking skills which consist of analogy, generalization, observation, and extrapolation. Still according to the statement of Sumarmo (2012) that deductive reasoning is drawing conclusions based on rules agreed upon with truth values that are right or wrong and not both together

Based on the description, the objective of this research is to produce a mathematical reasoning ability test for logic set subjects. This study hopes to contribute in set and logic courses and provide variations of tests and to know how the validity and characteristics of the reasoning ability tests are developed

2 Method

This research is development research, the development model used is a model created by Borg & Gall (1989). Borg and Gall developed ten steps in development research. Some actions taken in the study are: 1) preliminary research, 2) product planning, 3) initial product development, 4) initial stage trial, 5) product revision, 6) final product.

Development of mathematical reasoning test instruments requires qualitative and quantitative data. The design used is Exploratory Design (Creswell & Clark, 2007). Subjects were S1 mathematics education students in the first semester who took the 2018 Logic and Set
matter consisting of 35 students. Research place in one of the LPTK Mathematics Education Study Program in Medan.

Fig. 1. Scheme of Making Reasoning test
3 Result and Discussion

The resulting product is a mathematical reasoning instrument in the logic set subject namely the question indicator, test instrument, scoring rubric. From the results of the students' answers, it is expected that the improvement of the questions developed. Research data is sourced from expert validation data for feasibility information of test instruments developed, and limited trials (student assessment data on tests developed)

3.1 Preliminary Studies

Beginning with the collection of references related to mathematical reasoning tests. Based on the theoretical study described by Sumarmo (2002) indicators of reasoning are: 1) drawing logical conclusions, 2) providing explanations with models, traits and relationships, 3) estimating answers and process solutions, 4) using patterns and relationships to analyze situations or make analogies and generalizations, 5) compile and test conjectures, 6) make counterexamples, 7) follow the rules of inference and check the validity of arguments, 5) compile valid arguments, 9) compile direct, indirect and use mathematical induction. In this section also conducted the selection of the place and the subject of the trial. One of the LPTK in Medan chose the test site. Then observations were made to see the basic abilities of students' mathematical reasoning

3.2 Plan the Product

The purpose of this activity is to design an accurate reasoning instrument based on the preliminary stage. The measuring device (instrument test) developed consists of test indicators, questions, and scoring tables. Four steps must be done, namely, curriculum analysis, material analysis, student analysis as students and design questions.

3.2.1 Curriculum Analysis

The aim is to determine the problems needed in the development of mathematical reasoning tests. The curriculum analyzed was the KKNI curriculum used by the LPTK which was the place of research. Another activity is learning analysis that implements Blended Learning.

3.2.2 Analysis of Students as Students

This activity was focused on the first semester students as the subject of the trial because the set and logic were learned in semester I. Each class consisted of 35 students. Based on the results of interviews with students that students' mathematical reasoning has never been explored adequately because the first semester students are new students transitioning from high school

3.2.3 Material Analysis

The material analysis is the activity of identifying the main concepts that will be used in designing the students' mathematical reasoning tests. Based on curriculum analysis activities, it was found that the courses that will be used in research based on the KKNI curriculum are
in the odd semester. The course is a logic set course. Furthermore, some of the subjects were selected from the class. Based on the chosen material, indicators for each question are developed, namely:

- Presenting mathematical statements verbally, in writing, pictures, and graphics
- Perform mathematical manipulation.
- Prepare evidence, provide reasons or evidence for several solutions
- Make conclusions from the statement
- Check the validity of the argument

### 3.2.4 Designing Questions

After the physical analysis activity, the next step is to create a reasoning instrument consisting of test indicators, test questions, and scoring guidelines. Questions are designed based on material that has been analyzed and based on students' mathematical reasoning. The researcher developed the test instrument in the form of a description test based on mathematical reasoning indicators. Other activities are compiling test scores and scoring rubrics. Indicator questions are designed based on mathematical reasoning indicators. Scoring rubrics are developed so that other researchers or lecturers are easy to make it easier to provide an assessment of the results of the tests of mathematical reasoning abilities that students have done.

Data collection of test instruments consisting of indicators, test items, scoring. For content validity on the reasoning test developed, it is asked for opinions, suggestions, and input to practitioners or academics in the field of mathematics education and assessment through a validation sheet. Valid on the contents of the mathematical reasoning test is focused on the approval of (a) formulation of indicators and aspects of ability, (b) compiling test items, and (c) rubric scores. Data analysis was carried out to obtain a feasibility assessment that would be used in measuring the reasoning test developed. Data collected from experts were then analyzed to determine the validity of the products produced.

### Table 1. Q-Cochran Test Results

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Performance</td>
</tr>
<tr>
<td>N</td>
<td>6</td>
</tr>
<tr>
<td>Cochran’s Q</td>
<td>2,9001*</td>
</tr>
<tr>
<td>df</td>
<td>7</td>
</tr>
<tr>
<td>Asymp.Sig</td>
<td>0,650</td>
</tr>
</tbody>
</table>

One is treated as a success

The results of the consideration given by the validator were analyzed using the Q-Cochran Test. The results of the validation analysis of performance and content are presented in Table 1. From Table 1 it can be seen that Asymp, Sig for performance validation is 0.650 which means that is greater than α = 0.05 so that it can be stated that all validators that give equal consideration to the performance validity of reasoning instruments. The validity of the contents of the Asymp value, Sig is 0.321 which is also higher than α = 0.05 so that it can be stated that all validators give equal consideration to the contents of mathematical reasoning instruments for logic set subjects. So that overall it can be said that the device of mathematical reasoning ability in the logic set courses has been validated regarding performance and content
3.3  Limited Trials

The trial in this study was a small group trial (limited testing). The test results are used to analyze the items and analyze the conceptual understanding. From the scores of students who have done the test then examined to see the validity of the things, test reliability, power difference and difficulty index. The validity of the article is done by correlating the score of each piece with the total score. From the results of the calculation of the correlation coefficients, each topics presented in Table 2.

<table>
<thead>
<tr>
<th>question number</th>
<th>correlation coefficient</th>
<th>interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.612</td>
<td>High</td>
</tr>
<tr>
<td>2a</td>
<td>0.706</td>
<td>High</td>
</tr>
<tr>
<td>2b</td>
<td>0.473</td>
<td>Quite</td>
</tr>
<tr>
<td>3</td>
<td>0.758</td>
<td>High</td>
</tr>
<tr>
<td>4</td>
<td>0.353</td>
<td>Low</td>
</tr>
<tr>
<td>5</td>
<td>0.573</td>
<td>Quite</td>
</tr>
<tr>
<td>6</td>
<td>0.238</td>
<td>Low</td>
</tr>
<tr>
<td>7</td>
<td>0.802</td>
<td>Higher</td>
</tr>
</tbody>
</table>

Based on the results of the calculation of the correlation coefficients as presented in Table 2, it can be stated that two questions are developed that have low item validity. So that valid questions based on calculations are five questions. Only five questions can be used to further become a research instrument of mathematical reasoning ability tests on logic set courses.

Next is to determine the reliability of the test. To assess the safety of the test coefficient using the Cronbach Alpha formula. Based on the students' test scores, the calculation of the reliability coefficient is presented in Table 3. From Table 3 it can be seen that Cronbach's alpha for the whole is 0.756 if rounded, Cronbach's alpha is 0.80 so that it can be said that reliability of mathematical reasoning ability tests on logic set subjects classified as high.

<table>
<thead>
<tr>
<th>Cronbach’s Alpha</th>
<th>Cronbach’s Alpha Based on Standardized Item</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.756</td>
<td>0.801</td>
<td>7</td>
</tr>
</tbody>
</table>

From the calculations with Cronbach's alpha can be seen, which items should be deleted, replaced or revised. This is determined by the value of Cronbach's Alpha if Item Deleted, i.e., if the value is more than 0.756, then the item must be removed replaced or revised.

<table>
<thead>
<tr>
<th>No</th>
<th>Scale Mean If Item Deleted</th>
<th>Scale Variance if Item Deleted</th>
<th>Corrected Item-TotalsCorrection</th>
<th>SquareMultipl eCorrection</th>
<th>Cronbach Alpha if Item Deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>39,386</td>
<td>80,673</td>
<td>0,567</td>
<td>0,278</td>
<td>0,715</td>
</tr>
<tr>
<td>2a</td>
<td>35,643</td>
<td>75,457</td>
<td>0,584</td>
<td>0,512</td>
<td>0,748</td>
</tr>
</tbody>
</table>
Table 4 shows that two items have a value higher than 0.756 based on Cronbach's Alpha if Item Deleted calculation, which is number 4 and number 6. So the two questions must be deleted, replaced or revised. Based on the results of the calculations above, it can be said that six questions do not have to be eliminated, replaced or changed, while two items must be removed. Because the problems that will be used in the study are only six questions, the two issues are number 4, and question number 6 are removed. Based on the calculation results of the mathematical reasoning test instrument in the logic set subject is six questions.

The next step is to determine the different power of questions. The power of different questions aims to find out how far the questions developed can distinguish high-ability students from low-ability students. The results of the calculation of the various influence of each item are presented in Table 5.

Table 5. Results of Calculation of Different Power Coefficients.

<table>
<thead>
<tr>
<th>Question</th>
<th>1</th>
<th>2a</th>
<th>2b</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>diff</td>
<td>0.67</td>
<td>0.25</td>
<td>0.45</td>
<td>0.56</td>
<td>0.17</td>
<td>0.77</td>
<td>0.15</td>
<td>0.55</td>
</tr>
<tr>
<td>Inter</td>
<td>G</td>
<td>M</td>
<td>G</td>
<td>G</td>
<td>P</td>
<td>VG</td>
<td>P</td>
<td>G</td>
</tr>
</tbody>
</table>

After knowing the different power of each question, the next thing to do is to determine the difficulty index of the item. The results of the calculation of the difficulty index of the topics presented in Table 6 can be seen only one problem that is difficult, namely problem number 4, from the results of the level of difficulty can be concluded that all questions can be used to measure the test of students' reasoning skills in the set of logic.

Table 6. Calculation Results of the Problem Index Item.

<table>
<thead>
<tr>
<th>Question</th>
<th>1</th>
<th>2a</th>
<th>2b</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>difficulty</td>
<td>0.6</td>
<td>0.38</td>
<td>0.47</td>
<td>0.69</td>
<td>0.25</td>
<td>0.46</td>
<td>0.55</td>
<td>0.43</td>
</tr>
<tr>
<td>Inter</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>m</td>
<td>d</td>
<td>m</td>
<td>m</td>
<td>Sedang</td>
</tr>
</tbody>
</table>

4 Conclusions

Based on the stages of instrument development, it can be concluded that the instrument of mathematical reasoning ability in the logic set subject is categorized as a valid instrument, meaning that it can be used as an instrument of student mathematical reasoning. Suggestions for further researchers so that researchers can further develop devices for the whole set of logic material. Because this study has my limitations.
References

The Simulation Damping of Power System Oscillation using Phase-Compensator and PID-Controller in Single-Machine Infinite-Bus

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Abstract. The paper present the dynamic oscillation of the electric power system. The concept of system resilience that functions for machines that move normally and can return to a stable state after a disturbance occurs. Oscillation in speed and oscillation changes in the electric power system occur due to disturbances. Disturbance in electricity causes an electric current that works on the system beyond the nominal current. The effect of the current disturbance will have an impact on changes in the current torque parameters that cause prime-over instability when the generator is operating. This instability will affect the rotor speed and the voltage emitted by the generator. Dynamic oscillation repair testing by applying phase compensation control and PID-Controller on the excitation system is done to see the response of speed and voltage response when the system is experiencing interference. Observation of system oscillation response using matlab simulation to see system performance. The simulation results show that dynamic stability improvement with phase compensation method can reduce oscillation speed and voltage within 6 seconds and the use of PID-controller can reduce the speed and voltage in 3 seconds. The phase compensation method and PID-controller applied to the excitation system can reduce the electric power system oscillation.

Keywords: Oscillation, Power System, Dynamic Stability, Phase-Compensator, PID

1 Introduction

The stability performance is an important factor in determining the quality of the Single-Machine Infinite-Bus (SMIB). In addition to stability performance, it also includes factors that affect the quality of the SMIB system, the system's ability to achieve a steady-state state of various kinds of disturbances that occur in SMIB system operations results in changes, especially changes in voltage response. If this situation is allowed to continue to occur, it will cause the SMIB performance to be disrupted and sometimes result in not being able to work normally after experiencing interference. To keep the single system running its operating point, it is necessary to analyze the SMIB system, especially its performance against interference. In the SMIB system, there are interruptions and there are minor disturbances. Many studies have been conducted to find oscillation damping techniques in electric power systems. The stability of the electric power system is done by tuning the Power System Stabilizer (Adi, 1994). The use of simulations is carried out in the field of short circuit
analysis of the power interconnection system. Simulation experiments were carried out on a multi-engine electric power system. In the experiment, a short circuit simulation using software shows the results of the analysis applied to learn in higher education (Rahmaniar, 2018). A study of damper oscillations of electric power systems was tested by applying optimal control and Power System Stabilizers (PSS) to electric power systems. Oscillation in the power system occurs due to a sudden disruption of the release of a large load or interference caused by a short circuit. The state of the system that experiences oscillation for a long time can cause interference to electrical equipment such as instrumentation, protection equipment and monitoring equipment at the electrical control centre. Experiments to test the system damping oscillation are applied in SMIB. SMIB as a plant is modelled with the state-space equation, and PSS and optimal control are applied to reduce oscillation. Matlab software is used as a tool to observe system performance. The test results show that the application of PSS and optimal control can reduce system oscillations (Agus, 2018). Study of dynamic modelling and analysis applied to the SMIB system to test the dynamic stability of the power system. SMIB is modelled in nonlinear and linear models as a plan for implementing STATCOM using PID controllers. The analysis is done by looking at the eigen values of the simulation display (Ghazanfar, 2009).

2 Smib Dynamic Model

The SMIB single machine of the power system (Praba, 1994) shown in Fig. 1:

![Fig. 1. Representation of SMIB Model](image)

Mechanical torque Equations:

\[
T_m = m \cdot a \\
T_m = m \cdot \frac{d\omega}{dt} 
\]

If the generator is loaded the mechanical torque will be affected by the electric torque:

\[
T_m - T_e = m \cdot \frac{d^2 \delta}{dt^2} \\
T_m - T_e = M \cdot \frac{d^2 \delta}{dt^2} \Rightarrow T_m - T_e = M \cdot \frac{d^2 \delta}{dt^2} 
\]

equation (2) can be arranged as a block diagram shown in Fig. 2.

![Fig. 2. generator is loaded the mechanical torque](image)
Damping system (D) as additional torque to stabilize the engine rotor simultaneously in this system, the damping provided by making a negative torque proportional to and phase with the rotor change (Δω):

\[ T_D = D \cdot \Delta \omega \tag{3} \]

\[ \Delta \omega = \frac{1}{Me} (\Delta T_m - \Delta T_r - D \Delta \omega) \tag{4} \]

The angle position also affects the opponent's torque with the synchronization torque where:

\[ T_s = K_s \delta \tag{5} \]

from equations (3) and (5), the block diagrams shown in figure 3:

\[
\begin{align*}
\frac{\Delta T_E}{\Delta \delta} &= \frac{K_z}{1 + s \tau_T} \frac{K_3}{K_1} \\
\text{Fig. 3. Block diagram of Eq. (3) and Eq. (5) with TS and D}
\end{align*}
\]

The effect of the K4 parameter on the rotor angle increase depicted in the block diagram is shown in Fig.4. The transfer function that describes changes in torque and rotor angle is formulated as:

\[
\frac{\Delta T_E}{\Delta \delta} = \frac{K_z K_4 K_3}{1 + s \tau_T} \tag{6}
\]

from equations (6), the block diagrams shown in Fig.4:

\[
\begin{align*}
\text{Fig. 4. The effect of the K4 parameter on the rotor angle}
\end{align*}
\]

The transfer function that describes the voltage regulation system is:

\[
\frac{\Delta E_{eq}}{\Delta V_r} = \frac{K_4}{1 + s \tau_d} \tag{7}
\]

For small fault analysis, the terminal voltage deviation can be connected to the angle change Δδ through the K5 factor whose value can change, then the change in the double flux ΔEQ' is connected via K6 whose value is always positive and decreases with the loading.

The block diagram of the SMIB electric power system (P. Anderson, 1977) can be shown in Fig. 5.
Fig. 5 shows the block diagram of the Single-Machine Infinite-Bus Model. Input torque is $\Delta T_m - \Delta T_e$ as input and torque angle $\Delta \delta$ as output. The mechanical loop has two function blocks over from left to right, the first block is based on the torque balance equation, and the second block shows the angular and velocity relationships for the selected unit. In this block, $M$ is the inertial constant, $D$ is the mechanical dampening coefficient and $2\pi f$ is the simultaneous speed.

The electric loop has additional $U_e$ control minus the additional terminal tension $\Delta V_t$ as input, and the internal voltage ($\Delta Eq'$) as the output multiplied by $K_e$ as the electric torque $\Delta T_E$. The electric loop has two transfer function blocks from right to left; the first block represents the voltage and excitation control system with the $T_A$ time constant and the gain $K_A$, the second block represents the function of the field circuit as the effect of the armature reaction, with the effective time constant of $T_3'K_3$ and the gain $K_3$.

$\Delta V_t$ consists of two components, $K_5\Delta \delta$ is caused by changes in the torsion angle $\Delta \delta$ and $K_6\Delta Eq'$ caused by changes in the tension in $q Eq'$. $\Delta V_t = V_t - V_{ref}$, a negative sign is given to $\Delta V_t$ because of negative feedback. Based on the block diagram, the stability of the power system is affected by the parameters $K_1$ to $K_6$. $K_1$, $K_2$, $K_3$, $K_4$, and $K_6$ are always positive, while $K_5$ can change from positive to negative. The simulation design uses Matlab Simulink from the SMIB linear equation formed in the state variable equation (Katsuhiko, 1994)

3 Phase-Compensator And Pid-Controller

3.1 Phase Compensation Method

A controller or commonly called PSS (Power System Stabilizer) is generally installed on the excitation system of speed response with the general form as stated by de Mello et al (1968):

![Diagram of Single-Machine Infinite-Bus Model](image-url)
Previously we need to calculate the characteristic equation, undamped natural frequency and damping the inertial system factor:

\[ G_i(s) = \frac{K_i \tau_s}{1 + \tau_s} \left( 1 + a \tau s \right) \]  

(8)

\[ d(s) = s^2 + 2\zeta \omega_n s + \omega_n^2 \]  

(9)

\[ \omega_n = \sqrt{\frac{K_i \omega_n^2}{2H}} \]

\[ \zeta = \frac{D}{4H \omega_n} \]  

(10)

3.2 PID-Controller

PID controllers are very widely used in the industry for decades, the response is very fast but overshoot is also very large (L. Qi, 2010). Similarly, implementation on control Liquid level. Classic PID parameters usually remain during operation, consequently, the controller becomes inefficient to control the system if there is an unknown or unknown interference the environment around the system changes (Sinthipsomboon, 2011). So the PID control is not sufficiently adaptive (O.Wahyunggoro, 2018) and also the determination of the PID parameter is also very difficult. One way to determine the PID parameters using the Ziegler-Nichols open loop method.

PID controllers are very widely used in electric power systems. The concept of the PID control system is shown in Fig. 6

![Fig. 6. The concept of the PID control system](image)

The PID control process with the response is very fast but the overshoot is also very large. Classic PID parameters are usually fixed during operation, consequently, the controller becomes inefficient to control the system if there is an unknown interference or the environment around the system changes. open loop Ziegler-Nichols, Tuning is much better obtained by installing a model:

\[ P(s) = \frac{K}{s(s+a) e^{-sT_{del}}} \]  

(11)

A simple way of tuning the PID control using an illustration of figure 9. Zero frequency retrieval from the Criteria gains process from the response of the steady-state value. Tdel time delay parameters of parameters to see Ziegler-Nichols step response with muffled oscillation calculations in closed loop systems (Desborough Honeywell, 2000)
4 Simulation Results

A single synchronous generator model is shown in Fig. 8, The value of the system parameters that will be tested in the simulation from Fig. 8

Data Of The SMIB System:
- $K_1 = 1.4479$, $H = 2.37$, $2H = 4.74$
- $K_2 = 1.3174$, $D = 2$
- $K_3 = 0.3072$, $\omega_R = 314$ rad/detik
- $K_4 = 1.8052$, $T_{do} = 5.9$ detik
- $K_5 = 0.0294$, $K_A = 400$
- $K_6 = 0.5257$, $T_A = 0.05$ detik

4.1 Simulation Result of the Generator in an Open Loop
Simulation results, response speed and voltage of the generator in an open loop state (without control) are shown in Fig. 9 a and Fig b:

Fig. 9.a: A response speed of the Generator Systems in an open loop state (without control)

Fig. 9.b: A response voltage of the Generator Systems in an open loop state (without control)

The eigenvalues of the system in the open loop condition:

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>Damping</th>
<th>Freq. (rad/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4.92e-001 + 1.02e+001i</td>
<td>4.82e-002</td>
<td>1.02e+001</td>
</tr>
<tr>
<td>-4.92e-001 - 1.02e+001i</td>
<td>4.82e-002</td>
<td>1.02e+001</td>
</tr>
<tr>
<td>-1.20e+000 + 8.65e-001i</td>
<td>8.12e-001</td>
<td>1.48e+000</td>
</tr>
<tr>
<td>-1.20e+000 - 8.65e-001i</td>
<td>8.12e-001</td>
<td>1.48e+000</td>
</tr>
<tr>
<td>-1.93e+000</td>
<td>1.00e+000</td>
<td>1.93e+000</td>
</tr>
<tr>
<td>-9.24e+000 + 1.49e+001i</td>
<td>5.27e-001</td>
<td>1.75e+001</td>
</tr>
<tr>
<td>-9.24e+000 - 1.49e+001i</td>
<td>5.27e-001</td>
<td>1.75e+001</td>
</tr>
</tbody>
</table>

The low damping is 4.82e-002 with the most dominant oscillation frequency being 10.2 rad/sec. The open loop system diagram is shown in Fig. 10.
4.2 The Closed-Loop System with Phase Compensation Method

From the results of the analysis using Eq. (8), eq. (10) and eq. (11), will be obtained:

\[ G_c(s) = \begin{bmatrix} 20s & 1 + 0.275s & 1 + 0.035s \\ 1 + 10s & 1 + 0.035s & 1 + 0.275s \\ 1 + 0.035s & 1 + 0.275s & 1 + 0.035s \end{bmatrix} \]

and, \[ \tau_o = 10; \quad K_o = 2 \]

The simulation of the controlled SMIB model with the three-level phase compensation method is shown in Fig. 11.
Fig. 11. Simulation of the controlled SMIB model with the three-level phase compensation methods
From the simulation results of the SMIB model with a three-level phase compensation control, the eigen value is:

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>Damping</th>
<th>Freq. (rad/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1.00e+000</td>
<td>1.00e+000</td>
<td>1.00e+000</td>
</tr>
<tr>
<td>-1.20e+000 + 8.70e-001i</td>
<td>8.09e-001</td>
<td>1.48e+000</td>
</tr>
<tr>
<td>-1.20e+000 - 8.70e-001i</td>
<td>8.09e-001</td>
<td>1.48e+000</td>
</tr>
<tr>
<td>-1.55e+000 + 8.16e+000i</td>
<td>1.86e-001</td>
<td>8.31e+000</td>
</tr>
<tr>
<td>-1.55e+000 - 8.16e+000i</td>
<td>1.86e-001</td>
<td>8.31e+000</td>
</tr>
<tr>
<td>-1.93e+000</td>
<td>1.00e+000</td>
<td>1.93e+000</td>
</tr>
<tr>
<td>-3.89e+000 + 2.11e+001i</td>
<td>1.81e-001</td>
<td>2.15e+001</td>
</tr>
<tr>
<td>-3.89e+000 - 2.11e+001i</td>
<td>1.81e-001</td>
<td>2.15e+001</td>
</tr>
<tr>
<td>-1.19e+001</td>
<td>1.00e+000</td>
<td>1.19e+001</td>
</tr>
<tr>
<td>-4.12e+001 + 1.70e+001i</td>
<td>9.24e-001</td>
<td>4.46e+001</td>
</tr>
<tr>
<td>-4.12e+001 - 1.70e+001i</td>
<td>9.24e-001</td>
<td>4.46e+001</td>
</tr>
</tbody>
</table>

From the results of the eigen values it can be seen that the lowest damping has increased from $4.82e-002$ (f = 10.2 rad / sec) in the open loop to $1.81e-001$ (f = 21.5 rad / sec). And the bode diagram of the closed loop system is shown in Fig. 12.

Fig. 12. Closed loop system bode diagram using the three-level phase compensation method
Simulation results, response speed and voltage of the generator in a closed loop using the three-level phase compensation method are shown in Fig. 13.a and Fig 13.b:
4.3 The Close Loop System: PID Controller Using Ultimate Sensitivity Method

Tested with the P controller only, then the Kc gain is raised slowly to the stability limit. The proportional gain at that time is called Ko and the oscillation period is called To. The optimum price of PID parameters is determined from the following table 1:

<table>
<thead>
<tr>
<th>Controller Type</th>
<th>Kc</th>
<th>T1</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>0.5</td>
<td>Ko</td>
</tr>
<tr>
<td>PI</td>
<td>0.45</td>
<td>Ko</td>
</tr>
<tr>
<td>PID</td>
<td>0.6</td>
<td>Ko</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Controller Type</th>
<th>Ko</th>
<th>T1</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>0.5 Ko</td>
<td>-</td>
</tr>
<tr>
<td>PI</td>
<td>0.45 Ko</td>
<td>0.83 To</td>
</tr>
<tr>
<td>PID</td>
<td>0.6 Ko</td>
<td>0.5 To</td>
</tr>
</tbody>
</table>

From the Fig. 8 of the SMIB system, it is tested by installing the P controller by increasing the gain at the stability limit. From the test with Matlab the response is obtained at the following stability limits, obtained Ko values = 300 and To = 0.4 seconds, Then the PID controller used is set as follows: P = 0.5 Ko = 150; T1 = 0.5 To = 0.2; TD = 0.125 To = 0.05. These parameters are used as initial values. Then the settings are done manually to get the best response, The results are obtained: P = 100, T1 = 0.2, TD = 0.05, And the system with the PID controller installed on the excitation system of the speed response is shown in Fig. 14.
The system simulation response with PID control is shown in Fig. 15. Oscillation improvements using phase compensation and PID-Controller from simulation results show system improvement. System oscillations can be significantly reduced.
Acknowledgement

This research is a form of experimental research conducted with a lecturer in the Expertise Lecturer Group research in the department of electrical engineering, Faculty of Engineering of Medan State University, Collaboration with Faculty of Engineering Padang State University engineering and Department Of Electrical Engineering-Universitas Pembangunan Panca Budi Medan in an effort to synergize the improvement of the quality and quality of human resources among universities

References

The Effect Chemical Reaction to Free Convection of Micropolar Fluid in a Vertical Channel

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Abstract. The present analysis is focused to the criteria for the onset of flow inversion of the fully developed free convection of micropolar fluid in a vertical channel under the effect of the chemical reaction. The governing equations force are solved and calculated numerically by Shooting Method based on Fourth order Runge Kutta Method. Parameter for the occurrence of invented flow by was presented. The exothermic chemical reaction is adopted to gain the optimally velocity, microrotasi and temperature.

Keywords: Micropolar Fluid; Chemical Reaction; Free Convection

1 Introduction

Micropolar fluids suggested by [1]simulated accurately the flow characteristics of polymeric additives, geomorphological sediments, colloidal and haematological suspensions, liquid crystals, lubricants etc. Studies of the flows of heat convection in micropolar fluids focus mainly on flat surfaces by Rahman et al. in[7]-[11]. [13] have considered natural convection flow of micropolar fluid along a vertical and a permeable semi-infinite plate embedded in a porous medium. The problem of fully developed natural convection heat and mass transfer of a micropolr fluid between porous vertical plates with asymmetric wall temperatures and concentrations is analyzed by [14].

Flow of fluids with internal heat sources are of great practical and theoretical interest. The fluid motion develops slowly following the development of non-uniformity in the temperature field. The volumetric heat generation/ absorption term exerts strong effecto the flow when the temperature difference is appreciably large. The analysis of temperature field as modified by the heat source in a moving fluid is important in view of chemical reactions. One of the earliest studies on free convection of micropolar fluid in a vertical channel with uniform wall temperatures had been studied analytically by [2].

Foraboschi and Federico in [5] have assumed 2 state volumetric heat generation as depending on temperature difference

\[ \theta = \begin{cases} \theta_0(T - T_0), & T \geq T_0 \\ 0, & T > T_0 \end{cases} \] (1)

In many chemical engineering processes chemical reactions take place between a foreign mass and the working fluid which moves due to stretching or otherwise of a surface. A chemical reaction is said to be first order and homogenous if its rate of reaction is directly proportional to the concentration and it occurs as a single phase volume reaction. Muthucumaraswamy studied the effects of a chemical reaction on a moving isothermal
vertical surface with suction and [3] considered MHD free convection flow and mass transfer over a stretching sheet with chemical reaction [6].

In this paper, an model is built with effect of chemical reaction by various parameters to micropolar fluid

2 Mathematical Formulation

Consider a laminar free convection flow from the micropolar fluid between two solid and thick plates between two parallel and vertical walls. The space between the plates is h. Walls at \( y = 0 \) and \( y = h \) are isothermal at certain temperatures \( T_1 \) and \( T_2 \), where it is assumed that \( T_1 \geq T_2 \). The fluid has a vertical velocity distribution evenly up the \( U_0 \) stream at the entrance of the channel. Thus, the basic equation for steady and fully developed flow from a thick, non-compactable and heat fluid that is assumed to be supplied to the surrounding fluid in [4] by an exothermic surface reaction [12]. On the basis of this assumption, the equation describes the physical situation

\[
(\mu + \kappa) \frac{d^2u}{dy^2} + \kappa \frac{dn}{dy} + \rho g \beta (T - T_0) = 0 \quad (2)
\]

\[
\frac{d^2\theta}{dy^2} - \kappa \left( 2n + \frac{dn}{dy} \right) = 0 \quad (1)
\]

\[
\frac{d^2\tau}{dy^2} = Q_{\theta} \alpha e^{\frac{-E}{RT}} \quad (4)
\]

Subject to boundary condition

\[
u(0) = 0, \quad T(0) = T_1, \quad n(0) = 0
\]

\[
u(h) = 0, \quad T(h) = T_2, \quad n(h) = 0 \quad (5)
\]

Reactions occur only on surfaces that are constructed by Arrhenius first order kinetic. The closure system by conservation of mass flux \( M \) is \[ U \ dY = M \ [4]. The construction of non-dimensional equations for this equation becomes

\[
\left( 1 + K \right) \frac{d^2U}{dY^2} + K \frac{dn}{dY} + \theta = 0 \quad (6)
\]

\[
\left( 1 + \frac{J}{2} \right) \frac{d^2N}{dY^2} - K \left( 2N + \frac{dn}{dY} \right) = 0 \quad (7)
\]

\[
\frac{d^2\theta}{dY^2} = -K \ e^{\frac{-E}{RT}} \quad (8)
\]

Where \( \gamma = h^2 + \frac{K}{2\mu} \) and \( K \) is material parameter which defined by

\[
\gamma = \left( 1 + \frac{K}{2\mu} \right) h^2 = \left( 1 + \frac{K}{2} \right) h^2
\]

\[
k = \frac{\kappa}{\mu}
\]

boundary condition be

\[
u(0) = 0, \quad \theta(0) = R_T, \quad N(0) = 0
\]

\[
u(1) = 0, \quad \theta(1) = -R_T, \quad N(1) = 0 \quad (9)
\]

Here, effect of micropolar based on \( K, N \neq 0 \).

3 Result And Discussion

The effects of chemical reaction by various \( K, K_F, \) and \( R_T \) are presented in Figure 1-3, respectively. **Figure 1:** First figures show that velocity increases as value \( K \), maximum velocity was obtained for \( K \) value was getting big. Whereas, velocity increase as \( R_T \) small.
velocity is maximum when Frank Kamenetskii number $K_F = 1.5$. **Figure 2**: Figures 2 show that microrotation decreases as various value of material parameter $K$. Microrotation is maximum when temperature different ratio ($R_T$) is getting big. Whereas, microrotation has minimum value for various value of $K_F$ for $Y<0.5$, while, microrotation has maximum value for various value of $K_F$ for $Y\geq 0.5$. Finally, microrotation approach optimal when $K_F = 1.5$. **Figure 3**: Figures 3 show that temperature has maximum value as various value of material parameter $K$ at $Y=0.4$. Temperature is maximum at $Y\geq 0.45$ for temperature different ratio ($R_T = 0.1$) and Temperature is maximum at $Y<0.45$ for temperature different ratio ($R_T = 1$). Finally, temperature approach maximum when $K_F = 1$. 

![Fig. 1. Plots of $U$ versus $Y$ for different values of (a) $K$ where $K_F=1.5, R_T=1.0$, (b) $K_F$ where $R_T=1.0$, $K=1.0$ and (c) $R_T$ where $K_F=1.5, K=1.0$](image-url)
Fig. 2. Plots of $N$ versus $Y$ for different values of (a) $K$ where $K_F=1.5, R_T=1.0$, (b) $K_F$ where $R_T=1.0$, $K=1.0$ and (c) $R_T$ where $K_F=1.5$, $K=1.0$.
4 Conclusions

Parameters for the occurrences flow reversal by freeconvection of Mocropolar fluid under the effect of chemical reaction in a vertical channel are presented. It can be concluded that flow reversal adjacent to the cold wall is found to exist with in the channel as the ratio of Frank-Kamenetskiinumber and Reynolds number is above a thre shold value. The exothermic
chemical reaction is found to enhance the flow reversal and made flow reversal possible for symmetrical walls temperatures.

Acknowledgement

The financial support received from BOPTN UNIMED is gratefully acknowledged.

Nomenclature

- $u$: non-dimensional velocity, m/s.
- $T$: non-dimensional temperature
- $T_0$: reference temperature
- $t$: non-dimensional time, s
- $K_F$: Frank-Kamenetskii number
- $g$: acceleration due to gravity
- $R_T$: Temperature difference ratio
- $k$: kinematic rotational viscosity, N.s/m$^2$
- $n$: Micro-rotation velocity
- $\rho$: Density of fluid
- $U$: Dimensionless velocity component in the x-direction
- $X,Y$: Dimensionless space coordinates
- $\Theta$: Dimensionless temperature
- $K$: Non-dimensional material parameter

References

The Instructional Material Development Based on National Qualification Frame of Indonesia to Improve Technical Skills of Machine Technical Student

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Abstract. The development of instructional material based on national qualification frame of Indonesia to improve technical skills of machine technical student is explained. The study is aimed to obtain instructional material which have high effectiveness. The instructional material is developed by conducting needs assessment of technical skills based on national qualification frame from varies sources (stakeholders), to arrange instructional material as a preliminary instructional material to be developed based on the needs assessment, and then conducting try out of that instructional material. For this study used Borg and Gall as a research method which combine by Dick, Carey and Carey model. The subject of this study are the student of Machine technical department Faculty of Engineering Universitas Negeri Medan. The subject of preliminary field testing are two experts in technical mechanical material, two experts in instructional design, two experts in instructional media, three students for one to one try out, twelve students for small group try out and twenty five students for field try out. The instrument employed in this study is a questionnaire, observation, and performance test that analyzed by using descriptive and inferential statistics. The finding of study are: (1) the quality of instructional material viewed from the expert in educational technologies is good, (2) in the one to one try out indicated that the product is good, (3) in the small group try out indicated that the product is good.

Keywords: Instructional material development, technical skill, national qualification frame

1 Introduction

Conceptually, the competency-based curriculum can be recognized as one of the means for the implementation of the teaching and learning process in the classroom to provide and broaden students' horizons about knowledge, skills, and other basic values in hopes of being reflected in: the habits of thinking and acting. However, students have a very strong dependence on how he is treated by educators. That is, the success of students mastering vocational competencies is related to how educators practice the learning system in school.

On the other hand, weaknesses in the implementation of vocational competency learning stem from different perceptions between the implementing components, and lack of ability to translate vocational competencies into teaching and learning operations, so that learning outcomes as a form of competence Vocational students have become weak or low. The main
problem in the conceptual learning of vocational competence is how to relevance teaching materials with the Indonesian national qualification framework contained in the planning and readiness of teaching staff to manage their learning so that the desired competencies in the students themselves can be achieved and practically as far as the competencies of a teacher to provide and expand insight into applying it to classroom learning practices. This really needs to be developed in a teacher by developing his skills through vocational competence.

If the mechanism for managing vocational competence learning has gone as it should, which is carried out on the basis of insight, learning needs and objectives that enable students to think creatively and master the competencies contained in the curriculum, then knowledge and skills as a result of the implementation of teacher teaching can be found in acquisition of learning outcomes achieved by students. Thus the development of learning materials to improve vocational competence in the form of technical skills (technical skills), is one answer as an effort to improve student learning outcomes in vocational schools.

This is related to Univesitas Negeri Medan’s flagship program found in the 2016-2017 Strategic Plan, one of which is Increasing Graduates Relevance through strengthening the implementation of competency-based curriculum, and the block system curriculum based on the Indonesian national qualification framework, one of which is the development of teaching materials and learning media. For the Department of Mechanical Engineering Education, will produce graduates who are able to carry out effective learning in Vocational Schools (SMK) in technology and engineering.

Competency demands from graduates of vocational schools in technology and engineering are technical skills in the field of machine element design technology. This means that the competency of the graduates of the Mechanical Engineering Universitas Negeri Medan Faculty of Mechanical Engineering Education Program is the technical skills in the design of machine elements as a minimum competency. Therefore, his learning in the Engineering Study Program of Mechanical Engineering Faculty Mechanical Engineering - UniversitasNegeri Medan needs to be minimized with the learning needs of Vocational Education in Vocational High Schools, especially in the eyes of the teaching of machine element design.

The specific objectives of this research are:

1. Produce teaching materials based on Indonesian National Qualifications Framework in technical skills competencies in the field of machine element design technology through needs analysis.
2. Produce teaching materials based on Indonesian National Qualifications Framework in technical skills competencies in the field of machine element design technology through limited scale field trials to produce, main products.

Technical skills in machine element design technology is a component of the subjects in the Engineering Study Program in Mechanical Engineering in accordance with the content standards for elementary and secondary education units. In the preparation of the Education Study Program curriculum

Mechanical Engineering subjects are divided into three groups, namely normative, adaptive, and productive including components of vocational competence. One component of
technological vocational competence is the design of machine elements. The development of machine element design technology has brought revolutionary changes in the construction industry, both through manual and digital techniques. The development of this machine element design technology requires the availability of learning component components in institutions, education that is always relevant to the ever-growing demands of the business / construction industry. One of the efforts made by the Indonesian government in the effort to prepare graduates for formal education that are relevant to these needs is to develop a curriculum based on the Indonesian National Qualifications Framework in accordance with the formal education grade. For this reason, the provision of teaching materials based on the Indonesian National Qualifications Framework is one of the alternative educational and vocational technology services in solving human resource development problems, especially the institutions producing teachers in vocational schools.

Management of competency-based curriculum learning is compiled and developed by the teacher in the 2013 curriculum (K-13), basically it is new. That is, for teachers who in the early stages still demand a lot of attention from all parties concerned.

Management and implementation of K-13 cannot be separated from various aspects of learning and the factors that influence it, from the concept to the implementation, so that the learning objectives can be achieved well. One of the problems faced in K-13 in addition to this new policy has also been taken with regard to the development and implementation in the classroom, namely the lack of availability of teaching materials that are relevant to the needs of employment and future projections. This is due to the lack of competency of the teacher to translate training materials / materials into classroom learning strategies, causing problems in the process and learning outcomes of students.

To answer the above problems, it can be done through the development of teaching materials based on Indonesian National Qualifications Framework, especially in the field of machine element design technology. Many teaching materials in the vocational field of machine element design technology have been and are being developed at this time, with the aim that students' knowledge and skills increase. However, from the survey conducted by the researcher, the existing teaching materials have not yet reached the level of vocational competence desired in other words not in accordance with the desires of the job market.

Thus it is necessary to develop teaching materials that are relevant to future job needs and projections or based on Indonesian National Qualifications Framework, which can be used as a source of learning by students with self directed so that the learning process in the classroom is effective, efficient and empowered pull in achieving learning goals or improving student learning outcomes in vocational competencies machine element design technology. This requires that the institutions that produce educators or teachers in vocational schools must always be relevant to competency, in this case the students of the Engineering Education Study Program as prospective teachers in Vocational High Schools.

The scope of the design of machine elements includes, welding, shaft and pegs, bearings, couplings, belts, chains, and gears. Seeing the extent of material in this study is limited to welding.

2 Literature Review

Competence is the knowledge, skills and basic values that are reflected in the habit of thinking and acting. (Depdiknas, 2002). Competence is "being able to perform whole work
roles, to the expected in employment in real working environment standards" (Burke, 1989). From this definition, there are three competency criteria: a). able to carry out the entire tasks of the workforce, more than having the skills or work tasks that are specific; b). in accordance with the standards expected in work; c). in real work environments that put pressure on and relate to all work and actual variations of work.

The SCANS report identifies 5 (five) competencies and 3 (three) basic parts someone's skills and quality to be able to handle work, namely: The five competencies: (a) resources: identifies, plans, and allocates resources (b) interpersonal: works well with others; (c) information: acquires and uses information; (d) systems: understands complex interrelationships; (e) technology: works with a variety of technologies. The three-part foundation consists of: (a) basic skills: reads, writes, performs arithmetic and mathematical operations, listens, and speaks effectively; (b) thinking skills: thinks creatively, make decisions, solves problems, visualizes, knows how to learn, and reasons; (c) personal qualities: displays responsibilities, self-esteem, sociability, self-management, integrity, and honesty (Huitt, 1999).

Competence is a basic characteristic consisting of skills, knowledge and other personal attributes that are able to distinguish someone from performing and not performing. Spencer & Spencer classify competencies into basic characteristics, causal relationships and reference criteria as follows: 1) Basic characteristics are competence as part of personality individuals and can predict behaviour in situations and tasks, namely: a). motive as encouragement from person consistently to do an action; b). nature / character, namely physical characteristics and a consistent response to certain situations or information; c) self-concept, namely attitude values or an individual's image; d). knowledge, that is information that someone has for certain fields; and e). skills, namely the ability to carry out tasks physically or mentally. 2). Causal relationships are competencies that cause and predict behaviour and performance. Motivation, character / character competence and self-concept can predict the behaviour actions that are on finally it can predict performance results. 3). Reference criteria are the most critical competencies that can differentiate competencies with high or average performance(Spencer & Spencer, 2008). Thus vocational competence is a form of one's ability and skill to carry out the whole vocational tasks in accordance with the standards expected in a real work environment.

Technical skills as the ability to apply specific knowledge, methods, or techniques in a particular area of specialization(Stoner James A. F., Freeman R. Edward, and Gilbert, 2003). This skill is an understanding and ability to do work activities related to specific fields or specific jobs. Technical skills are usually more related to other hand or physical skills.

In the field of machine element design, Okumura argued that technical skills in machine element design technology are actions to carry out metallurgical bonds on metal or metal alloy joints carried out in a molten state of several metal rods using heat energy through a procedure and technique which is done by hand (Okomura, T. dan Wiryosumarto, 2004). Also called it motorbike skill which is adaptive, because it combines several motoric movements in designing machine elements (Singer, 1975).

From the several definitions given by these experts, what is meant by technical skills in this study is the application of specific knowledge, procedures, and techniques in a particular area of specialization, which, related to psychomotor skills.

A learning design procedure, starting from identification, development, evaluation and ending with revisions (Twelker, 1972). Instructional materials were prepared based on learning strategies used(Harmon, 1982). Three types of model development to determine
which are appropriate and appropriate to be used, namely: (1) an inductive model, which
departs from the experience of current student behaviour, then grouped, compared, developed
and finally evaluated for revision, (2) deductive model, beginning with the determination of
general objectives, determining criteria, looking for links between existing elements / partners,
data collection, formulation of specific objectives, developed and implemented, then evaluated
and revised, (3) classic models, starting with some general requirements of objectives,
program development, program implementation, then evaluated and revised (Kaufman &
English, 1979).

The University Consortium for Instructional Development and Technology (UCIDT)
presents a model that can be applied for the development of learning. The University
Consortium for Instructional Development and Technology (UCIDT) presents a model that
can be applied for the development of learning. The model includes 3 (three) stages:
definition, development and evaluation, divided into 9 (nine) with 3 (three) steps and are
interrelated with each other, namely:

Level I. Definition. Step I. Identification of the problem. In this first step it is done is the
identification of problems, namely the gap between expected and existing. More specifically,
determine the conditions, what and what should be achieved by students. The second step is
the analysis of the situation, namely in what environment learning is organized, including
students, learners (teachers), managers, and learning resources or materials. The third step is
the management of management, namely the leader executor responsible and carrying out
communication and other authorities. The fourth step, as part of the development stage is
identification of goals. The stages of learning development begin by identifying specific
learning goals, if achieved, then the problem in the first step will be solved. In the formulation
of objectives must be stated: who is the participant or learners (Audiences), what behaviour
can be done after the program is finished, under what conditions they are formed, and the level
of expertise achieved. The fifth step is a special method or learning methods used to achieve
goals. The sixth step is construct a blueprint or prototype, which is the components used, such
as teaching preparation, exam materials, and specific guidelines and program evaluation. The
seventh step is to test the prototype. The evaluation stage begins by testing each component of
the program. This initial trial was carried out in a small sample and observations were held to
see the presentation. Student comments are made as an assessment of what they participants
have learned. The eighth step is the analysis of results. Data collected in the seventh step
determines the significance of the extent of the contribution given by each component to the
achievement of goals, useful or not. The final step is implementation / revision. Program
improvement is done by looking at the achievement of certain goals, by reassessing the
contribution of learning components to the achievement of goals (Molenda & Rice, 1979).

The results achieved through preliminary studies funded by the Higher Education in the
Competitive IX Research, have been conducted as product development research to find a
learning model of psychomotor skills for training the Ministry of Manpower BLK / KLK in an
effort to improve the quality of labour, as follows: 1) The basic components of the learning
model psychomotor skills with whole method. 2) The basic component of the learning model
of psychomotor skills with partial training (part method). The results of this study indicate that
using an effective whole exercise model for psychomotor skills that has a simple movement
and an effective training model for psychomotor skills that have complex movements. The
results of research conducted by Napitupulu, at al found that by developing teaching materials
based on the development of interactive multi-media based learning models, it can improve
vocational competency of Construction Technology Vocational students (Napitupulu &
Julaga, 2014).
3 Methodology

This research uses development research methods. Performed directly by collecting descriptive data that processes and analyse data inductively. To produce operational products, namely learning models with computer-based vocational tools to improve teacher teaching competencies that are effective, efficient and attractive, a research and development cycle process is known as “the R & D cycle” (Gall, Gall, & Borg, 2007). In this study, survey methods were used through needs analysis, trial methods through procedures (a) expert reviews, (b) one-on-one trials, (c) small group trials, and (d) limited scale field group trials. The population of this study were all Mechanical Engineering Education Study Program students who took machine element design courses. This sampling uses purposive techniques. Data collection techniques used in this study are questionnaire techniques and interview techniques, as well as documentation techniques to capture data on needs analysis activities, questionnaire techniques to capture data about the response of respondents and students on expert and validation activities on one-on-one trials and group trials, small, and testing techniques and observations on field trial activities are limited. Data analysis techniques used were (1) descriptive analysis to describe data from needs analysis and expert validation as well as one-on-one and small group trials. (2) t test to find out the difference in the effectiveness of the model for limited and wide-scale field testing.

4 Result

The finding of study are:

1) The quality of teaching materials according to expert material is presented in Figure 1 below:

![Fig. 1. The Quality of Material According to Expert Teaching Material](image)

2) The One To One Try Out

The quality of teaching materials in One To One Try Out presented in Figure 2 below:
3) The Small Group Try Out

The quality of teaching materials in the small group try out presented in Figure 3 below:

5 Discussion

From the description above shows that the quality of teaching materials according to the four material experts presented in Figure 1 shows that one person (25%) stated very well three people (75%) stated good. Then The One To One Try Out presented in Figure 2 shows eleven students (5%) stated very well 40 students (76.69%) said well, six students (11.54%) said that they were not good and five students (4.62%) stated very poor. Furthermore, the Small Group Try Out presented in Figure 3 shows two students (11%) stated that very well 15 students (79%) stated well, one student (5%) stated that they were not good enough and one student (5%) stated that they were not very good.

The findings of the study were: (1) the quality of teaching materials seen from good educational technology experts (75.00%), (2) in one to one trials showed that the product was good (76.69%), (3) in Small group trials showed that the product was good (75.0%). The findings in this study are in accordance with research that has been done and in line with the theoretical framework that has been built.
6 Conclusion

Based on the result of research and discussion, it can be concluded:
The quality of instructional material viewed from the expert in educational technologies is
good. In the one to one try out indicated that the product is good. In the small group try out
indicated that the product is good.

Recommendation

Based on the results obtained in this study, the development of teaching materials in
accordance with the Indonesian National Curriculum Framework is needed to evaluate the
performance and effectivities of the Instructional Material.

Acknowledgements

Thank you to the State University of Medan and the Ministry of Technology Research
and Higher Education, the Research Institute of Medan State University, which has funded
this research in the Medan State University Budget Implementation List (DIPA), in
accordance with the Contractual Agreement SP Number DIPA-000574 / UN33 I KU I 2018,
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The Influences of Blended Learning with WhatsApp Android Application to Students Responses in Medan State University

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Abstract. This study revealed the students’ responses in blended learning with WhatsApp android application. This study was held in Class B year 2016 Mathematics Education Department Medan State University. Subjects of this research were 39 students divided into six groups in the course of Research Method. The research applied qualitative method with descriptive design. Result of this study showed positive responses from students during the learning process. They could learn everywhere utilizing internet network by their smartphone. Learning makes students more energetic and more flexible, so it raises their comfort which influences their responses.

Keywords: Blended learning, WhatsApp Application, Students’ respond.

1 Introduction

Research method is one of the courses in Department of Mathematics Education, Medan State University. This course supplies knowledge and technique about how to do research in students’ thesis. The success of this course can not be seen directly from the students’ grades of the course, but it can be seen from how fast the students compile a research proposal and quality of their research report.

Based on Accreditation Report issued by Department of Mathematics Education, from 2010 to 2014 only 58.6% students completed their studies in four years. Students having difficulties in prepared research proposal. Author interviewed 10 fifth-year students who conduct proposal seminar in Department of Mathematics Education. The results of the interview explained that students need a long time in the thesis guidance process and make many times revisions. Then, the author interviewed 4 senior lecturer as the thesis supervisor. The results of the interview explained that the supervisor had conducted guidance according to the procedure, but the students still made the same mistake. A supervisor told, “They need 2 weeks just to determine problem of the research, then it takes a month or several times revisions just to compile background problem of the research in chapter one. Can you imagine how long they need to compile a proposal, conduct research, and write a thesis? More than eight months”. The author concluded that the situation caused by students’ low skill to compile
the logic-narrative contents of the proposal research. Even though all students had passed the course of Research Method in sixth semester.

Author re-conducted deep interview the students and obtained shocking results. The students got high score in course of Research Method, about grade A or B. However, after almost a year passed, at eighth semester they forgot all the lecturer explanations of the course. A student told, “Course of Research Method is different from the other course that contain theorems, formulas, and procedures, which when undertook once would be remembered. This course contains methods and technique in writing a proposal that we understood at the time, but now we forget. We might underestimated this course”. Then the author conducted that student’s low skill to compile a proposal research caused by they responses to the course is low.

Response is a reaction of a person to the stimulus (Skinner, 1996) and (Pierce and Stacy, 2001). Students’ responses to the learning process depend on the learning model and approach used by the teacher (Lestari, 2014). Positive response will be maintained if the students feels the benefit of the stimulus and feels comfort in it. At the end, response can become a habit of the students. By the definition, author propose a new way to learn which utilized Information and Communication.

Technologies (ICT). Author attempted to used blended learning by using ICT as an effort to improve students’ responses in the course of research method.

Basically, blended learning is a composite of on-line learning and face-to-face learning (Motlan, Sinulingga, Siagian, 2016). The approach may utilize a wide variety of media and technology. There are three advantages of using blended learning; (a) to improve learning activities, (b) to give flexible time and space, and (c) to reduce cost (Singh, 2003). The combination of learning between real classrooms and virtual classrooms can improve student morale and response (Gon and Rawekar, 2017). To optimize the design method of inquiry-based blended learning requires the development of inquiry based teaching materials and blended learning along with other supporting devices. Blended learning can be done using ICT especially on smartphones through the internet network.

Now, due to the rapid increase in smartphone users and internet users, a new paradigm shift in learning from the e-learning phase to m-learning. There are many benefits such as access anytime and anywhere, facilitate collaboration, and reduce barriers between students and teachers (Mohammed, Laila, and Hamza, 2012). WhatsApp is one of the instant messenger application in social networking that provide by android on smart phone. Usage of WhatsApp messenger made communication through mobile phones has become easier, faster and cheaper (Yeboah and Ewur, 2014). This application is in great demand for several reasons; freely available, simple messaging, able to share text, images and videos, and used as discussion forum. WhatsApp is the most popular messenger application among the college students (Jadhav, Bukhtar, and Mehta, 2013).

WhatsApp can be used in education for different purpose (Nirgude and Naik, 2016). It had researched that the application has potential to support the learning process and has implications for pedagogy, allowing direct access to many online sources, and student responsibility on their own learning (Gon and Rawekar, 2017). A learning process is mixed by combining class room activities with WhatsApp activities instead of conducting entire learning in the class for the course scientific research methods in information science and found very effective (Barhoumi, 2015).

As explained above, the author tried to enhance the student’s responses through blended learning with WhatsApp application. Research questions are; how to use blended learning
with WhatsApp application in course of Research Method? How students’ response about implementation blended learning with WhatsApp application.

2 Method

This study was conducted at Department of Mathematics Education, Faculty of Mathematics and Natural Sciences, Medan State University. The Subject was students in Class B year 2016 Department of Mathematics Education in fifth semester. In accordance with the background of the problem, this research was held at course of Research Method with 39 students. The students use National Standard Qualification based curriculum. Students have studied prerequisite courses in previous semester, namely Statistical Methods and Evaluation of Learning Achievement. Each of students has WhatsApp Application on their own smart phone. The object of this study was students’ response in course of Research Method. Description of research stages appear in Table 1.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey</td>
<td>Determining problems of research. This stage aimed to explore the perceptions of students about course of Research Method in order to get informations why students need long time to compile research proposal. The main cause was low students’ responses. Next, determining solutions to solve the cause of the problem through literature review, namely blended learning with WhatsApp Application.</td>
</tr>
<tr>
<td>Collecting data</td>
<td>At this stage, the authors implement blended learning on the subject of research. Lectures are conducted 2 times off-line and 2 times online. Lectures begin with offline learning (class room learning) then online learning (use whatsapp application) alternately. Data collection was done through; observation (during offline and online learning) and interviews outside lecture time.</td>
</tr>
<tr>
<td>Analysis</td>
<td>At this stage the author conducts an in-depth analysis of the results of observations and interviews.</td>
</tr>
</tbody>
</table>

The instruments that used in this study were interview and observations. The interview was given to the research subject at the survey stage and the data collection stage was more particularly after 4 times of learning. Interview questions are structured so that they are not only to reveal students' difficulties in compiling research proposals but also to reveal students' response in the course of research method. The observations was held during the lecturer (both of face-to-face learning and on-line learning with WhatsApp Application). The main elements observed from students are; student learning preparation, student participation in asking questions, and student participation in giving opinions on other students' questions.

3 Results And Discussion
At the survey stage, author observed 10 students and interviewed the students and several thesis supervisors. From the survey stage, it was found that the factor that caused students took long time to compile research proposals were low student responses in course of research method. This course not only explains various concepts about research but also teaches methods and techniques for compiling chapters I to chapter III of research proposals. The course is accepted by students in the 6th semester meanwhile students began to prepare proposals at the beginning of 8th semester. In theory, low student responses to the course had an impact on students' low ability in compiling research proposals. After conducting a literature review, the authors chose blended learning in the hope that the implementation of blended learning can enhance student responses to the course of research method.

**Usage blended learning with WhatsApp application in course of Research Method**

The implementation and data collection stage was conducted in the odd semester of Academic year 2018/2019, precisely in the course of research method. The author began the preparation of the implementation of blended learning in the inaugural week in Medan State University, precisely when the course contract was explained. The author gave technical instructions on how to implement blended learning where in this study the lecture was held two times face-to-face learning in classroom and two times learning with WhatsApp Application out of classroom. Details of blended learning lectures are; preparation on 23rd August 2108, first face-to-face learning on 30th August 2108, first learning with WhatsApp application on 6th September 2108, second face-to-face learning on 13th September 2108, and second learning with WhatsApp application on 20th September 2108. Both of face-to-face learning and learning with WhatsApp application, lectures use group discussion methods, where students in groups directly ask the lecturer. students formed study groups where 39 students were divided into 7 groups (there are four groups of six members and three groups of five members). Students formed group WhatsApp where all students put their group number before their name, show at Figure 1.
Both of face-to-face learning and learning with WhatsApp application, the lecturer would be outlined the course material 3 days before the lecture schedule through social network. In addition, students are also required to have a research method book. Students must learn and develop the material that has been given by the lecturer so that in the lecture schedule students just ask about the material to be studied.

**Students’ response about implementation blended learning with WhatsApp application.**

After the implementation of blended learning for four meetings, the author and the second author conducted depth interviews with all research subjects. Summary of students’ answers from each question is presented below.

*How is your preparation before learning?* Students prepare carefully a day before learning in both of face-to-face learning and learning with WhatsApp application. Each student read several books related to the material that has been given to them. They tried to understand the same concept with different perspectives, even they tried to make examples in the field of mathematics education.

*Did you understand all learning material?* Students understand the learning material well. This was because they had been given out line material three days before the lecture so they focused on developing the material.
Fig. 2. Students took photos of their reading material to discussed through WhatsApp application

What did you think about the implementation of blended learning? Students felt comfort and more flexible particularly learning with WhatsApp application. They can did discussion learning everywhere and in any condition. When learning through WhatsApp were conducted, students at home had more access to various reading materials than in classrooms where they can only brought limited reading material. They easily took photos of their reading material to discussed through WhatsApp application, show at Figure 2. They don't even need to take a bath before began to study. The students feels confident that they will not forget the material and explanation of this course for many years because learning with WhatsApp application leaves a digital imprint on their smart phones so that it can be learned the next two or three years.

4 Conclusions

Blended learning can be used through the WhatsApp application with careful preparation. Usage of Blended learning with WhatssApp application can enhance students’ responses.
References


Abstract. This research aims to look at the effect of an increase in student learning outcomes in the course Introduction to Accounting Prodi Economic Education first half of the school year 2018/2019 by applying cooperative learning models of Group Investigation (GI). This research is a classroom action research (PTK). The subjects were students Prodi Economic Education first half of the school year 2018/2019. This research was conducted in two cycles with four stages of implementation: planning, implementation, observation, and reflection. This research technique of data collection is observation and questionnaires. The results of this study indicate that Learning Activities Introduction to Accounting increase is after given action. The increase in the percentage of students in Accounting Learning Activities based on observations of the first cycle is 68% to 88% in the second cycle. The increase in the percentage of students in Accounting Learning Activities based on questionnaires of the first cycle is 83% to 93% in the second cycle. Accounting Student Achievement Learning Activities individually by category Very High and High based on observations was 55% in the first cycle increased to 85% in the second cycle. Achievement of Learning Activity Accounting student individually by category Very High and High-based questionnaire was 92% in the first cycle increased to 98% in the second cycle.

Keywords: Cooperative learning is a model of Group Investigation (GI); Learning outcomes; Introduction of accounting
1 Introduction

During this lack of analytical skills of students in terms of learning outcomes of students in the course Introduction to Accounting more due to the approach, methods or strategies which are used by professors in the learning process is still traditional and less to allow students to develop thought patterns in accordance with their abilities. Alternative solutions to address the problem of accounting student learning activity that is less than optimal is to apply the model of learning that stimulates the growth of activity. The learning model that can be applied is cooperative learning. Cooperative learning model is a model of learning by groups. According Miftahul Huda (2012: 33) in cooperative learning, students should be active participants and through the group can build learning communities help each other. Learning like this requires more active among students to work together to achieve group goals, to train students in expressing their opinions or ask questions, and carry out the tasks which it is responsible within the group.

Cooperative learning model that can be selected to address the problem of lack of classroom learning activities accounting in the first half Prodi Ekonomia Education dalah type Group Investigation (GI). According Miftahul Huda (2012: 124), the Group Investigation (GI) Students will be involved in activities such as making a summary, hypotheses, conclusions, and present a final report. Implementation of cooperative learning model Group Investigation (GI) in general is a lecturer in designing a fairly broad scope of topics and then divide it into sub-topics.

Implementation Group Investigation (GI) in the study is expected to improve student learning activities. Group Investigation (GI) require students to actively seek information from various sources, so that students not only rely on the lecturer as an information resource. Through Group Investigation (GI) Students are expected to be more active, namely in terms of recorded material, cooperation within the group, issued an opinion / ask, answer questions, participation in preparing reports and presentations, as well as enthusiastic about learning.

1.1 Formulation of the Problem

Based on the background that has been described above, the problem in this research is how to increase student learning outcomes by implementing cooperative learning model investigation group (Group Investigation) introductory accounting courses in the first semester of the academic year students of 2018/2019?

1.2 Research Purposes

Based on the formulation of the problem, so the research objectives to be achieved through this research is to analyze the improvement of student learning outcomes by implementing cooperative learning model investigation group (Group Investigation) on introductory accounting courses at the department of Economic Education.

2 Theoretical Study

2.1 Type Group Investigation
Model Group Investigation by Slavin (2005: 216) is a cooperative planning students on what is required of them. Members of the group take part in the planning of various dimensions and demands of their projects. Cooperative planning skills should be introduced gradually into the classroom and trained in a variety of situations before the class is carrying out a full investigation project ". It is intended that the Group Investigation will be successfully carried out if each member of the group participate actively participated from the beginning of the sampatactivities, namely in terms of planning, investigation, preparation of a report or presentation of the results of investigations should be done to be able to run smoothly.

2.2 Learning Outcomes

Nana Sudjana (2009: 3) defines student learning outcomes in is a change in behavior as a result of learning in a broader sense include the areas of cognitive, affective, and psychomotor. Learning Outcomes are the abilities of the students after receiving their learning experience. "From these processes will lead to new experiences by students. The realization of his own learning outcomes are skills that have been mastered by students, so that the learning outcomes is the ability of students receiving learning experience which looked at changes in behavior.

3 Framework Of Thinking

This study uses cooperative learning Group Investigation. Implementation of cooperative learning model of Group Investigation in general is a lecturer in designing a pretty broad scope of topics and then divide it into sub-topics. The class is divided into groups of 5-6 students. These groups can be formed based on shared interests, or familiarity. Students are given the freedom to form their own group. Each group chooses a topic and then conduct an investigation on the topic. As part of the investigation, students seeking information from various sources that offer a variety of ideas, opinions, data or solutions related to the topic being studied. Results of investigation of students then made a report and presented to the class. Lecturer in this study serve as resource persons and facilitators. Based on the above, frameworks can be described as follows:

![Fig. 1. Frame of work](image-url)
4 Research Methods

The method used in this research is descriptive qualitative technique Classroom Action Research (CAR), which was adapted from the model Kemmis and Taggart (1998). According to Stephen Chemish (in D. Hopkins, 1993, p. 44) action research is a form of reflective study by the perpetrators of the measures taken to increase the stability of the rational faculty of action in implementing the tasks, deepen understanding of the measures for what he does, and improving the conditions in which these learning practices do (Suryana, 2010: 43). The study consisted of a cycle of the cycle from planning, implementation, monitoring, and reflection does that aims to improve the learning process.

4.1 Operational Definition of Variables

- Cooperative Learning Model Group Investigation is one type of cooperative learning model. The class is divided into groups of 5-6 students. Students are given the freedom to form a group. Each group chooses a topic and then conduct an investigation on the topic. As part of the investigation, students seeking information from various sources that offer a variety of ideas, opinions, data or solutions related to the topic being studied
- Learning outcomes : The results of this study is to learn in introductory accounting learning outcomes obtained by the students after a group investigation methods applied in the form of a written test where the ability were measured students' cognitive abilities such as knowledge (C1), comprehension (C2), and application (C3).

4.2 Data Analysis Techniques

This research uses descriptive quantitative data analysis techniques. Data analysis was performed to analyze the Accounting Learning Activity data obtained from the results of observation and questionnaires. The data analysis was conducted at the end of the cycle, so it can be an increase or not.

5 Results And Discussion

The success of these measures can be seen from the observations of the learning process. If the results obtained are in accordance with the success criteria predetermined action then this action is declared successful.

Based on the above table can be seen in the improvement of learning outcomes Introduction to Accounting as a whole from the first cycle to the second cycle. Accounting Learning Outcomes percentage in the first cycle showed a 68%. This means Learning Outcomes Introduction to Accounting in the first cycle is not as expected. Learning Outcomes Introduction to Accounting in the second cycle shows the figure of 88%. This shows an increase in the percentage of Learning Outcomes Introduction to Accounting from the first cycle to the second cycle of 20%. Percentage of Learning Outcomes Introduction to Accounting in the second cycle have achieved the expected results of more than 75%.
Table 1. Improved student learning outcomes based on observations in the first cycle

<table>
<thead>
<tr>
<th>No.</th>
<th>Learning Activity Indicator Accounting</th>
<th>Cycle I</th>
<th>Cycle II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>record material</td>
<td>65%</td>
<td>85%</td>
</tr>
<tr>
<td>2</td>
<td>Cooperation within the group</td>
<td>75%</td>
<td>95%</td>
</tr>
<tr>
<td>3</td>
<td>Issuing opinions / ask</td>
<td>50%</td>
<td>80%</td>
</tr>
<tr>
<td>4</td>
<td>Answer the question</td>
<td>60%</td>
<td>85%</td>
</tr>
<tr>
<td>5</td>
<td>Participation in the making report and presentation</td>
<td>90%</td>
<td>95%</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>68%</td>
<td>88%</td>
</tr>
</tbody>
</table>

Table 2. Improved student learning outcomes based on observations on the second cycle

<table>
<thead>
<tr>
<th>No.</th>
<th>Learning Activity Indicator Accounting</th>
<th>Cycle I</th>
<th>Cycle II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>record material</td>
<td>75%</td>
<td>90%</td>
</tr>
<tr>
<td>2</td>
<td>Cooperation within the group</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>3</td>
<td>Issuing opinions / ask</td>
<td>65%</td>
<td>75%</td>
</tr>
<tr>
<td>4</td>
<td>Answer the question</td>
<td>75%</td>
<td>90%</td>
</tr>
<tr>
<td>5</td>
<td>Participation in the making report and presentation</td>
<td>95%</td>
<td>100%</td>
</tr>
<tr>
<td>6</td>
<td>Enthusiastic about learning</td>
<td>85%</td>
<td>98%</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>83%</td>
<td>93%</td>
</tr>
</tbody>
</table>

Based on the table above shows an increase of Learning Outcomes Introduction to Accounting as a whole from the first cycle to the second cycle. The first cycle indicates the percentage of Learning Outcomes Introduction to Accounting for 83%, while in the second cycle of 93%. This shows an increase of Learning Outcomes Introduction to Accounting for 10%.

Learning Outcome Indicators Introduction to Accounting in the questionnaire coupled with indicators that can not be observed directly by observation. The indicator is enthusiastic about learning. According to the table above, the percentage of indicators enthusiastic about learning as much as 85% in the first cycle increased to 98% in the second cycle. This shows that students have a high enthusiasm in the implementation of cooperative learning model of Group Investigation (GI).

Improved Learning Outcomes Accounting for results obtained from the observations and the results of questionnaires. One indicator of Learning Activity Accounting achieve a satisfactory result is an indicator of cooperation within the group. Indicators Activities Learning Accounting else also increased with the implementation of Cooperative Learning Model Group Investigation (GI). Cooperative learning has positive consequences that the students are given the freedom to be actively involved in their group. Pertisipan students must be active and help each other (Miftahul Huda, 2012: 33). Thus the implementation of cooperative learning model is indeed appropriate to improve student learning outcomes Introduction to Accounting Economic Education Semester I.
6 Conclusion

Improved Learning Outcomes Introduction to Accounting percentage of students overall based on observations of the first cycle is 68% to 88% in the second cycle. Indicators record material increased from 65% in the first cycle to 85% in the second cycle. Indicators of cooperation within the group increased from 75% in the first cycle to 95% in the second cycle. Indicators of expression / ask increase of 50% in the first cycle to 80% in the second cycle. Indicators answered questions increased from 60% in the first cycle to 85% in the second cycle. Indicators of participation in preparing reports and presentations by 90% in the first cycle increased to 95% in the second cycle.

Improved Learning Outcomes Introduction to Accounting percentage of students overall based on questionnaires of the first cycle is 83% to 93% in the second cycle. Indicators record material increased from 75% in the first cycle to 90% in the second cycle. Indicators of cooperation within the group remained at 100% in cycle I and II. Indicators of expression / ask increase of 65% in the first cycle to 75% in the second cycle. Indicators answered questions increased from 75% in the first cycle to 90% in the second cycle. Indicators of participation in preparing reports and presentations by 95% in the first cycle increased to 100% in the second cycle. Indicators enthusiastic about learning increases of 85% in the first cycle to 98% in the second cycle.

References

Efforts to Increase Interest in Writing Educational Research Proposals through the Development of 6 KKNI Assignments

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Abstract. The KKNI as a curriculum that has been implemented in Unimed is a manifestation of the quality and identity of the nation in learning with a quality and productive national education system. The main objective of this study is to increase students interest in writing educational research proposals through the development of 6 tasks in our curriculum. And also the relationship between Cjrs tasks, CB ideas and engineering. This research is a descriptive research. The sample taken is the fifth semester students of the first semester who manage the study program. Data retrieval is done by questionnaire and analysis of task results. The results of the questionnaire calculation at the beginning were only 9 people (30%) students who had a high grade to discuss the research proposal. At the end of the meeting, 6 questionnaires showed an increase in interest to 24 people (80%). From the results of the questionnaire calculation at the beginning, only 9 people (30%) students had a high interest to discuss research proposals. At the end of the meeting, 6 questionnaires showed an increase in interest to 24 people (80%).

Keywords: writing, educational research, KKNI

1 Introduction

The Indonesian National Qualification Framework (IQF/KKNI) is a qualification framework for Indonesian human resources that juxtaposes, equates and integrates the education sector with the training sector and work experience in a work ability recognition scheme that is tailored to the structure in various occupational sectors. The KKNI is an embodiment of the quality and identity of the Indonesian nation in relation to the national education system, the national job training system, and the national equivalence learning outcomes assessment system, which is owned by Indonesia to produce quality and productive national human resources.

The qualification description at each level of KKNI comprehensively considers a complete learning achievement, which can be produced by an educational process both formal, non-formal, informal, and independent experience to be able to do quality work. Learning outcomes also include aspects of national identity development which are reflected in the Pancasila, the 1945 Law and Unity in Diversity, namely upholding the five principles of
Pancasila and upholding the law and upholding a commitment to respect the diversity of
religions, ethnicities, cultures, languages and arts grow and develop on the earth of Indonesia.

Be advised that papers in a technically unsuitable form will be returned for retyping. After
returned the manuscript must be appropriately modified.

Medan State University (Unimed) is one of the universities in North Sumatra that has
implemented its learning curriculum with KKNI in accordance with national instructions in the
Minister of Culture and Regulation (Permendikbud) number 73 of 2013 concerning the
application of the KKNI in the Higher Education field. The Unimed KKNI learning curriculum
is supported by the six assignments that students must work on for one semester. The six
assignments are Routine Assignment (TR), Critical Book Review (CBR), Critical Journal
Review (CJR), Mini Research (MR), Engineering Ideas (RI) and Project Assignments. These
six assignments are intended so that students become human beings who are skilled with
science and have competence in their fields.

Many benefits can be obtained in the implementation of six assignments KKNI. Simply put
if students are able to review journals and criticize journals students are expected to be able to
analyze the needs of stakeholders based on the findings of the researchers. From the results of
the analysis made by the students, with the guidance of the student lecturers making this mini
research, the results of the problem-solving process were generated.

During this time the work done by students was limited to working on questions, creating
papers and assignment reports that were only presented in front of the class. Though many of
these assignments can be continued into a mini research that can be published. However,
students tend to prefer to talk than do research. Hal Senada juga diutarkan Rahmiati (2014)
mengenai minat menulis mahasiswa. To conduct a mini research, a preparation is needed
systematically in a research proposal. For students in writing research proposals, the biggest
problem is the lack of ability or willingness of students to write. Very few students have an
interest in writing research proposals, as seen from the low interest of students participating in
PKM. Lack of reference, motivation and time is also a problem that most students complain
about when asked to design a research proposal and conduct research.

The role of learning tools in the KKNI curriculum is very important to overcome them.
Each assignment of the six main KKNI assignments is directed to find the sub-section of the
learning objectives. In the research methodology course, students are expected to not only be
able to write a research proposal as a requirement for graduating courses. Through the
development of six KKNI assignments that are applied to learning and the synergy of the entire
KKNI assignment, it is expected to encourage students’ interest in making research proposals
carry out research. And it is also expected that the results of the research will trigger
motivation to publish the results of research in the form of articles.

In the course of the KKNI implementation, several previous studies to develop learning
tools have been carried out such as the development of KKNI-based textbooks by Tiur
malasari (2017), Development of KKNI-oriented learning tools in Islamic Economics courses
by Tri Effyanti (2018). Learning outcomes can be in the form of scientific work produced by
students can also improve the competitiveness of universities as studied by Rudi Salam, et al
(2017) with the title of research "Improving the Quality of Scientific Publications in
Supporting Higher Education Competitiveness"

2 Literature Review
2.1 The KKNI

The KKNI is a reference framework that is used as a measure in the recognition of
education levels. The KKNI is also referred to as a competency qualification framework that
can pair, equalize, and integrate between education and job training as well as work experience in the framework of providing recognition of work competencies in accordance with the work structure in various sectors (dokumen 001).

According to Perpres No. 08 of 2012, the KKNI is an embodiment of the quality and identity of the Indonesian nation in relation to the national education and training system owned by Indonesia. So, it can be concluded that the KKNI is a study program that requires the education system in Higher Education to clarify the profile of its graduates, so that it can be adapted to suitability in the perspective of community needs analysis.

Implementation of curriculum based on KKNI in Higher Education is needed because it can hone the potential of students to become agents who are broad-minded and have skills that are in accordance with the criteria needed in the community. In addition, the KKNI system makes it easier for universities to determine the ultimate goal as a result of the learning outcomes that have been taught.

Thus, the implementation of the KKNI makes students create more for various things. To improve the quality of university graduates, both lecturers and students must be able to participate in the implementation of KKNI curriculum.

### 2.2 Definition of Research

Research is an activity to search, record, formulate and analyze until compiling the report. A scientific research based on scientific characteristics namely rational, empirical and systematic. Here are some research terms according to some experts:

a. David H. Penny; Research is a systematic thinking about various types of problems the solution requires the collection and interpretation of facts.

b. J. Suprapto MA; Research is the investigation of a field of science that is carried out to obtain facts or principles patiently, carefully and systematic.

c. Sutrisno Hadi MA; In accordance with its objectives, research can be defined as an effort to find, develop and test the truth of a knowledge.

d. Mohammad Ali; Research is a way to understand something through investigation orthrough the search for evidence that emerged in connection with the problem, which done carefully so that the solution is solved.

Type of educational research based of the method

- a. Historical research
- b. Ex post facto research
- c. Experimental research
- d. Survey research
- e. Evaluation research (evaluation research)
- f. Policy research
- g. Naturalistic research
- h. Action research
- i. Research development

According to the type of data and analysis, educational research is divided into:

- a. Quantitative research
- b. Qualitative research
- c. Quantitative and qualitative combined research

According to the depth of analysis of research data

- a. Descriptive research
b. Explanatory research

According to the level of explanation (explanation)
   a. Descriptive research
   b. Correlational research (relationship)
   c. Comparative research

According to the place of research
   a. Field research (field research)
   b. Library research (library research)
   c. Laboratory research (laboratory research)

In Narbuko, etc (2012) and Sandjaja (2011)
Several stages that must be passed by the researcher are as follows (Suryana, 2010)

![Research Steps Implementation Diagram]

Fig. 1: research steps implementation

In educational research, the first stage that must be prepared in the study is arranged in a planned manner in the form of a research proposal (stage 1 to 3).

2.3 Ability to write a Research Proposal

2.3.1 Writing Ability

Writing is a creative process of moving ideas into writing symbols. More specifically explained that writing has three main aspects, namely the goals to be achieved, the ideas to be communicated, and the idea transfer system. In line with this explanation, (Akhdiah, 2003)
argues "writing ability is a complex ability, which demands a number of knowledge and
skills."

The writing consists of a series of meaningful letters. In written communication there are
at least three elements involved, namely the author as the messenger of the message or the
content of the writing, channel or medium of writing, and the reader as the recipient of the
message.

(Rahayu, 2007) explains more specifically, scientific writing concerns the language
aspect. Language narration must be complete and complete, complete, solid, clear, concise,
and strong / impressive. So, the writing has communicative disclosure techniques and shows a
rational frame of mind. Writing activities are very concerned with the elements of mind,
reasoning, and factual data because that is the form that results from writing activities in the
form of scientific writing or nonfiction.

Based on the opinions of the experts above, it can be concluded that writing is a form of
indirect communication by utilizing graphology, language structure and vocabulary so as to
produce coherent, expressive and understandable writing to express ideas, thoughts, or ideas to
others. Writing skills require experience, time, opportunity, and practice. Through practice and
practice continuously and regularly will improve writing skills.

2.3.2 Writing Educational Research Proposals

A proposal is a plan that is prepared for a particular activity or it can also be said as a plan
that is outlined in the form of a work plan (Hasnun 2004). Proposals are notified with
expectations and requests. Therefore, in a proposal clearly explained what is planned and
needed. To be more convincing to the reader, sometimes a proposal is equipped with
pictures, photos, activity schedules, maps, graphics or other things needed so that the reader
knows and understands the activities that will be carried out. This section must be in two
columns.

Interesting proposals will attract people to read them. If the interested person is really
interested, then this is the success of proposal writing. The purpose of proposal writing can
vary. Among them is to get approval and get funding and facilities assistance (Hasnun, 2004).

In general, the following are proposals commonly proposed by people (Susanto, 2010):

a. Business proposal (business establishment proposal)
b. Project proposal (proposal for submission of funds to donor agencies)
d. Activity proposals (proposals for seminars, training and competitions)

3 Research Methods

According to Moh Nazir (2011), the scope of the research method is the techniques and
procedures used in the study. Therefore, the determination of research methods is closely
related to the tools and steps of research work.

This research is a descriptive study, which is the research that analyses the data only to the
variable description one by one. Description means giving systematically and factually about
certain characteristics in a particular population. According to Sukmadinata (2006), explaining
descriptive research is a form of research aimed at describing existing phenomena, both natural
phenomena and man-made phenomena. The copyright form is located on the authors’ reserved area.

The learning model applied is discovery learning. Discovery is a learning model developed based on the view of constructivism. This model emphasizes the importance of understanding structures or important ideas for a discipline, through active involvement of students in the learning process. According to Bruner in Winataputra (2003) meaningful learning can only occur through discovery learning. In order for learning to be meaningful and have a strong information structure, students must actively identify the key principles that they find themselves, not just accept explanations from the teach.

The subject of this research was the fifth semester mathematics education students who took the research methodology courses, namely the mathematics education extension class as many as 30 people.

The instrument in this study is a questionnaire to measure student interest in writing proposals and analyzing 6 synergistic KKNI assignments.

3 Result And Discussion

This study only lasted for 6 meetings with the ultimate goal that students have a high interest in writing proposals and producing proposals at the 6th meeting through the development of KKNI assignments.

This research was conducted through several stages of activities accompanied by giving questionnaires to measure and increase student interest in writing research proposals. Furthermore, the data is integrated into a research result.

In the early stages students are encouraged to be able to study independently while still receiving intensive guidance from lecturers. Students are introduced to the material and the ultimate goal of learning. Interaction is done to see the characteristics of students. In addition, before learning is carried out students are given a questionnaire to indicate students' interest in writing proposals. Some indicators that are seen to measure student interest are (1) concentration of attention (2) personal experience (3) motivation to write (4) motivation to read (5) general knowledge (6) emotions in expressing thoughts. Questionnaire consists of 23 positive statements (interested) and 18 negative statements (not interested).

The questionnaire is given at the first learning meeting after getting a college contract. The students emphasized that giving questionnaires did not affect the final score. From the raw score, the results of the questionnaire at the beginning of the meeting were obtained as follows:

<table>
<thead>
<tr>
<th>Interest criteria</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>High</td>
<td>9</td>
<td>30</td>
</tr>
<tr>
<td>Sufficient</td>
<td>14</td>
<td>46.6</td>
</tr>
<tr>
<td>Low</td>
<td>7</td>
<td>23.3</td>
</tr>
<tr>
<td>Very low</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
From the data above shows the beginning of more than half the number of students do not have a high interest in writing proposals. From the results of the interaction and analysis of questionnaire data obtained several reasons which in general are the lack of knowledge and ability to pour the contents of the mind in writing. Students prefer to pour their thoughts in the form of presentations. Students do not feel the need to write if they do not face a thesis, even though there are enough opportunities for students to show their thinking creativity in student creativity research held every year.

At the second meeting, students were given basic material on research. Routine assignments that are given only to work on LK are given during learning activities. To encourage making the initial draft of the proposal is given the assignment of Critical Journal Review. Through this assignment students are asked to look for 5 journals related to general problem variables in learning. From this CJR, students are asked to analyze problems that often occur in the classroom supported by experience when students do internship I and internship II. Students are given the opportunity to take 1 week to complete their assignments. At this stage students identify, choose and formulate problems.

At the third meeting, discussions were carried out on the results of the CJR assignments. Departing from the problems obtained by students, students were asked to find a way out of the problems they found. And this is part of the development of the Rekaya Ide assignment. Students are given one week to work on engineering ideas. At this stage students form the mindset of the problems found and formulate hypotheses.

At the fourth meeting, an evaluation was carried out from the previous assignment. By continuing to connect between CJR and RI duties, students are encouraged to find literature literature from the previous discussion of CJR and RI. This assignment is stated in the Critical Book Review (CBR) assignment.

At the fifth meeting, an evaluation of the previous assignment assignments, CJR, RI and CBR was conducted again. The lecture material is still provided during the meeting so it does not miss the basic knowledge material that must be possessed in writing a research proposal. From the results of the assignments obtained from the 4 previous meetings students were asked to summarize all findings into a research proposal. The research proposal consists of introduction, literature review and research methods.

At the sixth meeting, an evaluation of the previous assignment was still carried out. at this meeting students were given a questionnaire to see interest in writing. The following results are obtained:

<table>
<thead>
<tr>
<th>Interest criteria</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>High</td>
<td>18</td>
<td>60</td>
</tr>
<tr>
<td>Sufficient</td>
<td>5</td>
<td>16,6</td>
</tr>
<tr>
<td>Low</td>
<td>1</td>
<td>3,3</td>
</tr>
<tr>
<td>Very low</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Overall results for six weeks may change. At the initial meeting the number of students who had high interest in writing a research proposal was only (9 person) 30%. after going through the program by developing program assignments in the KKNI, especially on the
assignments of CJR, CBR and RI. It appears that the number of students who have high interest in writing research proposals to be 24 person or 80%. From the results of the interaction as the process of the previous meeting, students with the relevance of the assignments of CJR, CBR and RI, they were easier in pouring context and creative ideas into writing forms as a proposal from the research.

5 Conclusions

Through the development and synergy of the 6 KKNI assignments, namely collaboration between CJR, CBR and RI assignments can increase students' interest in writing educational research proposals.

From the results of the questionnaire calculation in the beginning only 9 person (30%) students had a high interest in writing a research proposal. At the end of the meeting 6 questionnaire analysis showed an increase in interest to 24 person (80%). With the synergy of 3 KKNI assignments, it is easier for students to write proposals.

The weaknesses in the results of this study are because this research is a preliminary study from another study, not all KKNI assignments are integrated. the reason is that the next stage is still needed so that the implementation of the research proposal is done through the synergy of the Mini Research and Project assignments. In addition, in short the study time, research proposals made by students were not too maximal. It was found that there were still many students who had not followed the procedure to write a research proposal. So far it is good enough as long as students are motivated to write which is the basic capital in being a potential human resource.

References

Improve Students’ Generic Science Skill and Self-Regulated Learning Using Cooperative Learning Model Based on Malay Culture

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Abstract. The purpose of the study were to improve students’ generic science skill and self-regulated learning using cooperative learning model based on Malay culture on physics learning. This research is an action research consisting of planning, action, observation and reflection stages. The instrument used in this study is lesson plan and student worksheet were based on Malay Culture, instrument generic science skills and questionnaire self-regulated learning. Subjects in this study were students of class XII MIA II MAN 2 Tanjung Pura. The result of the research shows that the skills of physics generic science and self-regulated learning by applying the cooperative learning model based on Malay culture had increased.

Keywords: Generic Science Skill, Self-Regulated Learning, Cooperative Learning Model, Malay Culture.

1 Introduction

Physics learning must be confronted with a new paradigm, which gives students direct experience to understand and guide them to use scientific knowledge. The ability to think and act on the scientific knowledge possessed by the scientific framework is called generic science skills (Liliasari, 2007). Generic science skills is known as core skills, essential skills and basic skills, and is something that is needed in the work (Yeung et al., 2007). Generic science skills help students to learn science and show how well the learning. But in reality on the ground, students' conceptual understanding is still low so students have not mastered generic science skills.

Science generic skills in physics course that can be develop are: direct observation, indirect observation, sense of scale, symbolic language, logical consistency, causality, modeling, logical inference and abstraction (Viajayani et al., 2013). Through generic science skills, students will be accustomed to scientific thinking that supports understanding of concepts (Siswantoet al, 2016). Generic science skills need to be trained for students to build personality and "high-level thinking". Generic science skills as the basis for high-level thinking processes that include creative thinking skills, critical thinking skills, decision making and problem solving everyday life (Liliasari, 2007; Sutopo, 2013).
The learning process that does not involve students actively also results in low student self-regulated learning. Self-regulated learning is defined as thoughts, feelings, and behaviors that are self-generated and planned that are adjusted to performance feedback to achieve their own set goals (Zimmerman, 2000; Alexiou & Paraskeva, 2010). Self-regulated learning needs to be improved especially in physics learning so that students have the responsibility to regulate and discipline themselves in learning and students can determine their learning goals and develop learning plans to achieve these goals. Students who have Self-regulated learning to work on learning tasks in an attentive and confident manner, proactively set goals, and develop a plan to achieve these goals (Alexiou & Paraskeva, 2010). Self-regulated learning helps prepare students for lifelong learning and the important ability for students to transfer skills, knowledge, and abilities from one domain or setting to another (Shuy, 2010). In addition to training skills, a good learning process must also be able to train student’ self-regulated learning. Students are said to have been able to learn independently if they have been able to do the task of learning without dependence on others.

Cooperative learning is a learning model where students learn and work in small groups collaboratively with heterogeneous group structures (Slavin, 2005). This learning model is a form of learning based on constructivism. Cooperative learning is a collaborative learning strategy in which groups of small students with different levels of ability work together to achieve common goals or complete group assignments and goals and tasks that they cannot solve themselves (Hossain & Tamizi, 2013; Tiantong & Teemuangsai, 2013; Gillies, 2016).

Cooperative learning models train students to talk and think and solve problems together, which has been shown to contribute to the development of individual reasoning and problem solving (Gillies, 2016), which can train students in building conceptual knowledge. A series of activities in constructing concepts are indicators of generic science skills, so that learning devices developed with cooperative learning models can enhance students' generic science skills (Harahap et al., 2017). In line with the results of Mohamed & Jaafar (2009) research that cooperative learning can be used as a learning strategy to enhance the generic science skills.

Culture is knowledge that is owned by a group of people, which is related to their behavior. Physics is closely related to culture, especially in Indonesia with cultural wealth, so that this integration not only creates meaningful and interesting physics learning but also preserves national culture and instills good character for students. Indonesia with a rich culture has the opportunity to be explored, not only to engage students in culture, but also to maintain students' cultural identity in the face of globalization (Rahmawati, 2017).

The results of observations at MAN 2 TanjungPura also showed that physics learning not links the material that can be used as a culture-oriented science learning to explain natural phenomena around students, it is necessary to hold the learning models which is expected to help the teacher in linking the material which is so broad with real-world situations. The cooperative learning models based on culture is carried out in order to foster students' appreciation of culture and develop understanding of students' physics concepts that are integrated in character. The application of based learning models based on Malay culture can also improve students' physical problem solving skills and self-regulated learning (Ummi et al., 2017).

The cooperative learning models in etnophysic was designed by incorporating local cultural facts in the physics material taught. Integrating these cultural facts into learning is expected to make it easier for students to understand problems because they are close and related to students. Especially for North Sumatra, one of the cultures that can be integrated into physics learning is Malay culture. Based on their identity and identity, the so-called Malay is Malay resam, uses Malay language and is Muslim, which is not bound to
genealogical factors (blood relations) but united by the same culture (Arifin, 2010). The value system that has been built in Malay has been proven to be able to make Malay dominate civilization in the archipelago, the concrete evidence is the use of Malay as an Indonesian language that is used today (Mahayana, 2009). The integration of Malay culture in learning physics can be an effort to preserve Malay culture.

2 Literature

2.1 Cooperative Learning Model Based on Malay Culture

The cooperative learning model based on Malay culture is a learning process that applies the steps of the cooperative learning model by incorporating aspects of Malay culture into learning, the facts of the Malay culture environment in the problems solved in learning and incorporating patterns of social interaction between Malay culture in the learning process. Integrated learning with culture is needed to enrich students' knowledge, improve students' communication skills and social skills, which enable students to face global challenges and also students closer to their cultural environment (Aufa et al., 2016).

2.2 Generic Science Skill

Generic skills are basic skills that students can have when experiencing the learning process in school. Generic science skills are basic (generic) skills needed to train students' scientific work so as to produce students who are able to understand concepts, solve problems, and other scientific activities, and are able to learn by themselves effective and efficient (Rosidah et al., 2017). Sudarmin (2012) stated that generic science skills consist of 10 basic skills, including: (1) direct observation, (2) indirect observation, (3) sense of scale, (4) symbolic language, (5) logical frame, (6) logical consistency, (7) causality, (8) modeling, (9) logic inference and (10) abstraction.

2.3 Self-Regulated Learning

Self-regulated learning is regulates a person's ability to understand and control one's learning environment. The ability to self-regulate includes goal setting, self-monitoring, self-instruction, and self-reinforcement (Shuy, 2010). Zimmerman (2000) defines it as a learning process that occurs because of the influence of thoughts, feelings, strategies, and behaviors that are oriented towards achieving goals.

Tanriseven (2014) asserts that the learning process that is realized through student self-regulated earning includes; opportunities provided to individuals in managing their learning process; exercises used to activate knowledge; elaboration provides new learning relationships with early learning; linking past knowledge with new ones; time and environment control where students can manage their own environment and strategies in learning. Zimmerman (2000) states Self-regulated learning consists of three stages, namely:

(1) Preliminary thinking; (2) Performance and (3) Self-reflection.

3 Research Methodology

This research is an action research consisting of planning, action, observation and reflection stages.
3.1 Subject and Object

Subjects in this study were students of class XII IA II MAN 2 Tanjung Pura academic year 2018/2019, where as the object of this research is application of cooperative learning model based on Malay culture, generic science skills and self-regulated learning.

3.2 Instrument

The instruments of data collection in the research are observation sheet, and questionnaire. Observation sheets are used to determine the implementation of learning, assessing the competence of attitudes, and skills. Filling the questionnaire to obtain data needs analysis and performance analysis. The improvement of generic science skills and self-regulated learning using the N-Gain by Hake (1999).

4 Result

The result of the research is the students’ generic science skill and self-regulated learning using the cooperative learning model based on Malay culture on physics material. The results of research and discussion as follows:

Planning Stage aims to plan and develop physics learning devices using the cooperative learning model based on Malay culture on physics material. The learning devices used in this study is lesson plan and student worksheet were based on Malay Culture, instrument generic science skills and questionnaire self-regulated learning. This learning device is ready to be tested on action and observation stage.

The action and observation stage was carried out to determine the improvement of students’ generic science skills and self-regulated learning at each meeting during four meetings. The action stage, the implementation cooperative learning model based on Malay culture applied using lesson plan and student worksheet which has been designed at the planning stage. The observation stage, the overall cooperative learning model based on Malay culture implementation is 4.34, which, if referenced to the predefined instruction learning device criteria, then the average value of 4.34 is in good category (4 <P ≤ 5).

Table 1. Score of Implementation of Physics Learning

<table>
<thead>
<tr>
<th>Average every meet</th>
<th>Total Average</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.11</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4.32</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4.36</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4.57</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.34</td>
<td>Good</td>
</tr>
</tbody>
</table>

Data generic science skill of student was analyzed to know improvement of generic science skill of student by comparing mean score of student obtained result of generic science skill of student each meeting.

Table 2. Improvement Generic Science Skills

<table>
<thead>
<tr>
<th>Average every meet</th>
<th>N-Gain</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>46.34</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>60.65</td>
<td>Low</td>
</tr>
<tr>
<td>3</td>
<td>69.53</td>
<td>Low</td>
</tr>
<tr>
<td>4</td>
<td>79.64</td>
<td>Medium</td>
</tr>
</tbody>
</table>
Based on Table 2, the generic science skill of students at each meeting has increased so that it can be concluded that the application of physics learning devices using cooperative learning model based on Malay culture can improve students' physics generic science skill. Generic science skill data was obtained based on the increase of students' generic science skill value in each meeting, which was assessed based on indicators of generic science skill.

Data self-regulated learning of students was analyzed by comparing mean score of student self-regulated learning of result before and after applying cooperative learning model based on Malay culture.

Based on Table 4 and Table 5 above, it can be concluded that the average of questionnaire results of student cooperation increased from pretest to posttest result. Increasing students' self-regulated learning in every aspect of indicators after the treatment of physics learning devices using cooperative learning model based on Malay culture.
5 Conclusion

Based on the result of analysis and discussion in this research, it can be concluded that: There is improvement of students’ generic science skill and self-regulated learning after applying cooperative learning model based on Malay culture.

References


The Use and Material Development of Audio-Visual Media on www.marmiton.org Website in French Listening Skill

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Abstract. Listening learning (production orale) based on e-learning by utilizing the website www.marmiton.org includes recipes in French to train students' understanding in vocabulary mastery and listening skills. This learning media is taught in an audio-visual manner that contains two language skills, namely reading and listening. This learning media is one of the supporters of the teaching and learning process which is very varied. This study aims to (1) describe the steps in the application of audio-visual media on the www.marmiton.org website in learning the listening skills of French, and (2) describe the feasibility of the material and the development of audio-visual media material on the www.marmiton.org website in learning French listening skills, and (3) describing student learning outcomes using audio-visual media on the www.marmiton.org website in learning French listening skills. The method used in this study is a pre-experimental method with one shot case study research design. The sample of the study is consisted of 30 students of the French Education Program, in the Language and Arts Faculty, UNIMED. The data was obtained through observation during the learning process took place, showing that 75% of the students were very interested in using this learning strategy because they could clearly see the form of the ingredients accompanied by new terms and vocabulary in French-language recipes.

Keywords: Development, audio visual media, listening

1 Introduction

The progress that continues to develop in the world of modern information and technology now influences the introduction of regional or cultural characteristics so that the pace of tourism in Indonesia is increasing. This can be seen by the large number of foreign tourists who are interested in Indonesia so that they come to Indonesia for travel or work and stay in Indonesia which they recognize based on the technology that is developing at this time. According to the official Indonesian Central Bureau of Statistics website, the number of foreign tourist arrivals to Indonesia in February 2018 rose by 17.36 percent compared to the number of visits in February 2017, from 1.02 million visits to 1.20 million visits. Based on these statistical data, it can be concluded that the world of Indonesian tourism is developing very rapidly and of course the Indonesian people are required to be proficient in foreign languages so that they can become guides who can improve the economy. Therefore, foreign language learning is very necessary, especially foreign languages for tourism. One foreign language that can be learned is French.
In language learning, learners can learn four language skills, namely: listening, speaking, reading and writing. Among the four language skills, listening skills are very important language skills, this is because listening skills can make learners know and understand what is the purpose of communication. In terms of listening skills, especially listening in French, learners will be required to understand what they see to get clear information in order to establish good communication.

The teaching of Français pour Objectif Spécifique (FOS) in the French Study Program studied several fields, such as the secretariat, banking, hospitality, restaurant and French culture. For students of language education, listening is not something that is rarely learned, in the field of restaurants in particular. Students tend to listen because there are many menus and ingredients that they must understand come from France. They must learn about typical French food recipes found in various media, both in print media such as recipe books, radio and video tutorial media that are available from various internet pages which certainly require listening skills to get clear information about the recipes they want to learn. But this research will also develop the material of the page by referring to culinary that has the peculiarities of North Sumatra.

Along with video tutorials that are often performed by learners, there are obstacles in translating new vocabulary from the original language into the source language. This makes the instructors required to be able to make learners interested in learning. Difficulties are not only experienced by learners but the same as faced by teachers, especially in delivering learning material to be more easily understood. Being a teacher is required to be creative and full of innovation so that it can stimulate learners to be more active in learning activities. One way that can be done by the teacher is to use learning media that can attract the attention of learners. Audio-visual media are media that contain sound elements called "audio" and elements of "visual" images.

Based on the scores obtained by students on listening skills, the competence of third semester students was still below average, especially in listening skills. The following are student learning outcomes on listening skills.

<table>
<thead>
<tr>
<th>Students</th>
<th>Mid-term test score</th>
<th>Number of Students (%)</th>
<th>Final test score</th>
<th>Number of Students (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester 3</td>
<td>80 – 100</td>
<td>20</td>
<td>80 – 100</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>70 – 79</td>
<td>40</td>
<td>70 – 79</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>60 – 69</td>
<td>30</td>
<td>60 – 69</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>... – 59</td>
<td>10</td>
<td>10 – 59</td>
<td>10</td>
</tr>
</tbody>
</table>

Based on the above scores, the authors developed technology-based learning media supported by the KKNI curriculum that has now been applied at Medan State University, which requires the use of technology according to the concepts and principles of learning. Therefore, the development of listening listening media is expected to improve listening skills.

This media has more capabilities, because audio-visual media relies on two senses at once, namely the sense of hearing and the sense of sight. With these media, it is hoped that it can generate motivation in learning and clarify the material presented. Audio-visual media that
is often found in daily activities in the form of cooking videos contained in a page. Without realizing it, videos that are often watched like cooking shows can be a learning medium. This certainly can help learners to learn more effectively.

2 Literature Review

2.1 Learning Media

Learning media is a tool for teaching and learning. That is everything that can be used to stimulate the mind, feelings, attention and abilities or skills of students so that it can encourage the learning process in students (students / students). According to Rayanda Asyar (2012: 8) Learning media can be understood as everything that can deliver or channel messages from sources in a planned manner, resulting in a conducive learning environment where the recipient can do the learning process efficiently and effectively, while Munadi (2008: 7) giving understanding that learning media is everything that can deliver and channel messages from sources in a planned manner so as to create a conducive learning environment where the recipient can carry out the learning process efficiently and effectively.

2.1.1 Benefits of Learning Media

According to Arief, et al (2009: 17) learning media have the following benefits:

1. Clarify the presentation of a message so that it is not too verbalistic
2. Overcoming the limitations of space, time and sensory power
3. Using learning media appropriately and varied can overcome students' passive attitude. In this case the learning media is useful for:
   - arousing learning passion.
   - allows direct interaction between students and the environment and reality.
   - allows students to learn by themselves according to their interests and abilities.
4. With the unique nature of students as well as different environments and experiences, while the curriculum and materials are the same for each student, this problem can be overcome by learning media in their abilities:
   - give the same stimulant.
   - equate experience.
   - raises the same perception

2.2 The www.marmiton.org Website as an Alternative Learning Media

The www.marmiton.org page is a site page that functions as an audio-visual about recipes that are packaged in French. The page entitled "marmiton" is a noun that comes from the French language itself and has a meaning as "cook". On the page www.marmiton.org there are various recipes that are available in French and certainly can be a medium of learning, because through the language that is heard and read, the page becomes a good learning media, especially for French learners. In this case, researchers used the page www.marmiton.org as a learning medium to test language skills listening to students of the French Language Education Program, Language and Arts Faculty, Unimed.
2.3 Listening as a Language Skill

2.3.1 Definition of Listening

Listening skills are part of language skills that are essential, because listening skills are the basis for mastering a language. Young children who begin to learn language, begin by listening to the series of sounds they hear, learning to imitate, then try to apply them in conversation. After entering school, the child learns to read from recognizing the letter or sound of the language shown by the teacher to say the sounds of language or the activity of imitating the sounds of the language. In this situation, the child has begun to write. And so on until the child can express the contents of the mind through both oral and written language, and be able to understand the contents of other people's thoughts expressed through both spoken and written language.

Listening or listening is a skill to understand spoken language that is receptive or accepting, as stated by Brooks in Tarigan (2008: 4) that listening means receiving information from verbal sources or in other words listening means receiving information from speaking activities.

According to Heryadi (2008: 7), "Listening activities are actions or mental activities in capturing, understanding, weighing, and responding to messages contained in symbols of oral language."

3 Methodology

The method used in this research is education and development research or often known as Research and Development (R & D). This research uses research and development methods or commonly referred to as Research and Development. Sugiyono (2011: 297) states that Research and Development is a research method used to produce certain products, and then tests the effectiveness of these products.

Borg and Gall (1979: 772) stated that "R & D processes are used to develop and validate educational products." Based on these definitions, this research relies on efforts to produce and validate an educational model namely Audio-Visual Media on the www.marmitonpage.org website in French Language Listening Skills Learning.

Borg and Gall further explained that what is meant by educator products include two types, namely in the form of material objects, such as textbooks, films for teaching, and so on as well as building procedures and processes, such as teaching methods or organizational methods of teaching. The form can be in the form of learning goals, methods, curriculum, and evaluation, both hardware and software, both the method and procedure.

Based on this understanding researchers want to do this type of R & D research to develop a teaching material in contextual learning. The teaching material is based on contextual learning using procedural development models. Setyosari, (2015: 284) procedural model is a descriptive model that describes the flow or procedural steps that must be followed to produce a particular product.

In this study, the researchers wanted to describe the steps in developing Media Audio-Visual on the www.marmiton.org page in French Language Listening Skills Learning. Therefore researchers used procedural models. Audio-Visual Media on the
www.marmiton.org website will be tested on students of the French Education Study Program of the Language and Arts Faculty, UNIMED.
3.1 Research Procedure

The developed media were analyzed using the validation of the material expert team and media design and assessment using rubrics developed by researchers by modifying expert opinions. Criteria for teaching materials based on the suitability criteria of Media Audio-Visual on the www.marmiton.org website in French Listening Skills Learning.

3.2 Research Location

Research location is a place used by researchers to conduct research. The location used in this study is the French Education Study Program, Language and Arts Faculty, Medan State University.

3.3 Draft Audio-Visual Media Development

The researcher adapted the development applied by Borg and Gall with the reason that the development plan had the aim of developing and validating the product. Visual Media Development is programmatically prepared with preparation and planning in the following steps:
1. Research and information gathering
3. Develop preliminary forms of Media Audio-Visual products.
4. Trial (Expert Validation)
   a. Limited Field Test
   b. Field Test
5. Revision I of the Main product based on expert validator advice
6. Upload Network

4 Discussion

In accordance with the purpose of the study, to develop learning media through audio-visual media and to produce a media. As the basic material of the media is data related to listening skills supported by audio-visual media on the page www.marmiton.org. The discussion of this paper contains the results of data collection and then mapped in the table. The preliminary data presented are related to KD-GPA and Material as follows.

<table>
<thead>
<tr>
<th>Basic Competence</th>
<th>Indicators of Competence Achievement</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Able to understand meaningful words and phrases related to</td>
<td>Understand the words related to recipes</td>
<td>Video resep masakan Prancis</td>
</tr>
<tr>
<td></td>
<td>Understand the phrases related to recipes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Able to do a cooking recipe demo</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Able to explain things related to recipes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Able to understand words related to recipes in French A2 level</td>
<td></td>
</tr>
</tbody>
</table>
The material contained in the table above is the second material in listening learning. The data needed in pedagogic elements are indicators and materials that will be developed and require knowledge in understanding the vocabulary contained in an audio-visual so that it can be practiced according to the indicators to be achieved.

5 Conclusion

This paper is the result of the initial data collection which still contains the content features of the teaching materials to be developed. In one chapter there are Basic Competencies and five Indicators of Achievement of Competence. Based on audio-visuals on the www.marmiton.org page, it will be filled with local cultural recipes in French that will increase knowledge about new vocabulary and innovation for students in learning listening skills.

References

Analysis Effects of Exposure time on Long Steel Stainless Steel Material Proper which Experience Stress Corrosion Cracking

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Abstract. The experiment are executed by using the Spring Loaded Fixture type in accordance with ASTM G49 and E 292 for the experimental method and specimen geometry each. Initiation of SCC failure begins with pitting corrosion and thinning attacks to date stress reaches the highest strength Furthermore, in this case. This experiment is aimed to investigate characteristics of SCC Austenitic stainless steel AISI 304, AISI 316, and 316L in Glycerol solution with four variations of chloride concentration, namely 50, 6,000, 9,000, and 12,000 ppm, two types of initial tensile stress, namely 50 % and 70% Yield Strength from each material test, and 150°C constant temperature. Failure occurs in catastrophic and brittle (trans granular) fractures. AISI 304 is more vulnerable to all experimental conditions. All material tests did not fail for 50ppm chloride concentration up to 556 hours of exposure time. The more concentration and chloride concentration is given, the crack speed becomes higher by shortening the failure time.

Keywords: Effects, Austenitic stainless steel, Stress Corrosion Cracking, characteristics

1 Introduction

Corrosion is derived from Latin corroedere which means "gnawing" that is degradation of material due to chemical reaction between material and its environment. Karat is part of corrosion which only happened to iron metal (Fe) which react with environment, like water and outside air.

Discussion of corrosion involves various disciplines, such as physics, chemistry, metallurgy, electrochemistry and material engineering. The nature and shape of corrosion is always associated with all or part of the discipline . The process of corrosion in a material is unavoidable, in which we can only reduce or slow down the process. The technical approach taken in assessing corrosion properties has helped researchers to reveal in detail the characteristics and properties of corrosion, so that it has found some technologies and systems in controlling corrosion and the side effects it causes. This has been able to reduce the loss in humans. Metallurgical engineering by researchers has found a variety of material variations that are "immune" to certain corrosion in accordance with its usefulness, so that directly has contributed greatly to the industry. One form of corrosion of some form of corrosion in question is the Stress Corrosion Cracking (Cracking) which is abbreviated as "SCC". SCC is a
specific corrosion and one of the causes of material damage that is classified as dominant in a material structure, so experts have categorized SCC failure into a cause of failure calculated in designing a construction.

Although intensive SCC research has long been done, but the results obtained to date only come to the stage of understanding of the process of the form of corrosion, while the control efforts undertaken still not give maximum results. The use of Austro-stainless Steels used in the construction of Glycerol distillation tanks and their piping is one of the cases observed. The failure occurring in this vessel for a period of time is an SCC failure. Most of the failures that occur in the welded connection area that has the largest residual stress due to the manufacturing process, such as bending and welding process. The SCC study mostly used the precracked specimen method to determine the crack growth rate against KISCC stress intensity, the elastic strain specimen using various test specimens, such as C-ring, doublebeam, O-ring to determine the correlation of failure time to the given strain, and plastic strain specimen, such as U-bend to determine the effect of plastic strain on failure time. The three methods each have advantages and disadvantages. Testing by method, precracked is done by considering the disability of the specimen, the elastic strain of the specimen will result in a decrease in stress, and the specimen strain platter is limited to test specimen that has undergone plastic deformation.

Testing with constant load method in assessing SCC problem needs to be done to find the failure characteristics due to the effect of voltage change on failure time, crack speed, and crack length. (constant load) in assessing the SCC problem needs to be done to find the failure characteristics due to the effect of voltage changes on failure time, crack speed, and crack length. Testing by this method will yield results appropriate to the conditions as the case examples mentioned above. Testing with constant load method further encourages continuous crack growth until the specimen fails and the failure occurs in complete (complete) relative to testing with elastic and plastic strain.

2 Research Methodology

SCC testing can basically use various forms of test specimens and is highly dependent on the purpose of testing to be achieved. The purpose of this study has been described in 1.3 above, so that the form of constant tensile load testing is deemed appropriate to obtain the graph of the test results in question. ASTM G 49 explains that the uni-axial voltage method for SCC testing gives results that are in accordance with SCC properties, and notched specimens of tensile test specimens can be used as standard materials for SCC testing.

The dimensions and geometry of the specimens as shown in Figure 1 are based on ASTM E 292 (Time for Rapture Notch Tension Test). To obtain the voltage concentration, then the specimen is given a notch. The material of the test object used has specifications as contained in Table 1 and Table 2. The table shows the mechanical properties obtained based on tensile testing performed and the chemical composition obtained from the Inspection Certificate issued by the TÜV Material Certification Agency.
Fig. 1: Geometry of Test Material according to ASTM E 29

Table 1: Mechanical Properties of Test Tests Using ASTM E-8 Tensile Test

<table>
<thead>
<tr>
<th>Material Type</th>
<th>C  %</th>
<th>Cr %</th>
<th>Mn %</th>
<th>Mo %</th>
<th>Ni %</th>
<th>P %</th>
<th>S  %</th>
<th>Si %</th>
</tr>
</thead>
<tbody>
<tr>
<td>AISI 304</td>
<td>0.04</td>
<td>18.3</td>
<td>2</td>
<td>-</td>
<td>0.65</td>
<td>8.2</td>
<td>0.045</td>
<td>0.19</td>
</tr>
<tr>
<td>AISI 316</td>
<td>0.08</td>
<td>17.1</td>
<td>1.4</td>
<td>2.03</td>
<td>0.04</td>
<td>10.13</td>
<td>0.045</td>
<td>0.09</td>
</tr>
<tr>
<td>AISI 316L</td>
<td>0.025</td>
<td>16.966</td>
<td>1.296</td>
<td>1.083</td>
<td>0.047</td>
<td>10.171</td>
<td>0.028</td>
<td>0.003</td>
</tr>
</tbody>
</table>

Table 2: Chemical Composition Test Objects

<table>
<thead>
<tr>
<th>Material Type</th>
<th>$\sigma_s$ Mpa</th>
<th>$Y_s$ (0.02%) Mpa</th>
<th>EL. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AISI 304</td>
<td>674</td>
<td>442</td>
<td>55</td>
</tr>
<tr>
<td>AISI 316</td>
<td>596</td>
<td>299</td>
<td>50</td>
</tr>
<tr>
<td>AISI 316L</td>
<td>632</td>
<td>316</td>
<td>49.3</td>
</tr>
</tbody>
</table>

Fig. 2: Test objects used according to ASTM E 292
2.1 Arrangement and Setup of Test Equipment

The design of the equipment for testing is based on the research objectives, the parameters measured and the accuracy of the test results that can be justified. Although some alternative test equipments may be used to provide a constant load according to the type of loading in this test, but some of the advantages of the equipment used in this test are relatively simpler, easier to make measurements and more easily controlled.

Constant stable and controlled constant loading will provide an increase in stress due to the decrease in cross-sectional area and due to the growth of cracks occurring in the notch area so that the ligaments will shrink. The crack propagation in this area is then measured at a certain time duration and can be performed more easily and constant load control will continue to be performed in accordance with the spring extension that occurs.

### Table 3: Spring Kalibration Result Press (Style Used)

<table>
<thead>
<tr>
<th>Load Testing</th>
<th>Start Lenght</th>
<th>Deflection</th>
<th>Long end</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Kgf</td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td>433</td>
<td>130</td>
<td>14,5</td>
<td>115,5</td>
<td>AISI 304</td>
</tr>
<tr>
<td>606</td>
<td>130</td>
<td>19,8</td>
<td>110,2</td>
<td>AISI 304</td>
</tr>
<tr>
<td>292</td>
<td>130</td>
<td>8,6</td>
<td>121,4</td>
<td>AISI 316</td>
</tr>
<tr>
<td>410</td>
<td>130</td>
<td>13,7</td>
<td>116,3</td>
<td>AISI 316</td>
</tr>
<tr>
<td>310</td>
<td>130</td>
<td>10,3</td>
<td>119,7</td>
<td>AISI 316L</td>
</tr>
<tr>
<td>433</td>
<td>130</td>
<td>14,5</td>
<td>115,5</td>
<td>AISI 316L</td>
</tr>
</tbody>
</table>

### Table 4: Testing Conditions Phase I,II,III dan IV.

<table>
<thead>
<tr>
<th>Environment</th>
<th>Materials</th>
<th>Spring Loading and Deflection Press</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.000 ml Glycerol +</td>
<td>AISI 304</td>
<td>50 % Ys = 442 MPa</td>
</tr>
<tr>
<td>50 ppm Chloride</td>
<td>AISI 316</td>
<td>50 % Ys = 299 MPa</td>
</tr>
<tr>
<td>with temperature</td>
<td>AISI 316L</td>
<td>50 % Ys = 316 MPa</td>
</tr>
<tr>
<td>150 °C</td>
<td></td>
<td>70% Ys = 442 MPa</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70% Ys = 299 MPa</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70% Ys = 316 MPa</td>
</tr>
<tr>
<td></td>
<td></td>
<td>433 Kgf and 14.5 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>606 Kgf and 19.8 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>293 Kgf and 8.6 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>410 Kgf and 13.7 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>310 Kgf and 10.3 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>433 Kgf and 14.5 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50% Ys = 442 MPa</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70% Ys = 299 MPa</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50% Ys = 316 MPa</td>
</tr>
<tr>
<td></td>
<td></td>
<td>433 Kgf and 10.3 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>606 Kgf and 70% Ys = 299 MPa</td>
</tr>
<tr>
<td></td>
<td></td>
<td>293 Kgf and 70% Ys = 316 MPa</td>
</tr>
<tr>
<td></td>
<td></td>
<td>410 Kgf and 70% Ys = 442 MPa</td>
</tr>
<tr>
<td></td>
<td></td>
<td>310 Kgf and 70% Ys = 299 MPa</td>
</tr>
<tr>
<td></td>
<td></td>
<td>433 Kgf and 70% Ys = 316 MPa</td>
</tr>
</tbody>
</table>
Fig. 3. The correlation curve between the Exposure time and the crack length of SCC AISI 304 (specimens No. 3, 5, and 7) in different environments with an initial voltage of 0.5 $\sigma_Y$s.

Fig. 4. Correlation curve between Exposure time and SCC crack length at 0.5 $\sigma_Y$s (Test object No. 3) and 6000 ppm chloride concentration with different material.
Fig. 5. Correlation curve between Total Crack Length and Progressive Crack Speed SCC AISI 316L (Test Items No. 26 and 28) in different environments with initial stresses $0.7 \sigma_{Ys}$.

Fig. 6. Correlation curve between Total Crack Length and Progressive Crack Speed with chloride concentration 12000 ppm at $0.7 \sigma_{Ys}$ (specimens No. 8, 18 and 28) with different materials.

Fig. 7. The correlation curve between the Exposure time and the SCC AISI 304 Crack Length at 6000 ppm (Test Items No. 3 and 4) with different voltages.
Fig. 8. Correlation curve between Total Crack Length and Progressive SCC AISI 316L Crack Speed at 12000 ppm environment (Test objects No. 27 and 28) with different initial stresses

The measurement of the corrosion rate by using the dye testing method is the basic calculation of commonly used corrosion. The calculation of corrosion rate is based on the measurement of weight loss of the specimen at certain exposure time. Table 7-9 shows the corrosion rate on all SCC test objects. The corrosion rate obtained in the three tables gives a clear picture of the effect of the environment (Glycerol + Chloride) on certain conditions on the occurrence of SCC on AISI 304, AISI 316, and AISI 316L materials.

<table>
<thead>
<tr>
<th>Number</th>
<th>Test object</th>
<th>Concentration Chloride (ppm)</th>
<th>Voltage (% $\sigma_y$)</th>
<th>LongDyeing(hour)</th>
<th>LoseWeight (mg)</th>
<th>Corrosion rate mm/year</th>
<th>MPY</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>50</td>
<td>0.5</td>
<td>556</td>
<td>1.145</td>
<td>6.76E-04</td>
<td>0.026</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>50</td>
<td>0.7</td>
<td>556</td>
<td>2.002</td>
<td>1.18E-03</td>
<td>0.046</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>6000</td>
<td>0.5</td>
<td>556</td>
<td>3.858</td>
<td>2.28E-02</td>
<td>0.089</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>6000</td>
<td>0.7</td>
<td>484</td>
<td>4.903</td>
<td>3.33E-02</td>
<td>0.131</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>9000</td>
<td>0.5</td>
<td>296</td>
<td>17.146</td>
<td>1.90E-02</td>
<td>0.750</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>9000</td>
<td>0.7</td>
<td>224</td>
<td>11.855</td>
<td>1.74E-02</td>
<td>0.683</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>12000</td>
<td>0.5</td>
<td>196</td>
<td>35.388</td>
<td>5.92E-02</td>
<td>2.330</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>12000</td>
<td>0.7</td>
<td>151</td>
<td>30.069</td>
<td>6.54E-02</td>
<td>2.570</td>
<td></td>
</tr>
</tbody>
</table>
### Table 6: Corrosion Rate on AISI 316

<table>
<thead>
<tr>
<th>Number</th>
<th>Test object</th>
<th>Concentration Chloride (ppm)</th>
<th>Voltage (% $\sigma_{YS}$)</th>
<th>LongDyeing (hour)</th>
<th>LoseWeight (mg)</th>
<th>Corrosion rate (mm/year)</th>
<th>MPY</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td></td>
<td>50</td>
<td>0.5</td>
<td>556</td>
<td>1,242</td>
<td>7,33E-04</td>
<td>0.0289</td>
</tr>
<tr>
<td>22</td>
<td></td>
<td>50</td>
<td>0.7</td>
<td>556</td>
<td>1,176</td>
<td>6,94E-04</td>
<td>0.0273</td>
</tr>
<tr>
<td>23</td>
<td></td>
<td>6000</td>
<td>0.5</td>
<td>556</td>
<td>3,613</td>
<td>2,13E-03</td>
<td>0.084</td>
</tr>
<tr>
<td>24</td>
<td></td>
<td>6000</td>
<td>0.7</td>
<td>556</td>
<td>3,190</td>
<td>1,88E-03</td>
<td>0.074</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td>9000</td>
<td>0.5</td>
<td>556</td>
<td>15,465</td>
<td>9,13E-03</td>
<td>0.361</td>
</tr>
<tr>
<td>26</td>
<td></td>
<td>9000</td>
<td>0.7</td>
<td>363</td>
<td>15,671</td>
<td>1,42E-02</td>
<td>0.558</td>
</tr>
<tr>
<td>27</td>
<td></td>
<td>12000</td>
<td>0.5</td>
<td>320</td>
<td>13,267</td>
<td>1,36E-02</td>
<td>0.536</td>
</tr>
<tr>
<td>28</td>
<td></td>
<td>12000</td>
<td>0.7</td>
<td>268</td>
<td>18,331</td>
<td>2,25E-02</td>
<td>0.885</td>
</tr>
</tbody>
</table>

According to the corrosion rate is said to be critical to a material when the MPY value is $\geq50$ (≥ 1 mm/year). The corrosion rate value obtained in the above Table does not reach the critical value but the material fails. This shows that the effect of stress has a dominant influence on SCC corrosion failure on a material.

The corrosion rate occurring as shown in Table 7 - 9 above also proves that a higher AISI 304 vulnerability level under these test conditions. The difference in average corrosion rates of AISI 304 to AISI 316 and 316L are 75% and 92% faster respectively. This proves the resilience of AISI 316L and 316 against higher pitting attacks. According to this proves that the presence of Mo strains owned by AISI 316 and 316L increases the resistance of stainless steel austenite to corrosion attack.

The corrosion resistance of AISI 316L is also driven by low C content (0.025%), while AISI 316 has a C content similar to AISI 304 (0.08%) but Mo content owned by AISI 316 makes this material relatively better resistant to corrosion attack.

### Table 7: Corrosion Rate on AISI 316L

<table>
<thead>
<tr>
<th>Number</th>
<th>Test object</th>
<th>Concentration Chloride (ppm)</th>
<th>Voltage (% $\sigma_{YS}$)</th>
<th>LongDyeing (hour)</th>
<th>LoseWeight (mg)</th>
<th>Corrosion rate (mm/year)</th>
<th>MPY</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td></td>
<td>50</td>
<td>0.5</td>
<td>556</td>
<td>1,242</td>
<td>7,33E-04</td>
<td>0.0289</td>
</tr>
<tr>
<td>22</td>
<td></td>
<td>50</td>
<td>0.7</td>
<td>556</td>
<td>1,176</td>
<td>6,94E-04</td>
<td>0.0273</td>
</tr>
<tr>
<td>23</td>
<td></td>
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Conclusions

The results of this study provide the following conclusions:

a) SCC testing with 50 ppm chloride concentration conditions indicated that AISI 304, 316, and 316L did not fail with exposure time of 556 hours to a voltage of 0.7 σys.

b) SCC test with 6000 ppm test condition gives result:
   - AISI 304 material fails on both types of loading.
   - AISI 316 material fails only for 0.7 σys voltage.
   - AISI 316L does not fail for both types of loading.

c) SCC test with 9000 ppm test condition gives result:
   - AISI 304 material fails on both types of loading.
   - AISI 316 material fails on both types of loading.
   - AISI 316L fails only for 0.7 σys voltage.

d) SCC testing with 12000 ppm test conditions gives the result that the three types of materials fail.

e) Figure 3 - 4 curve shows that at higher concentration of chloride will result in the material of the test having shorter failure time, crack speed and faster corrosion rate and wider crack opening.

f) Figure 5 - 6 curve shows that the AISI 316L Failure time material is relatively longer compared to AISI 304 and AISI 316L. AISI 304 has shorter failure time. AISI 316L crack speed material is slower compared to AISI 304 and AISI 316, and AISI 304 has faster crack speed. The average corrosion rate comparison of AISI 304 to AISI 316 and 316L were 75% and 92% faster respectively. This proves the resilience of AISI 316L and AISI 316 against better pitting attacks. AISI 304 has a shorter average failure time, i.e., AISI 304 failure time against AISI 316 and 316L are 51.44% and 137.51%, respectively, while AISI 316 against AISI 316L is 67.37%.

g) Figure 7 - 8 curve shows that the test material tested at 0.7 σys initial voltage has shorter failure time and faster crack speed.

h) SCC crack model that occurs in the test material is on the grain (transgranular) with brittle fracture fracture.

Suggestion

SCC failure is strongly influenced by stress, environment, and material structure where the combination of these three factors are synergized, leading to SCC failure. Based on the results of this study and to avoid the occurrence of failures on similar materials in use, the following points need to be considered:

a) Perform actual load calculations on a construction or components made of stainless steel austenite to obtain the amount of voltage that occurs.

b) In the condition of Glycerol solution containing concentration of 50 ppm chloride, a voltage of 0.5 σys, 150 °C AISI 304 material temperature may be used, but if the voltage of 0.7 σys should use AISI 316. SCC failure is strongly influenced by stress, environment, and material structure where the combination of these three factors are synergized, leading to SCC failure. Based on the results of this study and to avoid the
occurrence of failures on similar materials in use, the following points need to be considered:

a) Perform actual load calculations on a construction or components made of stainless steel austenite to obtain the amount of voltage that occurs.

b) In the condition of Glycerol solution containing concentration of 50 ppm chloride, a voltage of 0.5 σys, 150 0C AISI 304 material temperature may be used, but if the voltage of 0.7 σys should use AISI 316.

c) At the condition of Glycerol solution containing the maximum concentration of 6000 ppm chloride, a voltage of 0.5 σys, 150 oC of material temperature, AISI 304 can not be used and preferably using AISI 316. But at 0.7σys voltage it is better to use AISI 316L where this material can be dug up to a chloride concentration of 9000 ppm and a maximum voltage of 0.5 σys.

d) To get the SCC threshold value need to do further research by using variations of temperature and voltage for this material, so it will be more useful especially for the industry.

e) To obtain more precise measurement results, the test equipment used is necessary developed, for example by using a strain gauge or other precision measuring instrument for get stretches strained during the test. The value of strain obtained then will get the amount of voltage changes that occur at any time.

References


Abstract. Model drawings for fine arts students focused on human objects, in portrait poses and full body. Based on observations on training tasks done by students, most of them had difficulty to achieve human face resemblance with the model being imitated. On the other hand, students are also in accurate in applying the proportion of human anatomy and draperies. The aim of the study was to find out the root of the problem of human model images that are difficult to achieve resemblance to the model being imitated. Then it was to know the accuracy of the application of proportions and draperies of cloth. The data collection technique of the research was by observing the students' drawing work in the final project. Observation accompanied by filling out observation sheets based on research variables. Documentation was conducted in the form of paper produced by the model, and photos of the model object being copied. Data analysis techniques used qualitative descriptive method. The results showed that 10% of the drawings achieved facial resemblance to the imitated model, the next 50% were less similar, and the next 40% were not similar. The application of the theory of proportions shows that 20% of the results of the proportion with the right proportion, the next 50% is less precise, and the next 30% is incorrect. Dravery cloth on the results showed that 40% is right, the next 40% is not right, and the next 20% is not right. Analysis of the findings of this study revealed that the root of the problem was the finishing of imperfect arts (seen in lighting techniques the object was less plastic, the neatness of the image on the face elements is also less than perfect) and the weakness in displaying objects in perspective.

Keywords: Facial resemblance, proportion, dravery.

1 Introduction

The Drawing Model course is a compulsory subject for all art students. This course is a continuation of the Form Drawing course, and Plastic Anatomy. Model drawings can be used as a foundation for the creation of figurative paintings, and drawings with human objects. The Drawing Model course prepares students to be skilled at drawing humans realistically based on the model being imitated.

The results of the authors' observations show that most students are weak in their realist abilities from the start. Therefore, it is necessary to have a learning strategy that makes the mastery of drawing models easier. Realist images are always in demand by the public from the past until now. The ability to draw realistically is the minimum standard for an art student. This means that every student must be able or ready to fulfill every consumer demand, to describe or portray his portrait on a realist canvas.
Some things that are suspected to be the cause of low student achievement in drawing models include:

a. The basic ability of drawing from new students is very low, due to lack of training during high school.
b. The frequency of student training drew a little model, because many other practical courses were also taken.
c. Students rarely analyze the work that is made, by comparing it to the theory of elements and art principles.

1.1 Formulation of the Problems

To reinforce the operational steps that will be implemented, the research problem can be formulated as follows:

1. How are the facial similarities in the results of the images imitated?
2. How does the proportion in the image refer to the model being imitated?
3. How does the draveri cloth in the figure refer to the model being copied?

1.2 The Purposes of the Study

1. To know the ability of students to achieve the similarity of images with the model being imitated.
2. To know the ability of students to apply the proportion of the right proportion based on the model being imitated.
3. To know the ability of students to display draveri fabrics based on the model being imitated.

1.3 Research Contributions

1. For students to accelerate mastery of model drawing skills
2. For students to improve learning outcomes (achievement index).
3. For lecturers as an increase in the ability to overcome problems that arise in the teaching and learning process (PBM), especially in the model drawing course
4. For the Department of Fine Arts and Higher Education as an improvement in the quality of output.

2 Literature Review

2.1 Definition of Drawing Models

Drawing models means making imitation of objects or object models, in a flat plane with a tool that produces a clear trace, (TarjaSudjana et al. 2000, p. 1). Objects or object models in drawing models are human. Humans used as models vary in age and sex, such as children, adolescents, adults, parents, men and women. Drawing a model as if moving objects or object models onto the image field without any changes. So there must be a model object presented in front of the drawer. This means that when drawing objects without objects or models that are imitated, it is not called drawing models.
Syafii, et al. (2003: 2.8) explained that drawing a model is an image that represents an object, in this case the object is human. Based on the two opinions above, it can be concluded that drawing a model is a representation of the human being presented before the drawing as a model. It means that the right image corresponds to the imitated object (representative representative).

The criteria for success in drawing a model is the similarity of the image according to the model object being imitated. There is no addition and subtraction of the characteristics of the object being observed. The composition of objects in the field of images is a condition of the beauty of an image, (Sipahelut, 1991: 87). Therefore the composition includes a part of evaluating the success of an image.

Shading (rendering) and paint strokes is a way of creating plasticity of image objects, so that the texture of the object image is clearly visible according to the model being imitated, (Sagala, 2003: 14). Shading is also useful in displaying image objects based on lighting on the model. Shading skill means the ability to apply dark light to the object image according to the lighting on the model with a scratch technique. Image clarity supports form accuracy. Form accuracy is the main requirement in drawing models.

Lighting of the object model can affect the observer's observation. Light coming from all directions, will interfere with observation and it is difficult to control the darkness of the object image and its shadow. Therefore, in drawing a model, it requires one direction of the dominant light source to the model object, so that it is clearly visible, and the shadow is also clear.

2.2 Technical Model Practicum Drawing

Practicum assignments are delivered at the beginning of the meeting, including the type of shading to be used, the direction of the illumination model, the expected image size, background of the requested image, and the time limit for completion. The model (object to be imitated) gets treated or arranged in such a way that it looks aesthetically pleasing. The student group (drawing) takes the position of sitting in front of the model object to form a semicircular pattern. One group consists of 5-7 students imitating one model (Tarigan, ibid).

The first stage of drawing is to determine the position of the drawing paper (horizontal / vertical) in accordance with the tendency of the model position in front. Assisted with a window view tool, the student will quickly determine the position of the drawing paper. The second stage is to set the outer edge of the drawing object (lay out) in the paper field, so that a harmonious composition is created (the image object is in the middle of the drawing area, not too small / not heavy, not heavy to the left / right / up / down).

The window view tool is made of a flat area such as thick cardboard or plywood, which is punched in the middle with a size of 4 X 6 cm, as a door or peeping space on the model object. The window view tool is used to help students observe the model through the window, so that it is easy to stitch images with the desired magnification scale.

The third stage is the taking of sketch drawings according to the proportions in the model. Magnification or reduction scale needs to be done because it adjusts to the size of the image area. Scale is obtained by comparing the size of the window view tool, compared to the area of the available image area. The fourth stage is doing color scaling or polishing to get the darkness of the object image and shadow according to the state of the model. Type of shading follows the image assignment instructions.
2.3 The Similarity of Images with Imitated Models

Each person draws a self-portrait, required to achieve results similar to the original. In general, human faces have differences between one another, because God created the same human form. Likewise, by drawing a person's face, the potential is very different from the original. Therefore, frequent training is needed, so as to achieve the imitation of the character of each face element properly.

The things that need to be considered to achieve similarity include: the initial sketch of the image must meet the accuracy of proportions based on the model being imitated, the lighting on the model must have one dominant direction of light, and understanding perspective drawing techniques.

2.4 Proportion in Model Drawing

Proportion is a size comparison of the parts that make up a single object, and also a comparison of sizes between several objects arranged in groups. For example, the ratio of the width of the human shoulder is twice the width of the head, the distance between the left and right eye is once the width of the eye, the position of the eye line is half the height of the head, the height of the ear from the lower limit of the nose to the eye line, and so on. Size comparisons must be based on the right scale based on the model being imitated. For example a scale of 1:3 means that all elements of the object will be enlarged three times the original.

The success criteria in proportion is if the scale of enlargement or reduction in the image does not deviate from the comparison in the model. To get accuracy in zooming or even minimizing it needs to do repeated exercises. Each time the exercise should be carried out a scale comparison test with the existing model. The test includes every element that builds an object, such as the ratio of head height and width, distance between two eyes and eyebrows, nose length, mouth width, ear height and width, and overall head shape. In addition to the comparison of the elements that build an object, also seen the comparison with the environment, for example the ratio of human height to the seat height of the seat.

2.5 Dark light in Model Images

Dark light is also called lighting technique in images. An object will be visible if there is light. So the process of seeing an object is the light that hits the object bouncing into the eyes of the person who sees it. This means that the object will be clearly visible when the reflected light of the object matches the eye's needs.

Dark light serves to give clarity to the image. Success in the application of dark light also depends on the skill of observing objects carefully. A very helpful way to overcome the difficulty of mastering this lighting technique is to treat the model. We recommend that there is only one dominant direction of light on the model, for example using a spotlight.

It is necessary to pay close attention to the reflection of light falling on the model, because there are parts that look glare or white on a shiny object, even though the object is dark, the shiny part still looks white. Besides shiny or slippery objects and transparent objects such as glass or plastic it also absorbs the bias color of objects that are around it. For example, the sunglasses used by the model can capture the red color around it, so that there are parts of the glasses that look red. Therefore the drawer must color with red, not based on logic the color is black.
Dark light includes: dark light of the object image, and dark light of light as a shadow. The part of the model that is close to the direction of the arrival of the light will look brighter than the other parts. Changes in light from light to dark on the object image will form a plastic gradation, therefore the object looks more real. The shadows of objects falling on the floor, as well as those concerning other objects beside them will reinforce the shape of the object. Besides that the background also needs to be optimized in order to give clarity to the object in front. For example, soft-colored objects can appear with a dark background.

2.6 Perspective in Model Drawing

The principle of perspective must be applied in drawing models, because the main requirements for drawing a model are to imitate the right shape based on observations (visual) of the existing model. The perspective is the result of observing the eye (visual) on an object where the part close to the eye looks bigger, taller, longer or wider, compared to the part that is farther from the eye. For example, the face of the model is observed from a three-quarter point of view, so the model's eyes don’t look as big, the one closer to the observer looks bigger than the other. To obtain accuracy in the application of perspective, it is necessary to practice observing the model in detail in parts. In addition to the perspective of differences in size, there are also perspectives on differences in darkness, namely the closer part is more clearly visible, farther and more blurred.

3 Research Method

The research location is in the Department of Fine Arts, Medan State University. The reason for choosing this location was because the condition was directly experienced by students in the lecture drawing model. The population of this research is all the model drawing works made by students as the final project of the 100 model drawing subjects. Samples were taken sampling randomly by 60% of the population, so that 60 works were obtained.

Data collection techniques use observation sheets to assess the quality of the application of composition, proportion, and perspective of the object image. The data analysis model uses the Miles and Huberman theory (TjetjepRohendiRohidi 1992: 20 translation) as follows:

![Fig. 1 collected data](image)

After data is collected, data tabulation, data analysis, and data interpretation and conclusions are carried out.
The model is arranged well and illuminated from one dominant direction.

Criteria of success observed:
- Similarity
- Proportion

Application of images in the drawing area with paint or polish shading techniques

Fig. 2. Design of the research

4 Results

1. The results of the study toward similarities, showed that 10% of the results of images achieved facial resemblance to the model being imitated, the next 50% was less similar, and the next 40% was not similar.

2. The results of the study on the application of the theory of proportions, showed that 20% of the results of the image with the right proportions, the next 50% was less precise, and the next 30% was incorrect.

3. The results of the study on the application of dravery cloth, showed that 40% of the dravery was right, the next 40% was not right, and the next 20% was not right.

5 Discussion

Less success of most students, in achieving finishing work that is very similar to the model, is influenced by various constraints, including internal factors and external factors. Internal factors such as the low basic skills of drawing students, before taking part in the model drawing lecture. External factors, including the lack of time for drawing exercises, drawing studio facilities had not been equipped with special lights for model recognition, and it was not well implemented in the form of criticisms and suggestions.
6 Conclusion

1. Very few images of models that achieve similarity (representative realists) of the model being imitated, and many images are far from similar.

2. There were still a few students who are able to display the proportion of humans, precisely based on the model being imitated, and quite a lot are close to right.

3. Quite a lot of students have been able to display dravery based on the nature of the fabric, but still less firm than the lighting.

Suggestions

In order that students can master the model drawing skills well, the following are suggested:

1. Students should exercise model drawing more often so that they are able to observe in detail the model objects

2. Students should appreciate / discuss the work more often, along with criticism and suggestions for improving the results of the drawing.

3. Department of Fine Arts or Institutions in order to prepare all supporting factors or specific teaching and learning facilities needed in the model drawing course.

4. Other researchers may be able to carry out experimental research with special treatment or trial of special design teaching-learning methods for drawing models.

References

Abstract. This study aims to produce a product for developing E Learning Schoology learning media for Pakpak Dairi Dance Technique which is applied to students of Dance Education Study Program, as well as knowing the feasibility of E learning Schoology media as a learning innovation. This research approach uses research development (R&D), which is carried out through stages namely: preliminary research, development planning, media production/development, and media evaluation. The subjects of this study were students of Dance Education Study Program. Respondents in this study involved 36 people, consisting of 2 validators, 3 students for one-on-one trials, 6 students for small group trials, 25 students for field trials. Aspects assessed are the media elearning schoology and aspects of learning. Data analysis is carried out quantitatively to evaluate products, and for other data conducted qualitatively. The results of the study showed that the learning media of E Learning Schoology of Pakpak Dairi Dance Technique was feasible and could be applied to students of Dance Education Program at FBS UNIMED in individual lectures.

Keywords: Learning Innovation, E-Learning Schoology, Pakpak Dairi Dance Technique

1 Introduction

Pakpak Dairi Dance Technique Learning is one of several dance courses in North Sumatra, which must be followed by UNIMED FBS Dance Education Study Program students. In addition, students also study Nusantara dances, and international / international. The provision of this material is of course to prepare prospective educators to have diverse regional, national and international dance knowledge and skills.

The Pakpak Dairi dance technique is given to students in semester 4 with a weight of 2 credits. Students are required to have Pakpak Dairi dancing skills with good and right techniques, and can make performance as a final evaluation. In the learning process, the method used in the class has been carried out still using the imitative method, and is felt to be ineffective and time-efficient. Lecturers as learning resources in subjects that are practical in providing movement technique material in meetings in class.

Learning through E-Learning is intended to answer the challenges of today that education must be able to align with the needs of the 4.0 industrial revolution. Related to this, the researcher attached the word learning innovation in this study with the intention that learning the Pakpak Dairi Dance Engineering course would later be designed with a new strategy...
through E-Learning Schoology. Rogers (1983: 11) gives a limitation which is meant by innovation is an idea, practice, or object object that is considered new by someone or another adopter group. The word "new" is very relative, it can be because someone just found out, or it could be because they just want to accept even though they have long known. Kotler (1996), mentions innovation as something that is pleasing to the goods, services, or ideas that are felt by someone, even though the idea has long existed but this can be said to be an innovation for people who just saw or felt it.

Basically learning Dance will be more interesting when using various media and methods, in fact in the implementation of learning the lecturer has difficulties in the use of media, especially those related to the use of e-learning. If dance practice learning can be carried out by utilizing technology, of course many potential students can be improved, especially in empowering student skills, paying attention to the various potential intelligences and intelligence of students (multiple intelligence), and having advantages in time efficiency.

The purpose of this research is to produce products for developing E-Learning media that can be used in the learning process of the Pakpak Dairi Dance Engineering course that is effective and efficient. In this learning process students can learn the basic dance techniques of Pakpak Dairi dance through the presentation of material that has been prepared in the form of visual and audio visual uploaded on the network. The stages of learning are arranged in accordance with the RPS each meeting, students follow the directions of activities that must be done in PBM contained in e learning schoology Through this e-learning schoology learning students can learn dance material not tied to face-to-face time in class, but learning can take place outside lecture hours.

By conducting learning innovations that utilize Shology's e-learning technology, it will certainly provide many benefits for students, especially in empowering skills, multiple intelligence abilities and also for lecturers. The results of this innovation are expected to provide benefits including:

1. Economically, if the learning of Pakpak Dairi Dance Technique based on e-learning is an option, it will save time and money because learning can be done quickly and within the campus environment itself, which can save energy and finance. Thus computer information technology-based teaching materials in this case blog, youtube, and hand out are a necessity for students to support independent learning; learn without being bound by time and space, so that it can maximize its competencies to be able to understand lecture material more comprehensively. Can help students in receiving and understanding learning materials so that they can improve learning achievement.

2. Familiarize students with exercises using technology tools to operate e-learning as a learning medium for various purposes of their studies. E-Learning is learning that utilizes or implements ICT, both used online with internet and offline facilities with intranet facilities, namely local networks (LAN). Thus it can make learning more interesting / enjoyable so that all students are motivated to actively learn.

3. Motivate lecturers to use E-Learning so that learning becomes more interesting and not boring.

4. Assist lecturers in explaining learning material with technology utilization.

5. Motivate lecturers to increase computer and internet use on campus.

6. Providing new learning media for institutions, especially Education Study Programs UNIMED FBS.

7. Adding a collection of learning media, especially dance practice subjects.

8. The results of this study can also be used as one of the inspirations in conducting learning innovations in other courses in an effort to improve the quality of learning.
2 Discussion

This research is a development research oriented to the development and validation of media products. The product developed in this study is the learning media of Pakpak Dairi Dance Technique, namely by packing learning material with audio visual utilization which contains the dance practice material "TatakTintoaSer-Ser" for the learning of 4th semester students at UNIMED FBS Dance Education Study Program. The learning design model and development procedure carried out are through the stages:

1. Making audio-visual media learning the practice of tataktintoa dance ser-ser in VCD form.
2. Development of e-learning schology media follows procedural steps
3. Developing e-learning schology media devices into products
4. Trial to obtain a number of information that is important for revision purposes.
   a. Perform a modular test (testing the course of the program) to ascertain whether the results are as desired until they become a learning medium.
   b. Evaluate the products developed.

Product development is based on the analysis of learning needs, characteristics of students, learning environment, and the carrying capacity of technology, both software and hardware. The software used in e-Learning uses the Moodle-based LMS application program provided by http://www.keytoschool.com. Basically, the application software is run on the Keytoschool server. Software supporting moodle server applications, such as Apache, MySQL, and PHP no longer need to be installed, because through hosting (registering) the developer has got a domain (website name) and learning settings service facilities for free.

The model of E-Learning media development in this study refers to Borg & Gall (1983: 772), can be described in the picture:

![E-Learning Media Development Model](image-url)

Fig. 1: E-Learning Media Development Model
3 Product Development Procedures For E-Learning Media For Pakpak Dairi Dance Technique

3.1 Needs Analysis

Literature study was conducted to gather information, by studying the syllabus of courses at UNIMED FBS Dance Education Study Program students related to the characteristics of the course, the time allocation available, then reading books about Pakpak Dairi culture, supporting books as theoretical study material, journals or research report on the development of E-Learning media.

Competence in the course syllabus is that students are able to understand the various Pakpak Dairi cultures, and that they can dance Pakpak Dairi with good and correct techniques. Each dance material is given to students for 8 times face-to-face with evaluation of their movements. At the end of the lecture students practice individually and in groups that present a variety of floor designs. This lecture is presented in theory 10%, 75% practice, and 15% field. The forms of teaching and learning activities are demonstrations, imitations, guided training, and independent assignments. Evaluation is done through individual tasks (process assessment), group assignments, and practices.

References used by researchers, namely references from books related to the media, books about lectures, books on E-Learning, books on dance, and other reference books that can be used as research references. Other references are references from the internet, references from existing learning media, references from educational journals, and research results related to learning media.

The field study was conducted by conducting lectures in the previous semester which still used imitation / imitation methods. The use of LCDs in theoretical lectures, using videos as dance appreciation, and classical demonstrations to provide basic motion material for students.

Based on the needs analysis, researchers tried to make computer and internet assisted lecture media as an alternative solution to the problem of the Pakpak Dairi Dance Engineering lecture. The trials in this study selected 25 odd semester students with serinte dance / tatak material to be developed using the e-learning schoology program.

3.2 Learning Design

At this stage the researcher analyzes the concepts and tasks related to the material, namely by preparing all teaching materials related to Pakpak Dairi Dance, RPS, Worksheets, 6 Assignments, and flowcharts. The flow chart is a guideline for making storyboard display plans in making e-learning media products as follows:
3.3 Media Production

The first step is to determine the application software that will be used, namely e-learning schoology. Furthermore, the writer makes or selects graphics, prepares texts and other supporting materials that have been prepared at the design stage, selected and assembled into a form of e-learning. So that the e-learning assembly runs effectively and efficiently, at every stage of the evaluation. The development of e-learning media is made as a tool in classical or independent lectures. This e-learning media product is packaged in the form of theory and practice which was uploaded to Be Smart e-learning FBS UNIMED and linked to youtube that can be run with computer specifications equipped with internet networks. The data obtained were analyzed quantitatively and qualitatively.

Broadly speaking, the lecture material component of Pakpak Dairi Dance Technique includes: course descriptions, Introduction to Pakpak Dairi Cultural Knowledge, explanation of basic motion techniques of tataktintoaser-ser, names of various dance movements and meaning of motion, description of worksheets, and forms of 6 assignments and evaluation.

3.4 Evaluation

This product evaluation phase refers to the opinion of Dick & Carey (2005: 279); Sadiman et al (2006: 181), namely: a). Validating products to media experts and material experts, followed by data analysis, and product revisions based on review of media experts and material experts, b). Conduct one-on-one trials (one to one), which is 3 students, followed by data analysis, and product revisions based on the results of one-on-one trials. The next trial was small group evaluation on 6 students followed by data analysis, and product revision
based on the results of small group trials. Then the final trial was a field trial on 25 students, followed by data analysis, and product revision based on the results of the trial so as to produce the final product.

Before the product was tested on students, the product that had been developed was validated by 1 media expert and 1 material expert. This expert validation is important to get assurance that the initial product developed is worth testing for students. Media experts provide assessments, comments, and suggestions on products from aspects of display and programming. Meanwhile, material experts provide assessments, comments, and suggestions on products from aspects of learning and content or material. After the product was declared feasible by media experts and material experts, the trial was then carried out by students.

The results of the trial analysis to students through these 3 stages, it can be concluded that the media product lectures of the Pakpak Dairi Dance Technique the product development results in terms of media aspects and aspects of the lecture get a “good” value. This program is very helpful for students in learning the material, easy to understand, and aspects of the presentation of the program interesting to learn. This media is more appropriately used individually and there is no revision in both appearance and material.

4 Conclusion

The results of the research and development of Pakpak Dairi Dance Engineering learning innovation through e learning schoology can be concluded that:

1. Procedure for developing innovation in learning Dance Technique Pakpak Dairi for students of Dance Education Study Program at Unibed FBS through e-learning media to produce appropriate media products through steps: (a) conducting needs analysis, (b) developing design, (c) conduct learning media production, (d) conduct evaluation/validation.

2. Learning media for e-learning schoology The Pakpak Dairi dance technique developed is suitable for use as a learning medium based on the results of good media expert validation, and the expert category validation is very good.

3. The results of the assessment of students of the Unimed FBS Dance Education Study Program through the trial 3 stages each provide an assessment of the appearance of the product and an assessment of the presentation of the material is said to be good.

4. This development is precisely carried out in response to the needs of the 4.0 industrial revolution in universities by utilizing Information Technology (IT) in learning that can be implemented in an independent learning strategy.

References

Abstract. Drama is a part of literary work that can be staged through the drama staging process using the main elements of the script and play, in addition to the other supporting elements. The text is different from the role playing. The manuscript is a sequence of stories before being staged. That sequence in modern drama is in the form of writing using conversation or dialogue models to be performed. The perceptual model can be used by using a Adjacency Pair Model in the German drama as well. These conversation models were initially needed in the role playing as the basis for determining the play. This play comes from the concept of making conversations or dialogues from a play. Good German drama scripts certainly use dialogue or good German conversation. Manuscripts are said to be good if there are conflicts, emotives, and behavioral images that are able to provide new inspiration for those who apply the text. The drama script was done by the script writer while the play was done by the director. The manuscript or play cannot be separated from the conversation or dialogue model built by the writer or director. Varieties and styles are usually in the form of comedy, tragedy, repertoire and parody. Then based on the length of the short conversation or dialogue a drama depends on the round of the drama. All of that certainly has an effect on the form of the drama that was made for it. This research was conducted at the German Language Program of UNIMED to analyze the ability of students to write German drama scripts in designing dialogues or conversations using Adjacency Pair Model.

Keywords: German Drama Manuscript, Adjacency Pair Model.

1 Introduction

Drama is one of the literary works which uses the language as a conversation or dialogue which has aesthetic words. In essence, the aesthetics of these words are the core of the drama's text into conversations or dialogs which contain conflicts (contradictions). These conflicts are arranged so that they form a plot and are expressed in the form of dialogue. How to determine conflict and how to write drama scripts? To write drama literary works, you can start by defining conflicts, arranging sequences of events in one round, developing the sequence of events into one round drama scripts, completing dialogues, commenting on and editing drama plays. To identify conflicts can be done based on events in literary prose, such as novels, novels, short stories, etc. In writing German drama scripts as a foreign language, the competence of language and knowledge of German is important for a scriptwriter to be able to compile the Sequence of Events for One Round in a German drama. Drama manuscripts can
be obtained from the writer's imagination or derived from literary works in the form of prose or stories such as the German short story (Kurzgeschichte). One of the competencies that must be possessed by the playwright is the ability to write drama scripts to be prepared in terms of (1) the suitability of the dialogue with the events to be described, (2) the clarity of the language in the dialogue, (3) the accuracy of the form of the drama, and (4) the clarity of the narrative (explanation) so that it is easily staged. Then it is only possible to compile a drama script with a series of events that have been determined based on the source of the event or also from the story telling by considering in terms of (1) the uniqueness of the conflict raised in the drama script, (2) the resolution of conflict resolution, (3) the suitability of the dialogue with the series of events described, (4) clarity of the contents of the dialogue, and (5) clarity of the narrative (explanation) so that it is easily staged. To write dialogues or conversations that are appropriate and appropriate to the events in a drama script can be used the corresponding pair model. Because the pair model corresponds, its elaboration is more complex and detailed about the types, characteristics, and functions of each unit and its parts. For example, the structure of preference, order and silence. By analyzing this paired model, the competence and meaning of the conversation of a language and the interaction of language are more fully understood. As for the language in question is not only Indonesian or regional languages, but also foreign languages outside the mother tongue of speakers can be analyzed in the corresponding pairing model that occurs in the structure of the conversation in the drama script. Based on the background above, this study was conducted to observe and analyze the ability to write German drama scripts by using a pair pair model derived from German modern prose (Prosa der Gegenwart) as the subject of the Literature course in the German language program at Unimed. Therefore, this research is very important to be carried out as an effort to increase learning motivation and improve competence in subjects or fields of general German language and German Literature or Literature.

2 Literature Review

2.1 Definition Of Drama
Manuscripts In an internet web source it is stated that drama is often equated with theater. These two terms indeed overlap. Drama comes from the Greek "draomai" which means to do, act; while theater comes from the Greek word also "theatron" means the place of the show. The word theater itself refers to a number of things, namely: drama, performance building, stage performance, group of drama players, and all performances shown. Even so in a simple way, as stated by JakobSoemardjo, the drama is divided into two, the first is the drama script and the second is the drama drama. This second term, the stage drama, is equated with theater. Literary work in the form of dialogues and possible to be performed as a spectacle is called drama, while works of art in the form of performances whose elements consist of motion art, music, decoration, make up, costum, and others are called theater. Drama includes literary art. Theater is a performance art. In addition to these two terms, there are other similar terms namely plays and tonils. The play comes from the Javanese language and tonil comes from the Dutch language. The drama script has its building elements. According to Herman J. Waluyo, drama builds on physical structure and inner structure. The physical structure of the drama is:

(1) plot;

(2) characterization / characterization;
(3) dialogue;
(4) background;
(5) side text (technical instructions).

While the inner structure of drama is: (1) theme, (2) mandate. Theater as a performing art has the following elements: (1) actor and casting, (2) director, (3) stage organizer (consisting of: stage / stage arrangement, decoration / scenery, lighting / lighting, and sound management / soundsystem), (4) artistic stylist (consisting of: makeup / make up, dress / costume, music and sound effects / music and sound effect), (5) script, (6) producer, (7) the audience.

2.2 Techniques for Writing Drama Scripts

Drama or drama writing techniques have specificities when compared to poetry or prose writing techniques. Because it has the possibility to be staged, the drama script has side text and main dialog. Side text or technical instructions are very useful for the director to get around the performance. The director who is obedient to the script, will follow all instructions written in the side text. On the other hand there is also a director who is not obedient to the side text because he is intentionally interpreting the drama text loosely. Thus, the side text (and also the dialogues) can be compatible or can be different if performed in the form of performances. The director's role is very important in addressing the drama script. The technique or method of writing the Drama Text itself has different writing techniques. Manuscripts that are able to provide creative inspiration are certainly manuscripts that have complete drama elements rather than short texts. Next, in the drama script, dialogue and stage direction information, it greatly helps the development of characters, plots, and themes. In addition, both can provide input for the determination of the play (staging) performed by the director. Dialogue is a reciprocal statement on the basis of the stimulus and response that arises and the perpetrators. Whereas the behavior statement refers to an order that tells the offender to do things that are outward. In the drama script, behavior information often starts the dialogue, explains the behavior of dialog, and is printed in parentheses. Dialogue and behavior information relate and complement each other according to the source of the story or event that has been determined.

2.3 Adjacency Pair Model

2.3.1 General Understanding

Nature and Model or Section Cook (1997) suggests Adjacency Pair is a pair of discourse moves that often together, e.g. question and answer (matching pairs are pairs of forms of oral language events that are always together, such as questions and answers). A stimulus with the answer is the corresponding pair spoken by the speaker and the listener at the beginning of communication, in the middle, or in the end. This corresponding pair is an important unit in communication even though it seems very simple and concise (Lubis, 1996: 109). And Yule (2006: 132-134) explains that what is called an adjacency pair is an automatic order in the structure of the conversation, such as greetings and high congratulations. In German, for example, as follows:

1. Anna: Hello (Hello)
2. Anna: WieGehts? (How are you?)
   Bill: Gut, Danke (Fine, thank you)
3. Anna: Auf Wiedersehen! (See you later !)
   Bill: Tschüs (Goodbye)

These pairs consist of the first part and the second part is spoken by two different speakers. The first part of the speech quickly created the hope of speaking the second part of his partner. Failure to produce speech for the second answer is considered to be a significant vacuum and therefore, this void is meaningful. There are substantial form variations that are used to fill the gap in the corresponding pair. Therefore the corresponding pair must always have two parts, the first and the second. In particular, there are many sequences in a conversation, such as a question-and-answer sequence, answers to thanks, requests, and others.

Saragih (2006: 27) explains that conversations are generally constructed by utterances in pairs or two parts. For example, the following conversation consists of two parts.

A: "Want the first flight"? (first part)
B: "Good. I take it ". (The second part).

Between these two parts there can be an insert, as in the following example:

A: "Want the first flight"? (Q1- first question)
B: "What time?" (Q2-second question)
A: "Seven" (A2 second answer)
B: "Good. I took that ". (A1- first answer)

The corresponding pairing model can also be done by isolating it into the smallest units so as to produce pairs side by side. For example answer questions, greetings, bargains. Coulthard (in Purba, 2002: 108) gives the pair the same as the unit of conversation structure. Therefore, when a speaker produces a speech as the first part and the other person is expected to provide a harmonious item in the second part. Coulthard divides the corresponding pair into eight models / types, namely

1. Greetings, examples
   A: "Hello"
   B: "Hi"

2. Call-Answer, example
   A: "Jimmy!"
   B: "Yes, ma'am".

3. Complaint-Complaint, example
   A: "You let the tap open".
   B: "Not me".

4. Apologies, examples
   A: "It's already 9:00 a.m."
   B: "Sorry, I'm late".

5. Request-Welcome, example
   A: "Can you add more coffee?"
   B: "Of course, please take it yourself".

6. Requests for Information-Giving, examples
   A: "What time is it?"
B: "5 o'clock right".
7. Offer-Acceptance, example
   A: "Want to ride?"
   B: "You saved me".
8. Offer-Rejection, example
   A: "Please, cigarette."
   B: "I don't smoke, thank you".

There is another opinion that gives an understanding of the corresponding pair and its parts. For example, Jefferson (2006) on an internet site revealed that the so-called matching pairs are conversions that are grouped in a place by acts of paired words. Example
1. Greetings (Greeting-Greeting);
2. Proposal-Acceptance;
3. Summons of Acknowledgment;
4. Complaints (Accusation-Denial);
5. Promise-Acceptance;
6. Receipts (Compliment-Acceptance);
7. Compliment-Rejection;
8. Request for Information-Rejection (Request for Information-Refusal);
9. Request for Information-Grant Request.

In a pair, such as summons-acknowledgment, the claim is called the first part or part of the first pair (first pair-part / FPP) while recognition is referred to as the second part or part of the second pair (second pair-part / SPP).

FPP forms a conditional relationship (conditional relevance) which provides possibilities for answers (responses) that form SPP. Examples in English and German:
1. a: Hello (Hello)
   b: Hi / Hello (Hey / Hello) ➔(greetings)
2. a. How are you? (Wiegeht’s?)
   b. Fine, thanks. (Gut / Prima, Danke) ➔(questions / answers / question-answer)

Goldkuhl divides the corresponding pair in the form of:
1. Questions - Answers (Question - Answer)
2. Greetings - Greetings (Greeting - Greeting)
3. Offer - Acceptance (Offer - Acceptance)
4. Request - Offer (Request - Acceptance)
5. Complaints - Complaint – Excuse

### 2.3.2 Function and Distribution

The pair function corresponds as follows:
1. As an opening and closing a conversation;
2. As steps (moves) in a conversation;
3. The first part in the corresponding pair functions as the next speaker selector;
4. The corresponding pair can be used as a remedial exchange namely exchange or change from the previous section;
5. The components in the corresponding pair can be used to form a longer conversation relationship. Distribution rules for matching pairs in conversations are defined as follows:
   a. The second part always appears after the first part.
   b. The first part can appear in anything in the conversation unless the first first part appears directly called insertion.

2.4 Writing plays as a Learning Development

   Model The learning development model is very diverse. The diversity of development models can lead to different approaches from each model. Researchers can choose one of the development models for research. Rahman (2013: 198-219) explains that there are several learning models that can be used such as Kemp, Dick & Carey, ADDIE Models, and 4-D Models. In this study, the ADDIE model will be used. The ADDIE (Analysis-Design-Develop-Implement-Evaluate) model appeared in the year 1990s developed by Reiser and Mollenda. The ADDIE function is to design and develop an effective and efficient training. The stages contained in the ADDIE model consist of: analysis, design, development, implementation, and evaluation. The advantage of the ADDIE model is that this model is simple and easy to learn and a systematic structure. This ADDIE model consists of 5 components that are interrelated and systematically structured, which means that from the first stage to the fifth step, the application must be systematic, it cannot be sorted randomly or we can choose which one we think we want to prioritize. Because these five stages / steps are very simple compared to other design models. Whereas the shortage of the ADDIE model is that in the analysis phase it takes quite a long time to divide the analysis into two, namely performance analysis and needs analysis. (http://www.academia.edu 5152425/Papers_model_ADDIE, 4 April 2016 21.05)

3 Results And Discussion

   In this section the data used are 3 German prose in the form of short stories (short stories) taken from the book “Prosa der Gegenwart” which is used as a model or example in learning "Literature" or Literature courses in the German language education program Unimed. In accordance with the steps of the ADDIE model used in the design of this study, it was carried out in stages as described below.
   1. Descriptive Analysis The steps taken in this phase are analyzing the description of contents and text from Prose der Gegenwart. This performance analysis step is knowing the structure of German prose. In this step the structure and description of the contents of the prose text is done by delving into the intrinsic and extrinsic elements of the prose first. In general, experts divide the imaginary prose intrinsic elements of plot, character, character, characterization, setting, point of view, style of language, message, and theme. There is another element, namely the storytelling style (Siswanto, 2008: 142).
   2. Design In this phase the initial design will be designed in the form of the corresponding pair model in each paragraph. Based on the structure or description of the prose contents in the form of intrinsic and extrinsic interpretations that have been described above,
corresponding pairs are arranged again according to the nature, function and distribution that may arise from each paragraph or multiparagrap. Then it can be arranged the model or part of the corresponding pair from this prose into the material of the drama script.

3. Development (Development) In this phase, the initial design that was completed earlier, it will be developed into a drama script which contains dialogues adapted to the first phase

4. Implementation In this phase, the prose that has been arranged with this paired pairing model will be applied in literary learning and then practiced into drama using drama scripts that have been created using the appropriate matching pair model.

5. Evaluation In this phase a questionnaire will be given, to find out whether the media that is made is useful and interesting and is appropriate with the ajasensi model. If there are still shortcomings, revisions and improvements will be needed. The questionnaire will be given to literary experts and German-speaking experts from native speakers.

3.1 Results of Development

Title of Prosa: Der Kaufmann und das Mädchen By: Angela Sommer

a. Analysis of intrinsic and extrinsic elements

1. Intrinsic Elements After reading and analyzing, there are some intrinsic elements of this prose:
   a. Theme: Rich Merchant and Binal Girl
   b. Mandate: - Do not be too easy to trust others that we don't know yet. - Don't be too complacent with female beauty.
   c. Ejambemen: Coherence
   d. Language: German
   e. Language style: Non Formal (colloquial)
   f. Majas: Hyperbole h. Neveaux: Human
   g. Plot / Flow: Forward backwards
   h. Settings: In the Car in the afternoon, in front of the theater cashier, in the theater hall, in the theater 14, and in the lobby.
   i. Statement:
      1) Der Kaufmann: Friendly, wishy-washy, as is.
      2) Das Mädchen: Flirtatious and indifferent.
      3) Rolf: Firm.
      4) Die andere Frau: Good and Friendly.
      5) Die Alte Frau: Fierce and chatty.
      6) Der Mann: Cunning and evil.

2. Extrinsic Elements: After reading the extrinsic element found in this prose in the form of any values contained in the contents of the story, as follows:
   a. Sociological Value: Der Kaufmann entered the trap das Mädchen.
   b. Moral Value: Must be polite and as a woman must be able to control herself.
   c. Value of Truth: You cannot cheat to enter the theater.

3. Prose Text Title: Der Kaufmann und das Mädchen
   Author: Angela Sommer

4. Play scriptFollowing are the results of the drama script produced using the following pair model

(Im Auto fahrtgerude)

Der Kaufmann: Du dududu... Ich möchte das Theater anschauen. Aber... mitwem? Aha, Rolf: Rolf, wöbst du?
Rolf: Hallo, was... zu Hause? Warum?
Der Kaufmann: Möchtest du jetzt anschauen?
Ich bin sehr müde. Und auch möchte ich mit dir was sagen.

Rolf: Jetzt??
Der Kaufmann: Ja.
Rolf: Jetzt kann ich nicht. Weißt du Abend?
Und was möchtest du sagen?

Der Kaufmann: Hmm... etwas (hahaha)
Oke, später bricht erst mit Wirkung auf dem Theater.

(Im Theater treffen Rolf)

Die alte Frau: Kann ich Ihnen helfen?
Der Kaufmann: O... ja, hast du schon einen Mann hier gesehen?

Der Kaufmann: Oh... Ok. Dankeschön.
Die alte Frau: (Lachen) Hier viele Männer wollen Theater anschauen. Ich finde, es geht nicht so wie Ihnen zu schauen.

Der Kaufmann: Ja, wann... hast du schon einen Mann gesehen?
Der Mann: Kännichtanschauen? Du trauringbro?

(Im foyer treffen schlechten Mann)

Der Mann: (rauchengerade): Hei, Warum bist du traurig bro?
Kann nicht anschauen?
Der Kaufmann: Ja, hm... hast du schon einen Mann gesehen?
Der Mann: Nein, ich seh noch nicht.

Ich habe das Ticket, aber... Möchtest du mein Ticket bezahlen?
Der Kaufmann: Ja, will, aber... Möchtest du meinem Freund...
Der Mann: Selbstverständlich. Das Zimmer ist 14.7 Reihe.
4 Conclusions

From the results and discussion of the research above it can be concluded that:

1. Using the ADDIE model in the process of developing Prosa der Gegenwart short stories into drama script using the corresponding pair model, the results of the research are obtained in the form of:
   a. The right analysis is in the form of descriptive analysis that describes the overall prose interpretation in the form of intrinsic, extrinsic, and short story synopsis.
b. The design of the study was carried out with a matching pair model that was
dominated by the Information and Information Giving Request model, and several Delays and
Statements.

c. The development of short stories designed with these matching pairs makes drama
scripts in which there are dialogues that can be read with easier interpretation. In the
respective pair that has been designed allows the reader or actor of the drama to be able to
recite the dialogue according to the intonation, the appropriate expression. An example when
the demand for information is rejected can be better played even if it is not in the form of
sentences negation or renunciation. The nature of ajasensi makes the reader or actor of the
script focus more on improvising the dialogue according to the situation or the pairing model
matches. The results of this development are in a good category, in accordance with the results
of expert tests conducted by native speakers of German (Praktikan) in the Unimed FBS
German Language Education Study Program.

d. In the Implementation phase, the results of the drama script can be applied to the
lessons in the "Literature" course or the Literature Course at the Unimed FBS German
Language Study Program or played at the Oktoberfest event which becomes the annual agenda
in the study program so that it is beneficial for students and German literary learners.

e. In the Evaluation Phase, good results were obtained in accordance with the
questionnaire distributed to students of the German Language Education study program. The
deficiencies and advantages have been revised according to the contents of the questionnaire.

2. The results of this development are in the form of a German drama script which
contains dialogues and elements of intrinsic, extrinsic and synopsis interpretation. And as the
findings in this study that in a pair of dialogues or conversations can occur more than one pair
model corresponds and there is a new place of said actions such as statements, information
reinforcement, invitations and delays in rhetorical sentences.

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Article: Making of Test Instrument Based Higher Order Thinking Skills on Basic of Mechanics and Heat

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Abstract. This study aims to determine the quality of appropriateness products of test instruments based Higher Order Thinking Skill (HOTS) on Basic of Mechanics and Heat based on the Expert Team. The research method used in this study is Research and Development (R&D) methods. The stages that will be carried out are: (1) preliminary study; (2) development study. In the preliminary stage is to study the learning tools, especially on the learning achievement of subjects and mid-semester exam questions and the final semester questions, where it is found that the learning achievement is still oriented towards Low Order Thinking Skill as well as mid-semester exam and final semester exams are still oriented towards low-level thinking. The next step is to conduct a development study by changing the achievement of learning oriented HOTS. Next, make a test instrument lattice based on learning achievement as a reference for making test instruments. From the results of the test instrument products that have been made then validated by two experts from the Department of Physics. From the results of the validation by the expert team, in general the test instruments were made in good categories according to HOTS criteria.

Keywords: Test Instrument, HOTS, Basic of Mechanics and Heat

1 Introduction

The 2016-2020 Medan State University strategic plan launched and developed State University of Medan to become a teaching and research institution that excels in producing scientific works. The research to be developed by Unimed is research, service, and science and technology that are useful for solutions to problems of education and the business world and the industrial world. Unimed also has to produce various learning developments, models and learning media, software, materials and systems to solve educational problems at the center of learning and research innovation. In accordance with that, it is necessary to conduct constructive treatments to build the characteristics of students. Then students must be prepared to be qualified and take a strategic role in future conditions.

Science, especially physics is very important role in driving the progress of Science and Technology (science and technology) because the development of physics is always pursued in accordance with the nature of learning towards the development of thinking abilities (mind on), skills (hands on), and scientific attitudes (heart on) (Asyhari, 2014) Physical learning is ideally in accordance with the objectives and nature of learning science, namely attitudes, processes, and products (Toharudin, 2011).

Changes in curriculum in universities are very urgent, where changes in curriculum will have an impact on university policies to develop more in all aspects, especially in the learning
process. Since 2016, Medan State University began implementing and developing the Indonesian National Qualifications Framework (KKNI) Curriculum. The Indonesian National Qualification Framework (KKNI) is a manifestation of the quality and self-identity of the Indonesian people relating to the national education system, training and national learning achievement equality assessment system.

In applying the IQF curriculum in the lecture process in the classroom, it does not only focus on developing the learning model or strategy used. The provision of learning resources and the implementation of authentic assessment processes must also be considered by the lecturer as a learning facilitator. To be able to perform authentic assessment, an assessment instrument is needed that can be used as a reference as a standard instrument.

Basic Mechanics and Heat courses are basic Mathematics and Natural Sciences courses that must be taken by all students in the Faculty of Mathematics and Natural Sciences. Where in the assessment is done based on the results of 6 tasks (1. Routine tasks, 2. CBR, 3. CJR, 4. Idea Engineering, 5. Mini Research, and 6. Project) and Mid Semester examination results and End Semester Exams. The form of the midsemester exam is an Essay question and the form of a test for the semester final exam is a multiple choice form. Test instruments that have been tested have not been standardized based on the learning process carried out. When viewed from the learning process, students are required to think high-level. This can be seen from the tasks given which consist of 6 tasks. Therefore, in carrying out the Examination, a standard assessment instrument is needed to be used as a reference in the Faculty in assessing students and must also be adjusted to the mindset in the learning process, namely higher order thinking skills so that there is harmony between the learning process and the test that was tested. During this time the test instrument given the orientation is still low-level thinking, this is what makes student learning outcomes still low, because it is not in line between the learning process provided with the given test. From the results of the question and answer session for students, students felt that the assignment had indeed taken up time and effort, so that when the exams were conducted they felt they could no longer study, because they had to complete the assignments. Actually this must be known by students, that by completing 6 tasks, they have taken the learning process with high level skills, so that it requires extra time and energy. For that, the test requires tests that are oriented towards higher-order thinking skills.

Assessment is one of the main components in the learning process (Wijayanti, 2014). Assessment is not only focused on the cognitive domain, but also focuses on the affective and psychomotor domains (skills). This is in accordance with the assessment carried out in Unimed based on the Chancellor Decree No. 065 / UN33 / Kep / 2016 which is the beginning of the beginning of lectures using an IQF-based curriculum. Aspects of understanding, application and reasoning in the realm of cognitive abilities can be used to show the profile of thinking ability (Rofiah, 2013).

2 Methodology

The research method used in this research is research and development methods Research and Development (R&D). R & D research is used to design products or procedures that are systematically tested in the field, evaluated, and developed in a way that meets the criteria of effectiveness, quality or similarity to a standard (Borg and Gall, 2003). The R & D research used in this study was adapted from Borg and Gall (2003), based on figure 1.
3 Result And Discussion

3.1 Need Analysis

At this stage, it is analyzed in three aspects, namely 1) potential of the system; 2) curriculum analysis; and 3) Analysis of Test Instruments

3.1.1 Potential Needs

Medan State University, especially the Faculty of Mathematics and Natural Sciences, is a Faculty that has the most potential number of students at the State University of Medan. Facilities and infrastructure that are sufficient enough to allow students to learn and find learning resources. For example the existence of digital Library is very helpful for students to find references. Then the existence of internet access that can be used as a medium to find references in cyberspace, such as to search for journals and scientific articles of good quality both nationally and internationally.

3.1.2 Curriculum Analysis

At this stage, the curriculum applied at FMIPA Unimed was analyzed, where Unimed had implemented the Indonesian National Qualifications Framework (KKNI) Curriculum starting in 2016 whose assessment was determined in the Rector's decree. One characteristic of the implementation of the IQF is the implementation of 6 tasks, namely: 1) Routine Tasks; 2) Critical Book Report (CBR); 3) Critical Journal Review (CJR); 4) Idea Engineering; 5) Mini Research (MR); and 6) Project. In detail the explanation of the 6 tasks is:

1. Routine assignments give meaning to train all competencies in converting lectures, with assessment indicators are attitudes, knowledge and skills.
2. Critical Book Report (CBR) gives meaning to reviewing books based on concepts or theories learned in a course to determine critical positions. Assessment indicators include 1) summary of the problem; 2) consider the context and assumptions; 3) communicating their own perspectives, hypotheses or conjectures; 4) analysis of supporting data and evidence; 5) using other perspectives and conjectures; 6) examine conclusions, implications and consequences; and 7) communicate effectively.

3. Critical Journal Review (CJR) gives the meaning of critically reviewing (all components of a research) or journal with the main objective of finding the advantages and disadvantages of a research / journal and displaying relevant suggestions to maintain strength and overcome the weaknesses of the research / journal. Indicator. Assessment indicators include: 1) a summary of the background of the research problem; 2) consider the context and assumptions; 3) communicating their own perspectives, hypotheses, or conjectures; 4) analysis of supporting data and evidence; 5) using other perspectives and conjectures; 6) examine conclusions, implications and consequences; and 7) communicate effectively.

4. Rekayation Idea (RI) gives meaning: a) derivation of new ideas or concepts from existing ideas and new ideas in the same or different social context, creation and innovation of existing ideas, b) potential to produce real products, c) the wild idea (wield idea) that is tamed. Indicators Assessment includes: 1) the ability to produce ideas; 2) describe ideas; 3) Writing engineered ideas; 4) Using current references; 5) Integration Skills.

5. Mini Research (MR) gives the meaning of simple research which consists of questions (hypotheses, objectives, main), theories, instruments, data collection, data analysis, and conclusions. The assessment indicators include: 1) Updating and originality; 2) suitability of the purpose formulation; 3) interlocking between elements; 4) appropriateness of the instrument; 5) suitability of data analysis techniques; 6) main findings; and 7) implications.

6. The project gives meaning: a) the application of knowledge transfer for authentic problem solving through the process of investigating ideas, inquiry processes, critical and creative thinking, and skillfully nominating the results. b) produce models or products that have ethical, aesthetic, social, cultural and economic values. Assessment indicators include: 1) Inquiry ability in investigating ideas and questions; 2) The ability to apply concepts and principles of science learned in various relevant fields of science; 3) Ability to think creatively in problem solving (fluency, flexibility, elaboration, and novelty of solving strategies); 4) Ability to manage resources to complete tasks; and 5) Reporting ability.

Through these 6 tasks, students are expected to be able to develop their abilities in expressing inspirational and creative ideas. By doing routine tasks, students can achieve the competence of each material taught. The critical Book Report and Critical Journal Review tasks will foster a critical attitude of students, this is based on the characteristics of HOTS itself. So by working on CBR and CJR assignments students have done high-level thinking reasoning (HOTS). The assignment of Idea Engineering, Mini Research and Projects has an impact on students on the habit of giving ideas or ideas that are good for self-development in the students themselves, and for transferring knowledge that is understood so that the learning process is more meaningful (Boorkhart, 2010).

Besides that, the purpose of giving 6 assignments is also expected to be able to implement 10 characters recommended by Medan State University, namely: 1) communication ethics, 2) Honesty, 3) Responsibility, 4) Cooperation, 5) Resilience, 6) Concern, 7) Discipline, 8) Perseverance, 9) Independence, 10) Initiative.

Attitude assessment is done by making a range of scales from 1 - 4. Where the rating scale is divided into 4 categories, namely:
Table 1. Assessment Attitude Range

<table>
<thead>
<tr>
<th>Attitude Value</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.51 – 4.00</td>
<td>Very good</td>
</tr>
<tr>
<td>2.51 – 3.50</td>
<td>Good</td>
</tr>
<tr>
<td>1.51 – 2.50</td>
<td>Not good</td>
</tr>
<tr>
<td>0.00 – 1.50</td>
<td>Very Poor</td>
</tr>
</tbody>
</table>

3.1.2 Instrument Analysis

Before conducting a test analysis given to students, an analysis of the learning device, namely the semester plan learning (RPL).

Table 2. CPL Physics Education Study Program

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Have a professional attitude and openness to collaborate and have social sensitivity and concern for the community and the environment for the development of learning</td>
</tr>
<tr>
<td>N</td>
<td>Mastering the concept of physics, the scientific mindset of physics based on natural phenomena needed to carry out learning in elementary, secondary and advanced education units</td>
</tr>
<tr>
<td>GS</td>
<td>Able to apply logical thinking, critical, systematic, and innovative in the context of the development or implementation of science and technology that pay attention to and apply the value of humanities in accordance with the field of Physics Education based on rules, procedures and scientific ethics in order to produce solutions, ideas and designs.</td>
</tr>
<tr>
<td>SS</td>
<td>Able to utilize various alternative solutions to physical problems that have been available independently or in groups for the right decision making in the field of education in classroom learning, physics laboratories and educational institutions that are their responsibility.</td>
</tr>
</tbody>
</table>

Based on the learning achievement of the physics education study program shows that the learning achievement has indicated from the characteristics of high-level thinking skills, this can be seen from the general skills of applying logical, systematic, and innovative thinking. Likewise for special skills, namely utilizing alternative problem solving. This is exactly what Susan M. Brookrhat said that high-level thinking has meaning in problem solving.

The following is a learning achievement of basic mechanics and heat courses.

1. Observe the theories, concepts, principles, laws and physics propositions in the study of General Physics I through the study of kinematics in one dimension and two dimensions, particle dynamics, effort and energy, linear momentum, collisions and implus, rotation, equilibrium, static fluid, dynamic fluid, temperature and heat, and ideal gas.
2. Conduct experiments according to his theory and have scientific process skills, critical, and problem solving abilities
3. Applying it in everyday life and as a basis for understanding advanced physics
Based on the learning achievement of the next course, it will be reduced to the learning achievement of the subject as follows:

1. Assessing kinematics of motion in one and two dimensions, solving problems and applying them in daily life
2. Assessing particle dynamics, solving problems and applying them in daily life
3. Assess business and energy, solve problems and apply them in daily life
4. Assessing linear momentum, collisions and impulses, solving problems and applying them in daily life
5. Assessing rotation and equilibrium, solving problems and applying them in daily life
6. Assessing static and dynamic fluids, solving problems and applying them in daily life
7. Assessing temperature and heat, solving problems and applying them in daily life
8. Assess ideal gas, solve problems and apply them in daily life.

From the learning achievement of the physics education study program and the learning achievement of basic mechanics and heat courses there is a lack of synchronization. Furthermore, to synchronize the learning achievement of the course is made by paying attention to the characteristics of high-level thinking skills (HOTS) as follows.

1. Making alternative solutions based on natural phenomena and cases needed to develop knowledge in learning.
2. Solving problems through logical thinking, critical, systematic, and innovative in the context of the development or implementation of science and technology
3. Make decisions through alternative physical problem solving that has been available independently or in groups
4. Producing products that can be used in the application of humanities in accordance with the field of Physics Education based on rules, procedures and scientific ethics in order to produce solutions, ideas and designs.
5. Using physics technology in learning, experimentation and research.

For sub-learning achievement courses can be described as follows:

1. Identify the problem based on the facts / cases presented.
2. Interpreting relationships between variables based on facts / cases presented.
3. Formulate problems from facts / cases based on individual perceptions.
4. Presenting ideas from facts / cases as solutions to problem solving given.
5. Applying ideas / ideas through experiments
6. Conduct trials by manipulating variables through the experimental method.
7. Adjust various knowledge used in different contexts.
8. Apply procedures to specific situations.
9. Discriminating facts / cases from hypotheses
10. Distinguish the level of relevance of the hypothesis
11. Justify the material based on the concept
12. Analyze the relationship between solutions and problems
13. Evaluate the stages / procedures of the experiments carried out.
14. Proving the possibility of results
15. Constructing product design as an alternative solution that is utilized in learning.
16. Produce product development planning as an alternative solution that is used in learning.
17. Using products in the physical feasibility test of products in learning, experiment and research.

After reviewing the RPL of the basic of mechanics and calor, then the analysis of the test instruments was carried out on the final semester examination test based on the Bloom taxonomic percentage of revision, namely C1 to C6.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Percentage of cognitive domain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C1</td>
</tr>
<tr>
<td>Kinematics</td>
<td>2</td>
</tr>
<tr>
<td>Particle Dynamics</td>
<td>4</td>
</tr>
<tr>
<td>Work and Energy</td>
<td>2</td>
</tr>
<tr>
<td>Momentum &amp; Impulse</td>
<td>4</td>
</tr>
<tr>
<td>Rygid Body Random</td>
<td>4</td>
</tr>
<tr>
<td>Dynamics Rotation</td>
<td>4</td>
</tr>
<tr>
<td>Fluid Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>Temperature and Calor</td>
<td>2</td>
</tr>
<tr>
<td>Kinematics</td>
<td>4</td>
</tr>
<tr>
<td>Gas Kinetic Theory</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
</tr>
</tbody>
</table>

From the percentage of the final semester exam questions it was clear that the questions being tested were still in the low-level thinking aspect, which was 82%, while for the high-level thinking it was only 18%. The difference is still far from learning activities that dominate higher-order thinking, especially on 6 tasks.

### 3.2 Development Phase of Test Instruments

The development of test instruments is carried out by making test grids based on learning outcomes. Because the questions developed are questions that require reasoning and creativity in thinking, the number of questions developed is 12 questions for the mid semester exam and 32 questions for the semester final exam.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Jumlah MT</th>
<th>Jumlah FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kinematics</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Particle Dynamics</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Work and Energy</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Momentum &amp; Impulse</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Rygid Body Random</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Dynamics Rotation</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Fluid Mechanics</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Temperature and Calor</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Gas Kinetic Theory</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>12</td>
<td>32</td>
</tr>
</tbody>
</table>
3.3 Validation of Test Instruments

Test instruments are made based on the grid, which is then validated by 3 experts from the physics education program. There are 3 aspects of validation, namely material aspects, construction aspects and aspects of language. Then the results of the 3 validators determined the mean value using the Aiken’s V formula. With the formula:

\[ V = \frac{\Sigma S}{n(C-1)} \]  

Table 5. Content Validity on Mid Test Instrument

<table>
<thead>
<tr>
<th>No. Item</th>
<th>Value V</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>0.75</td>
<td>valid</td>
</tr>
<tr>
<td>2.</td>
<td>0.75</td>
<td>valid</td>
</tr>
<tr>
<td>3.</td>
<td>0.92</td>
<td>valid</td>
</tr>
<tr>
<td>4.</td>
<td>0.83</td>
<td>valid</td>
</tr>
<tr>
<td>5.</td>
<td>0.75</td>
<td>Valid</td>
</tr>
<tr>
<td>6.</td>
<td>0.83</td>
<td>Valid</td>
</tr>
<tr>
<td>7.</td>
<td>0.67</td>
<td>Valid</td>
</tr>
<tr>
<td>8.</td>
<td>0.58</td>
<td>Valid</td>
</tr>
<tr>
<td>9.</td>
<td>0.42</td>
<td>Valid</td>
</tr>
<tr>
<td>10.</td>
<td>0.75</td>
<td>Valid</td>
</tr>
<tr>
<td>11.</td>
<td>0.92</td>
<td>Valid</td>
</tr>
<tr>
<td>12.</td>
<td>0.83</td>
<td>Valid</td>
</tr>
</tbody>
</table>

In general, the test instruments on mid semester exam questions have valid test validity, although there are some questions that need major and minor improvements.

Table 6. Content Validity on Final Test Instrument

<table>
<thead>
<tr>
<th>No. Item</th>
<th>Value V</th>
<th>Inf.</th>
<th>No. Item</th>
<th>Value V</th>
<th>Inf.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>0.92</td>
<td>Valid</td>
<td>17.</td>
<td>0.75</td>
<td>Valid</td>
</tr>
<tr>
<td>2.</td>
<td>0.83</td>
<td>Valid</td>
<td>18.</td>
<td>0.67</td>
<td>Valid</td>
</tr>
<tr>
<td>3.</td>
<td>0.67</td>
<td>Valid</td>
<td>19.</td>
<td>0.92</td>
<td>Valid</td>
</tr>
<tr>
<td>4.</td>
<td>0.83</td>
<td>Valid</td>
<td>20.</td>
<td>0.83</td>
<td>Valid</td>
</tr>
<tr>
<td>5.</td>
<td>0.67</td>
<td>Valid</td>
<td>21.</td>
<td>0.67</td>
<td>Valid</td>
</tr>
<tr>
<td>6.</td>
<td>0.92</td>
<td>Valid</td>
<td>22.</td>
<td>0.67</td>
<td>Valid</td>
</tr>
<tr>
<td>7.</td>
<td>0.92</td>
<td>Valid</td>
<td>23.</td>
<td>0.67</td>
<td>Valid</td>
</tr>
<tr>
<td>8.</td>
<td>0.92</td>
<td>Valid</td>
<td>24.</td>
<td>0.92</td>
<td>Valid</td>
</tr>
<tr>
<td>9.</td>
<td>0.83</td>
<td>Valid</td>
<td>25.</td>
<td>0.25</td>
<td>Not Valid</td>
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<tr>
<td>10.</td>
<td>0.67</td>
<td>Valid</td>
<td>26.</td>
<td>0.67</td>
<td>Valid</td>
</tr>
<tr>
<td>11.</td>
<td>0.75</td>
<td>Valid</td>
<td>27.</td>
<td>0.83</td>
<td>Valid</td>
</tr>
<tr>
<td>12.</td>
<td>0.33</td>
<td>No Valid</td>
<td>28.</td>
<td>0.67</td>
<td>Valid</td>
</tr>
<tr>
<td>13.</td>
<td>0.67</td>
<td>Valid</td>
<td>29.</td>
<td>0.92</td>
<td>Valid</td>
</tr>
<tr>
<td>14.</td>
<td>0.83</td>
<td>Valid</td>
<td>30.</td>
<td>0.67</td>
<td>Valid</td>
</tr>
<tr>
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<td>0.50</td>
<td>Valid</td>
<td>31.</td>
<td>0.75</td>
<td>Valid</td>
</tr>
<tr>
<td>16.</td>
<td>0.83</td>
<td>Valid</td>
<td>32.</td>
<td>0.92</td>
<td>Valid</td>
</tr>
</tbody>
</table>

960
In general, the test instruments developed in mid semester questions are valid, although there are some that must be revised.

Table 7. Content Validity on Final Test Instrument.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.92</td>
<td>Valid</td>
<td>17</td>
<td>0.75</td>
<td>Valid</td>
</tr>
<tr>
<td>2</td>
<td>0.83</td>
<td>Valid</td>
<td>18</td>
<td>0.67</td>
<td>Valid</td>
</tr>
<tr>
<td>3</td>
<td>0.67</td>
<td>Valid</td>
<td>19</td>
<td>0.92</td>
<td>Valid</td>
</tr>
<tr>
<td>4</td>
<td>0.83</td>
<td>Valid</td>
<td>20</td>
<td>0.83</td>
<td>Valid</td>
</tr>
<tr>
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<td>Valid</td>
<td>21</td>
<td>0.67</td>
<td>Valid</td>
</tr>
<tr>
<td>6</td>
<td>0.92</td>
<td>Valid</td>
<td>22</td>
<td>0.67</td>
<td>Valid</td>
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<tr>
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<tr>
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<tr>
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<td>Valid</td>
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<tr>
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<tr>
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<td>Valid</td>
<td>32</td>
<td>0.92</td>
<td>Valid</td>
</tr>
</tbody>
</table>

The test instruments developed for the semester final exam were 32 questions, and valid questions were 30 questions and 2 questions were invalid. Of the 30 valid questions 7 questions (%) do not need improvement, 11 questions (%) need minor improvements, and 12 questions (%) need major improvements.

4 Conclusion

Based on the results of the making of Higher Order Thinking Skill (HOTS) based test instruments in the Basic Mechanics and Heat subjects, it can be concluded as follows:
1. The test results of the validity of the tests by experts indicate that the test instruments developed are valid and can be used for testing into the field.
2. Test instruments developed in good categories in accordance with indicators of higher order thinking skills.

References


Mobile Based Learning Model in Response to Industrial Revolution 4.0 in Higher Education

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Department of Universitas Negeri Medan, Indonesia¹,²,³,⁴

Abstract. Mobile-based learning is learning that can be done anywhere and anytime through information technology. The purpose of this study is to develop a mobile-based learning model in higher education. This study refers to the design of ADDIE development which includes five stages, namely: Analysis, Design, Development, Implementation, and Evaluation. Based on the test results, the product is declared valid, and an effective and efficient learning model is obtained. Based on the qualitative and quantitative analysis, the appropriate learning model in higher education is through a combination of learning in class, and online learning assisted mobile. Mobile learning can be a complement to the lecture material given in class. Thus, mobile learning can function as a remedial and enrichment.

Keywords: Mobile learning model, industrial revolution 4.0, learning in higher education.

1 Introduction

The digital revolution is currently creating a combination of technology that eliminates the boundaries between physical, digital and biological elements (Schwab, 2016). The speed of this development occurs exponentially, not linearly, which is unprecedented in the history of industrial development, and has the potential to disrupt the industry globally (Schwab, 2015), including in education (see: Strayer, 2012; Bergmann and Sams, 2012; Roehl et al., 2013; Al-Htaybat et al., 2018). To overcome the disruption of technology, it is necessary to renew and adjust the graduates' competencies to meet global professional qualifications. This is important considering the current and future generations not only must be academically qualified but also must be very technologically aware (Al-Habyat et al., 2018). That is why they are referred to as digital natives, a term that shows their technological proficiency, natural relations with technology, and their involvement in digital culture (Prensky, 2001). However, learning will not be able to prepare the millennial generation to be natives in technology if learning itself does not absorb technology in its learning activities.

Interestingly, pedagogy in learning continues to evolve, including in the method of delivery of teaching materials, which are also being developed. Various potentials for creating active learning are now available with simple designs in addition to traditional lectures in the classroom. Educators in elementary, middle and high school have found innovative ways to restructure the class (Strayer, 2007) to focus attention on students (Bergmann & Sams, 2012). Among them are flipped classroom or inverted classroom. Flipped classroom adopts learning models that assign lecture classes or instructional content as homework. In preparation for...
class, students are asked to attend lectures. The time in class lectures is generally utilized by submitting problems, concepts, and involving students in collaborative learning (Tucker, 2012). With internet access widely available in most colleges and universities, students can view web-based instructions whenever they have time, wherever they are, and in their way. This provides an opportunity to utilize the classroom only to confirm information from what is discussed in online lectures. Because students have actually gone through college before class, the time available in class can be focused on problem solving, skills development, and getting a deeper understanding of the subject matter (Bergmann & Sams, 2012). Thus, the lecturer can provide students with various learning opportunities that are student-centered in class and the interaction between lecturers and students becomes more efficient and quality. Peer mentoring and collaboration styles that can be built with mobile learning can increase Millennial student involvement in learning activities either in class or wherever they are (Prensky, 2010).

2 Literature Review

2.1 Industrial Revolution 4.0

The Industrial Revolution 4.0 is the name of the latest automation and data exchange trends in factory technology. This term includes cyber-physical systems, internet for everything, cloud computing, and cognitive computing (https://id.wikipedia.org/wiki/Industri_4.0, 2018). This revolution was marked by an era of disruption, namely the emergence of online (digital) industries. Not just computers, mobile technology is endemic, and almost everyone is connected online. In this revolution, the role of innovation is to determine the competitiveness of a product on the market. And apparently, there is a gap between industries that are dependent on innovation and labor readiness. Many job providers find it difficult to find human resources which have literacy skills (read, write and count) as well as data literacy (big data), technology literacy (coding, and understanding of AI) and human literacy (humanities, communication, and design).

2.2 GEN-RI 4.0

GEN-RI 4.0 stands for General Education + Industrial Revolution 4.0. The principle is that literacy from general education collaborates with data literacy and technology in the curriculum. Also, there is a new technique in dealing with the development of science and technology that is very fast, namely the concept of lifelong learning. Students are expected to continue updating their knowledge following the latest developments in science and technology. Our country is trying to combine conventional learning with online, known as the blended learning facilitated by the Online Learning System (SPADA) and the IdREN network (backbone). SPADA applies many new methods related to online learning such as Hybrid Credit Transfer

• Pioneering Cyber University;
• Regulators and quality assurance of PJJ (online learning);
• Innovative-based learning;
• Flip learning;
Based on the description above, it can be concluded that the concept of lifelong learning requires lecturers to study for life. This means that educators must constantly develop themselves sustainably to adapt their instructional designs to technological developments and industrial revolutions. Because the industrial revolution will automatically change the pattern of human life including student learning patterns. Thus the teaching staff must adjust to remain able to produce quality learning amid dynamic student learning styles due to technological disruption.

2.3 Mobile Learning

Mobile Learning (M-Learning) is unique learning because learners can access learning materials, directions and applications related to learning, anytime and anywhere. This will increase attention to learning material, make learning pervasive, and can encourage learner motivation for lifelong learning.

Using m-Learning enables more opportunities for collaboration on an ad hoc basis and interacts informally between learners. Mobile learning is a learning model to respond to the development of the world of information and communication technology, especially information technology and mobile communication, which is very fast cannot be denied one of the devices that is closely related to everyday life. Mobile learning is an intersection of mobile computing and e-learning that provides:

a. Resources that can be accessed from anywhere,

b. A powerful search system capability,


d. Alternative learning models that have characteristics do not depend on location and time.

The alternative model is also expected to be able to provide knowledge sharing facilities and visualization of knowledge, so that knowledge becomes more interesting and easily understood.

Some important abilities that must be provided by the m-Learning learning tool are there

a. The ability to connect to other equipment (especially computers),

b. Ability to present learning information and

c. The ability to realize bilateral communication between teachers and learners.

3 RESEARCH METHODS

This research uses development research methods. The purpose of development research according to Borg and Gall (1983) is to develop and validate educational products. Educational products are not only in the form of material, such as textbooks, learning videos, etc., but also include referring to existing learning methods and processes, for example, learning models or methods of organizing learning (Borg dan Gall, 1983). The development carried out in this study is the development of learning models. The learning model was developed by adopting information technology into the whole learning process. The model developed will be general so that it can be adapted to various subjects. The development procedures used are limited to limited trials to produce prototypes 1. Continuous development is needed during the
The development of the learning model was carried out referring to the development procedures of Borg and Gall (1984) and Plomp and Nieveen (2013) but limited only to the validation and trial stages. The results of the development in the form of a final prototype that has gone through a series of validation and trial stages are then implemented and evaluated to obtain continuous improvement so that the model that has been built has reliability in the implementation of mobile-based learning.

The activities carried out during the development process are:

a. Needs Analysis: The activity begins with an analysis of the situation and problems that occur in learning activities in the UNIMED environment. The results of the situation analysis are then reviewed theoretically based on developing theories and researches.

b. Development: The results of the needs analysis are then used as the basis for the development of a mobile-based learning model. The relevance in this context is the suitability of the problem with the theory used to build the learning model. The activity begins with designing a learning model by considering the findings of the latest research and adapting the product from the research. Design adaptation from previous development research was carried out in the hope that the adapted model had good validity and reliability. Although in this study the learning model remains validated to guarantee its success. The design of the model that has been determined for use is then constructed into a mobile learning model. The model that has been built is then realized into learning tools, namely RPS and Lecture Contracts. Instrument that has been built at this stage is categorized as prototype 1.

c. Product Trial: Prototype 1 which was produced at the realization stage, then tested for validity by 2 experts from Medan State University, North Sumatra. Based on the results of this validation test, a small revision was then made to obtain a mobile-based learning model in the form of a prototype 2. After the prototype 2 was obtained, then a field trial was conducted. Field trial activities are divided into two aspects, namely 1) reviewing students' understanding of the model that has been built; and 2) reviewing the level of student satisfaction related to the learning model used. The results of the trial were used to evaluate the performance of the learning model and further improvements were made.

3.1 Data Analysis

The development of this learning model has good quality if it meets aspects of validity, practicality, and effectiveness.

1. Validity: The validation results of the validator about the learning model were analyzed descriptively, then compared with the validity of a learning model. The learning model is declared valid, if it meets the following criteria.
   a. More than half (50%) of validators state that the learning model has a strong theoretical basis.
   b. More than half (50%) of the validators stated that the learning model component was feasible
   c. The results of the trial show that the linguistic component fulfills the good and right language.

2. Activism: the learning model is said to be practical, if it meets the following criteria.
   a. More than half (50%) of validators give consideration that learning models can be applied in class.
   b. Lecturers say they can apply the learning model in the classroom.
3. Effectiveness: the effectiveness of teaching materials seen from the viewpoint of students by testing one to one in the classroom.

4 RESULTS AND DISCUSSION

4.1 Results of Needs Analysis

Need analysis is done by giving questionnaires and observations to students and lecturers. The results obtained from questionnaires that have been conducted regarding learning activities show that 86% of students need more teaching resources. The tightness of lecture time and the many assignments given by lecturers make students not have much time to find teaching resources both in the library and through the internet. The need for Android use in learning media is 90%. The results of the needs analysis questionnaire show the ability of lecturers and students to operate the android is very good. Learning facilities such as laboratories have been used when practicing, while LCDs, wifi, or hotspots already exist, but have not been used in learning activities to the fullest. The use of media is still dominated by limited worksheets or media.

4.2 Results of Product Development

The product development carried out was the development of m-Learning media as a blended in learning. This stage is after the needs analysis. The product development process is carried out in several stages, namely collecting materials in the form of materials from valid sources and making material presentations and material mastery test questions. The M-Learning consists of a summary of the subject matter and enrichment that is equipped with competency standards, basic competencies, indicators, learning objectives, relevant learning videos, sample questions, practice questions, and competency tests to measure student success. M-Learning is made so that students are more interested and easy in learning material. Mobile learning products are built to strengthen learning. Mobile learning products that have been developed can be seen as in Figure 1.

![Menu of Lecture](image)
b. Menu of Material Subject

c. Menu of Lecture Task

d. Menu of Test Result

Fig. 1. Menu on mobile-based online learning
4.3 Validity Test

Based on the material expert test instrument which was filled by material experts in the form of questionnaires, obtained improvement suggestions, namely adding material was still too minimal, correcting writing errors, and replacing images from everyday life. Based on the design expert test instrument that has been filled by the design experts in the form of questionnaires obtained improvement suggestions as follows: 1) Pay attention to the rules of IT media development, 2) Improve the writing of letters and writing is expected to be constant, 3) Fix unclear writing, 4) The size of the writing on the evaluation question is enlarged, 5) Add a background image to the instructions for use, 6) The color of the discussion question simply uses black, 7) Fix the instructions on the video, 8) Change the image to the problem according to daily life.

4.4 Field Test

Field tests were conducted in class A of Computer Science Study Program 2018/2019 Academic Year. At this stage, students use the media individually (independent), then are given a questionnaire to state whether the media is interesting, easy to use and helps students in learning. This stage aims to find out the improvements or shortcomings of the m-Learning media developed before the trial phase of the operation of the product in small groups. A summary of student responses and assessments of the use of m-learning can be seen in Table 1.

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Value</th>
<th>Qualitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attraction</td>
<td>3,12</td>
<td>Interesting</td>
</tr>
<tr>
<td>Ease of use</td>
<td>3,74</td>
<td>Very easy</td>
</tr>
<tr>
<td>Benefit</td>
<td>3,61</td>
<td>Very helpful</td>
</tr>
</tbody>
</table>

4.5 Effectiveness

Product effectiveness testing is done by giving a test to students. Test questions have 20 items by adjusting the indicators that have been made. After testing the effectiveness of students who have used Android-based m-learning, the researchers obtained student test results from the cognitive aspects. The product is said to be effective if more than 77.14% of students complete the KKM. The percentage value of the effectiveness of the product is converted into a score of the quality value statement so that a score of 3.08 is obtained which means that the product is in a good and effective category to be used as a learning medium.

5 CONCLUSION

Based on the research that has been done regarding mobile-based learning (m-Learning), it is concluded that: 1) Produced m-Learning products as a blended learning model in universities that have validated their suitability; 2) Test results of the design, material test, and field test of the product so that the product is declared feasible and can be used as a blended
learning model and the product has also been tested through field testing along with seeing the response and assessment of students on product use; 3) m-Learning media as a tools of blended learning model has good attractiveness with a score of 3.12, excellent ease of quality with a mean score of 3.74, very good quality of usefulness with a mean score of 3.61; 4) m-Learning media as tools of blended learning model are declared effective to be used as learning media.

REFERENCES

Utilization of Cyclic Natural Rubber to Modified Asphalt

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Abstract. This research aimed to determine the stability value of modified asphalt using a cyclic natural rubber. Modified asphalt designed with mixing with the pure bitumen with cyclic natural rubber. The increasing of cyclic natural rubber on a mixture of bitumen started from 0 phr, 1 phr, 3 phr, and 4 phr. Furthermore, modified bitumen (5 samples) tested with testing property requirements test of pure asphalt. The results obtained that the data qualified for property requirements for asphalt. The next step was making a specimen with mixing the modified bitumen, soft aggregate and coarse aggregate to optimum asphalt content of 6 %. Then the specimen tested with Marshall Test to determine the value of bitumen stability. Then the result of stability value from sample 1 to 5 was 1252 kg, 1129 kg, 1159 kg, 1312, and 1320 kg respectively. Based on the results, the conclusion of this research was cyclic natural rubber could be used as a material to modified asphalt as well as increased the value of asphalt stability. The increasing of stability value meant that highway could hold a heavier load.

Keywords: Modified Asphalt, cyclic natural rubber, stability

1 Introduction

Seven characteristics must be owned asphalt mix: stability, durability or durability, pliability or flexibility, resistance to fatigue (fatigue resistance), surface roughness or shear resistance, waterproof, and easy to implement (Sukirman, 2012). Stability is the ability of pavement receive traffic loads without permanent deformation occurs in waves, grooves, and bleeding. The need for stability comparable to the function of the road and the traffic load will be served. Roads that serve high traffic volume and predominantly consist of heavy vehicles in need of pavement with high stability. Instead of pavement that is intended to serve the light vehicle traffic, would not require the value of stability.

Several factors generally cause damage to the highway. One effect is the activity of mobilization by the transportation of goods and people in the use of the road that sometimes does not comply with the rules could affect the life of roads. The high mobility of road transport activity will affect the stability of the asphalt. Asphalt stability will impact on the durability of asphalt and road damage.

To improve the stability of bitumen, required a strong bond between the asphalt and aggregates. Aggregate is a mixture of market, gravel, crushed stone or other materials derived from natural or artificial materials. Aggregate is a significant component of the structure of the pavement, which is (90-95) % of aggregate based on the percentage of weight. Thus the
quality of the road pavement structure is determined by the aggregate nature and results of the aggregate mixture with other materials (Sukirman, 2012). An asphalt binder (matrix) which brings together all the aggregates in the manufacture of the highway. Bitumen is used as a material in road pavement serves as 1) a binder, providing a strong bond between the asphalt and aggregates and asphalt among others; and 2) a filler, fill the voids between the grains of aggregate in the pores in the grain aggregate itself (Sukirman, 2012). Based on its functions, asphalt has a vital role in the quality of asphalt. Excellent quality of asphalt will potentially improve the quality of roads and vice versa.

Various modifications of asphalt have been made to improve the stability of asphalt. One research showed that the value of stability meets the specifications issued by the highways stability value that was obtained in 1331 kg which had outweighed the minimum value of 1000 kg (Wasono, 2013). Another result (Ritonga W, Wiryosentono B, Nasruddin, 2013) showed that the asphalt mixture with natural rubber asphalt cyclic meets the physical requirements required by the Indonesian National Standard (SNI) (Departemen pekerjaan Umum, 2005).

A new material that allows trying to serve in the manufacture of asphalt mix is natural rubber cyclic (cyclic natural rubber). Cyclic natural rubber is one form of natural rubber modified by heating using an acid catalyst. Different cyclic properties of natural rubber with natural rubber origin. Excess cyclic natural rubber which is resistant to rub power and has better adhesion. The primary use is cyclic natural rubber as a raw material for paints, coatings and adhesives (Chusna, 2002). This study aims to determine the effect on the stability of cyclic natural rubber asphalt. Expected by adding a cyclic natural rubber will increase the stability of asphalt mixture so that the quality of the highway could be better.

2 Materials And Methods

This research was conducted at the Laboratory of Civil Engineering Politeknik Negeri Medan. The instruments used in this study were penetration test, thermometer, timer, soaking tub (water bath), rings (made of brass), steel balls, a heat source (heater), mold brass ductility, ductility testing machine, pycnometer, glass vessels, thermostat, analytical balance, oven, mixer, while the material used is asphalt Pen Cyclic 60-70 and natural cyclic rubber.

The first stage conducted in this study was to test the physical properties of asphalt. Asphalt modified was designed by mixing (60-70) pen bitumen, acrylic acid benzoyl peroxide into the beaker, heated for 30 minutes at a temperature of 90°C, and 180 rpm until melted. The same treatment was also finalized with the variation of asphalt with cyclic natural rubber shown in Table 1.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Asphalt</th>
<th>CNR</th>
<th>Acrylic Acid</th>
<th>BPO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>gr</td>
<td>gr</td>
<td>ml</td>
<td>gr</td>
</tr>
<tr>
<td>1</td>
<td>2000</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>2000</td>
<td>100</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>2000</td>
<td>100</td>
<td>40</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>2000</td>
<td>100</td>
<td>60</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>2000</td>
<td>100</td>
<td>80</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 1: The composition of Mixed Research Samples
After making modified asphalt, physical properties test was performed to determine the asphalt characteristics by the SNI. Samples testing were carried out in the form of testing the physical properties of bitumen which includes penetration, softening point, ductility, density, impairment/lose weight and penetration after losing the weight.

Further testing will be done on the physical properties of aggregates. Aggregates in asphalt highway included coarse and fine aggregates. Testing of asphalt-aggregate properties included moisture absorption, bulk density, effective density, and abrasion. The next step was to manufacture the test object. Making a test specimen made by mixing sand (fine aggregate) and gravel (coarse aggregates) with asphalt modification. The optimum asphalt content used was 6%. Test specimen made as many as five specimens representing each sample of bitumen modification. After the making of the object was completed, the next stage was to Marshall test to the specimens. This test was performed to determine the value of the characterization of modified asphalt.

3 Results And Discussion

3.1 Physical Properties Test

The first stage of the research was to test the physical properties of the asphalt to the pure asphalt with Iran pen 60/70 (sample 1) and modified asphalt (sample 2, 3, 4, and 5). Physical requirements included penetration test, softening test point, ductility tests, density tests, test weight, and the penetration test after the weight of the asphalt that has been modified according to the SNI. Results of testing physical requirements pure asphalt are as shown in Table 2.

<table>
<thead>
<tr>
<th>No</th>
<th>Physical Properties Test</th>
<th>Sample 1</th>
<th>Sample 2</th>
<th>Sample 3</th>
<th>Sample 4</th>
<th>Sample 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Penetration (mm)</td>
<td>72.50</td>
<td>53.17</td>
<td>51.83</td>
<td>47.00</td>
<td>46.50</td>
</tr>
<tr>
<td>2</td>
<td>Softening point (°C)</td>
<td>35.00</td>
<td>39.50</td>
<td>42.00</td>
<td>42.50</td>
<td>44.50</td>
</tr>
<tr>
<td>3</td>
<td>Ductility (cm)</td>
<td>110.00</td>
<td>120.00</td>
<td>150.00</td>
<td>150.00</td>
<td>150.00</td>
</tr>
<tr>
<td>4</td>
<td>Density of asphalt</td>
<td>1.01</td>
<td>1.02</td>
<td>1.02</td>
<td>1.03</td>
<td>1.09</td>
</tr>
<tr>
<td>5</td>
<td>Losing weight (%)</td>
<td>1.00</td>
<td>2.15</td>
<td>2.32</td>
<td>2.34</td>
<td>2.40</td>
</tr>
<tr>
<td>6</td>
<td>Penetration after weight lost (%)</td>
<td>70.20</td>
<td>50.30</td>
<td>49.00</td>
<td>47.59</td>
<td>45.08</td>
</tr>
<tr>
<td>7</td>
<td>Decreased ductility</td>
<td>55.00</td>
<td>60.00</td>
<td>75.00</td>
<td>75.00</td>
<td>75.00</td>
</tr>
</tbody>
</table>
The data showed that the addition of concentration of cyclic natural rubber on asphalt using compatibilizer acrylic acid and benzoyl peroxide gave effect to the physical properties of the asphalt. The addition of natural rubber cyclic was making the lower value of penetration bitumen into 40/50 with a previous 60/70. Due to the penetration value decreased, so that the requirements of the physical properties of the asphalt adjusted to SNI Pen 40/50.

Based on Table 2, the increase of the concentration of cyclic natural rubber in modified asphalt impacted the low value of bitumen penetration. Bitumen penetration is a level of stiffness which is meant the inclusion of needle. The higher the penetration value, the more soft asphalt and vice versa. The addition of cyclic natural rubber in asphalt resulting penetration value became smaller which means the asphalt became stiffer.

The addition of natural rubber concentration of cyclic also increased the value of the softening point of modified asphalt. The increasing of softening point value means the asphalt stiffer and vice versa. The results of properties test of softening point are still in the same condition with the results of the penetration test that showed asphalt became stiffer. Hardening of asphalt was possible because the strengthening of the bond between the asphalt particles resulting cyclic function of natural rubber to glue bonds between the particles. This situation is also by the revelation Palupi NPet al., (2008) which states that the cyclic natural rubber can serve as an adhesive resin in the mix of materials.

Based on the results of testing the physical properties of the asphalt on table 3 above, it can be seen that the concentration of cyclic addition of natural rubber until 4 phr fulfilled the physical properties of asphalt. Thus the cyclic natural rubber can be used as a mixture of asphalt.

3.2 Stability of Modified Asphalt

Figure 1 showed that the addition of cyclic natural rubber affected the modified bitumen stability value. The greater the concentration of cyclic natural rubber applied to the asphalt mixture and the aggregate affected the higher the value of asphalt stability. The stability value of sample 1 (pure asphalt) was 1252 kg, while the addition of cyclic 4 phr natural rubber (sample 5) had a stability value of 1320 kg. The overall sample met the standard value of asphalt stability of at least 800 kg. The relationship between the cyclic addition of natural rubber against asphalt modification value stability can be seen in the following figure:
The research data showed that the addition of cyclic natural rubber concentration causes the value of asphalt stability was greater. Based on modified bitumen standard, the high stability value indicated the asphalt could hold a heavier load. The resistance to load was a form of the strength of asphalt. The increasing of asphalt strength may be caused by cohesion between asphalt and aggregate whose strength is better when cyclic natural rubber is added. The results by Cubuk (2009) also found the addition resins could improve the stability of the asphalt.

### 3.3 Density of Asphalt Modified

The addition of cyclic natural rubber affected the modified bitumen density value (Figure 2). The greater concentration of cyclic natural rubber applied to the asphalt mixture, and its aggregate had little effect on the asphalt density. The density value for sample 1 (a pure bit) was 2.41, while the addition 4 phr of cyclic natural rubber (sample 5) had a stability value of 2.42. The entire samples met the density standard. The relationship between adding cyclic natural rubber to the modified bitumen stability could be seen in Figure 2.

![Fig. 2. The relation between the addition of cyclic natural rubber to the value of density](image)

### 3.4 Flow of Asphalt Modified

The relationship between adding cyclic natural rubber to asphalt flow value could be seen in Figure 3. Based on the figure, it showed that the addition of cyclic natural rubber effected on the value of asphalt flow. The flow value of pure asphalt was 3.6, while the flow value of modified asphalt (sample 4) was 4.18.
The research data showed that the addition of cyclic natural rubber concentration caused the flow value of asphalt was greater. Based on the modified asphalt standard, high-density values indicated the better asphalt is holding the load. The results of this study were by findings of Sidiq (2013) that kerosineserved as an agent or a wetting agent that will lower the density of the asphalt so that the asphalt becomes more easily detached.

Also, this study was also by the results of research Ritonga (2016) that modified asphalt with palm kernel ash may increase its density value. This is likely due to the composition of the constituents, filler levels, compaction energy, and asphalt content.

4 Conclusion

In the quality analysis according to SNI, penetration of iran asphalt with the value of 60-70 after modified with cyclic natural rubber is declared feasible to be used. Also, marshall test data showed that the addition of cyclic natural rubber concentration on asphalt affected modified asphalt characterization. This addition increased the stability and density value of asphalt where high values indicated asphalt could hold a heavier load.

Acknowledgments. The researcher would like to extend his gratitude to the Ministry of Research, Technology and Higher Education for funding this research under the schema of Penelitian Strategis Nasional Institusi 2018.

References

Improve Generic Skills of Science and Honesty of Students Through the Aceh Cultural Cooperative Model

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Abstract. The purpose of this study is (1) to improve generic science skills through an Aceh-based cooperative culture model on physics material. (2) Increase the honesty of students in the learning process through a cooperative culture based in Aceh. (3) To improve students' understanding of culture. The sample of this study was taken 1 (one) class. The research sample was applied to students of class XI IPA 1 Kutacane 1, Bambel sub-district, Aceh Tenggara district, which consisted of 37 students. Classes will be applied to learning through Acehnese culture-based cooperative learning models. Data collection techniques through generic science skill observation sheets are expressed in the number of mean values, and N-Gain values. Data processing to measure student honesty is to calculate the percentage of each indicator of student honesty questionnaire. Student response data were obtained using the student response questionnaire. The results of the study enhance students' generic science skills through a cooperative model based on Aceh culture physical material with a normal gain of 0.72 in the high category. Honesty students are obtained using an honest questionnaire, the openness of teachers and students in the learning process can improve students' sense of honesty. The positive response of students reaches 90.8%.

Keywords: Cooperative based on Aceh culture, generic science skills, Honesty of Students

1 Introduction

Physics is learning science related to the natural surroundings. Physical science learning cannot be separated from laws, concepts, and theories that are fundamental. The demands of science learning on eragloba according to the National Science Teachers Association (2006) are to prepare students with various skills and skills such as creative thinking, innovative, critical, problem solving, communication, collaboration, ICT Literacy and leadership. Science learning must also prepare qualified students, namely science-aware students, have high-level values, attitudes and thinking skills so that human resources will emerge that can think critically, think creatively, make decisions, and solve problems (Hadi, 2017).

Based on the Minister of National Education Regulation (Ministry of National Education, 2006) No. 22 of 2006 the purpose of physics lessons in high schools are: (1) forming a positive attitude towards physics by realizing the order and beauty of nature and promoting the greatness of God Almighty, (2) fostering a scientific attitude that is honest, objective, open, resilient, critical and able collaborate with others, (3) develop experience to
be able to formulate problems, propose and test hypotheses through experiments, collect, process, and interpret data, and communicate the results of the experiment orally and in writing, (4) develop reasoning skills in thinking inductive analysis and deductive by using concepts and principles of physics to explain various natural events and solve problems both qualitatively and quantitatively, (5) master the concepts and principles of physics and have the skills to develop knowledge, and the attitude of confidence as a provision for continuing education at a higher level.

Education as an effort made to realize the learning and learning atmosphere, so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation and state. Facing the current era of globalization requires reliable human resources who have high self-confidence, are able to solve problems that have, have a high sense of curiosity, diligent, appreciate the work of knowledge and have the willingness to cooperate. Education is the most important part of life. The quality of a nation's education influences the progress of the nation.

Education has problems that are core to the learning process. Learning is a process of interaction between students and educators and learning resources in the learning environment (Law No. 20 of 2003 concerning National Education System). The learning process is the implementation of a series of planning that has been carried out by the teacher in the form of interaction with students inside and outside the classroom to achieve goals. In this condition there is a series of actions of the teacher and students on the basis of reciprocal relationships that take place in an educutive situation.

The ever increasing era of globalization can influence students' character quickly. From the results of interviews with teachers at high school 1 Kutacane Aceh Tenggara stated: the low curiosity of students, low honesty of students, not thinking critically, low interest in students 'learning in physics subjects, low students' interest in solving physical problems. Students assume that physics learning is very difficult to see from formulas, theories, concepts, and principles.

As a result of the problems resulting in low physics learning outcomes under the KKM with an average grade of 70.00 and a lack of collaboration in learning seen in the teaching and learning process during observation. Though learning science in principle is not enough to simply memorize a concept through textbooks, more than that learning science is essentially a process and product. Learning science can be done in a variety of ways, such as observing / observing an object or natural phenomenon, taking measurements, making hypotheses, designing, testing data, discussing groups and conducting experiments.

Generic skills are very important for students because this ability is needed by students in developing careers in the future in accordance with their respective fields, especially in the field of science. Generic abilities are not suddenly obtained but these skills must be continuously trained to increase. The purpose of increasing generic science skills is that the knowledge and skills gained from learning outcomes in the teaching and learning process can be applied in real life and answer the challenges of the times that are growing faster, especially in terms of science and technology. In learning, generic science skills must
be adapted to the model or method of learning, so that it is more effective in seeing improvements that occur.

According to Kamsah in (Rosidah 2017) states that generic skills are employability skills used to apply knowledge. Thus, generic skills are also skills needed for various fields of work and life. In addition, generic skills are also skills that result from intellectual abilities combined with psychomotor skills so as to produce attitudes that will be attached throughout life.

Efforts to realize a learning atmosphere are more emphasized to create conditions and preconditions so that students learn, while the learning process prioritizes efforts to achieve learning goals or student competencies. In the learning process, teachers are required to be able to learn, which includes planning, implementing, and evaluating learning. This is in accordance with Republic of Indonesia Regulation No. 41 of 2007 concerning Standard Processes.

Education for Indonesia is an integral part of national development and one of the determinants of successful development in all fields. One proof of the efforts made by the government to improve the quality of education is to implement the 2013 curriculum. The 2013 curriculum puts culture into one of the components developed from the elementary school to high school level.

Education and culture is something that cannot be avoided in everyday life, because culture is a whole and whole entity that applies in a society and education is a basic need for every individual in society. Education and culture have a very important role in fostering and developing the noble values of the nation, which has an impact on character formation based on noble cultural values. Like Tilaar (in Suryana 2015) states that culture is a complex totality that includes knowledge, beliefs, art, law, morals, abilities and habits that are obtained by people as members of society.

Character education not only aims to improve students' understanding, but also more important to produce young people who have the ability to become agents of change, character and culture. Character and cultural education has become an important issue in the curriculum at various levels. According to Chang (2009), the most important factor in the formation of children's character is how children deal with problems in the surrounding environment. One of them is by educating students to analyze character, culture and social values. Implementation in 2013 The curriculum in Indonesia focuses on developing student character, facing challenges, especially in difficulties. Teachers in integrating approaches develop the character of students in learning.

Integrating education and culture in the learning process will create meaningful learning. Because the process of culture-based learning not only transfers culture and cultural embodiment but uses culture to make students able to create meaning, penetrate the limits of imagination, and be creative in achieving a deep understanding of the subjects being studied, especially physics subjects as part of science knowledge.

Sardjiyo & Pannen (2005) stated that culture-based learning is a strategy for creating learning environments and designing learning experiences that integrate culture as part of the learning process. Culture-based learning is based on the recognition of culture as a fundamental part (fundamental and important) for education as an expression and communication of an idea and the development of knowledge. Culture that is integrated in the various cultural contexts in the land of Aceh.

Learning device is a tool or material used to carry out the learning process. Therefore, it is better for learning devices to be prepared using scientific methods. One of them is arranging learning tools based on Cooperative Learning learning models. Trianto (2011) stated
that the learning tools needed to manage the teaching and learning process can be: syllabus, Learning Implementation Plans, Student Activity Sheets, Learning Evaluation Tests, learning media and student textbooks. Based on Permendikbud number 22 of 2016 concerning the Standard Process for Primary and Secondary Education, it is stated that the preparation of learning tools is part of the planning of learning. Learning planning is designed in the form of a Syllabus and Learning Implementation Plan which refers to the Content Standards. Learning planning includes the preparation of learning plans and preparation of media and learning resources, learning assessment tools, and learning scenarios.

The learning device must be accompanied by an appropriate learning model and the most likely to be applied in appropriate learning is the cooperative learning model. According to Slavin (2005) cooperative is a learning model where students learn and work in small groups collaboratively with heterogeneous group structures. This learning model is a form of learning based on constructivist notions. Cooperative learning is a collaborative learning strategy where groups of small students with different levels of ability work together to achieve common goals or complete group assignments as well as goals and tasks that they cannot complete on their own.

Integration of Aceh's cultural context into physics learning can provide opportunities for teachers to improve the generic abilities of student science and honesty of students and introduce various kinds of Acehnese cultural contexts that are close to the child's environment, so that the culture is preserved and opportunities for development remain open in the school environment. Learning in schools that is separate from the local culture can lead students to be separated from the roots of their community culture, which in turn will make students not have good skills to participate in solving local problems that require methods and methods that are inherent in customs and customs, where is the student going through his life later.

According to Kamsah in (Rosidah 2017) states that generic skills are employability skills used to apply knowledge. Thus, generic skills are also skills needed for various fields of work and life. In addition, generic skills are also skills that result from intellectual abilities combined with psychomotor skills so as to produce attitudes that will be attached throughout life. Indicators of generic science skills used are direct observation, indirect observation, awareness of scale, symbolic language, logical frame, logical consistency, causal law, modeling, logic inference, abstraction.

2 Research Purposes

(1) To improve generic science skills through a cooperative culture model based on Aceh on physics material. (2) To increase student honesty in the learning process through a cooperative culture based on Aceh. (3) To improve students' understanding of culture.

3 Research Sample

According to Sudjana (2005) states the sample is a part taken from the population. The sample of this study was taken 1 (one) class. The research sample was applied based on the problem to solve the problem need an action, so the research sample was applied in class XI IPA 1 Kutacane 1 State High School, Bambel sub-district in Southeast Aceh district the
students consisted of 37 students. The class will be applied to learning through Aceh culture-based cooperative learning models.

4 Data Analysis Techniques For Generiks Science Skills And Student Honesty

Instrument data were analyzed to determine the improvement of generic science skills and student honesty. Data analysis techniques to improve generic science skills and student honesty in this study are:

4.1 Descriptive Analysis

The research data in the form of students' generic science skills are expressed in the number, average, and N-Gain values. Generic science skills are assessed at each meeting and the honesty of students is assessed after the application of learning tools using the Acehnese culture-based cooperative learning model.

4.2 Inferential Analysis

4.2.1 Increased Generic Skills of Science

The data processing of the generic science observation skill sheet was intended to determine the generic science skills of students, while the gain calculation and normalized gain scores were intended to determine the improvement of generic science skills in the application of learning devices using the Acehnese culture-based cooperative learning model. The steps taken to measure the test score are:

1. Scoring
   Giving a score by giving a score weight from 1 to 3 adjusted to the predetermined scoring criteria. The score of each student was determined by looking at the students' generic science skills based on observation sheets and rubrics that had been developed. This scoring process is carried out when students carry out experiments at each meeting.

2. Calculation of Gain scores and normalized gain
   Knowing the increase in generic science skills developed through learning is calculated based on the normalized gain score. This is intended to avoid mistakes in interpreting the gain of each student. The normalized gain score is used by the formula developed by Hake, namely:

   \[ g = \frac{S_{\text{pos}} - S_{\text{pre}}}{S_{\text{mak}} - S_{\text{pre}}} \]  

   (Hake, 1999)

   Information:
   - $g$: gain
   - $S_{\text{pos}}$: posttest score
   - $S_{\text{pre}}$: pretest scores
   - $S_{\text{mak}}$: maximum score

   with the N-gain acquisition category (Hake, 1999) shown in Table 1.1.
### Table 1. Average Value of Normalized Gain

<table>
<thead>
<tr>
<th>Gain (g)</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>g ≥ 0.7</td>
<td>High</td>
</tr>
<tr>
<td>0.7 &gt; g ≥ 0.3</td>
<td>Medium</td>
</tr>
<tr>
<td>g &lt; 0.3</td>
<td>Low</td>
</tr>
</tbody>
</table>

#### 4.2.2 Increase Student Honesty

Assessment of student honesty is done using a rating scale questionnaire in the form of a numerical scale. This questionnaire was conducted to measure the honesty of students during the learning process by using a cooperative learning model based on Aceh culture.

Data processing to measure student honesty is by calculating the percentage of each indicator of student honesty. The steps taken to process student honesty questionnaire data are as follows:

- a. Calculate the number of each type of aspect of the indicator assessed.
- b. Calculate the percentage of each type of aspect of the honesty indicator of students who are assessed using the formula:
  \[
  \% = \frac{\text{Number of students who meet the criteria}}{\text{number of all students}} \times 100\%
  \]
- c. After calculating the percentage of each aspect of the indicator, then compare the most dominant percentage of each aspect of the indicator at each meeting.

#### 4.2.3 Student Response Questionnaire

Student response data were obtained using student response questionnaires. Data was obtained by means of students giving a checklist √ in the available column for each question asked. Response questionnaire is given to students at the end of learning activities using the instruments provided. This questionnaire is used to obtain data about the level of student interest in LKS and student responses. The responses of students who want to know are:

- a. Students' feelings about the components of the subject matter, Student Activity Sheet (LKS), learning atmosphere in the classroom, and how to teach the teacher (happy or not happy).
- b. Students' opinions on the components of the subject matter, student activity sheets (LKS), generic science skills worksheets, honesty questionnaires, classroom learning atmosphere, and teacher teaching methods (new or not).
- c. Students' interest in further learning activities, if learning is carried out as has been followed now.
- d. Students' opinions about the language used in the worksheet are generic skills of students' physics, student honesty questionnaires and worksheets (understandable or not).
- e. Students' opinions about the appearance (writing, illustration, picture, layout of images) contained in the worksheets of students' generic science skills, student honesty questionnaires and worksheets (interesting or not interesting).

#### 4.2.4 Interview
Interviews are conducted to find out things that are less observable at the time of observation. The questions asked are prepared with certain guidelines referring to aspects or things that will be examined, in this case students' understanding of physics learning.

5 Research Results And Discussion

Lessons learned from the learning process through cooperative learning models based on Acehnese culture in each learning process using aspects of the students respond when the teacher gives apperception. Students who discuss the material delivered by the teacher, Students work on LKS, Students discuss with the group, at the precisely the Acehnese culture-based cooperative learning model and students present the results of group discussions. Then the results of the study:

5.1 Genetic Science Skills

In the study of physics science using the Acehnese culture-based cooperative model on students' generic science skills has increased. Improving students' generic science skills through a cooperative model based on Acehnese culture on physical material with a normal gain of 0.72 with a high category.

5.2 Honesty of Students

Honesty of students is obtained by using honesty questionnaires. After the learning activities are complete the students are given an honesty questionnaire filled by students. Five indicators of student honesty, namely 1) Not cheating or cheating, 2) Expressing their feelings, 3) Expressing right / wrong attitude towards the material during group discussion, 4) Courage and confidence in answering the teacher's questions, 5) Calm and understand the task of the teacher. Based on the five indicators of honesty students experience positive changes. Openness of teachers and students in the learning process can improve students' sense of honesty.

5.3 Student Response

The positive response of students reaches 90.8%. Student activities in learning at each meeting have increased. Previous research carried out related to culture-based learning in science or physics learning namely the findings of Wahyudi (2003) who conducted a study of cultural aspects of physics learning and the importance of a culture-based physics curriculum gave a conclusion that students 'cultural background had an influence on students' learning process in school. Coupled with Suastra (2005) reveals that ethnosciene that lives and develops in society is still in the form of concrete experiential knowledge as a result of the interaction between its natural and cultural environment.

The goal of physics learning based on Aceh's cultural context is to help students become aware of how students can think mathematically according to their culture and traditions. In addition, increasing the generic ability of science and honesty of students through the context of Aceh culture can make teachers and students undergo a fun learning process, because in a culture of culture-based learning, teachers and students actively
participate based on the culture they have known so far so that learning outcomes are more optimal.

6 Conclusion

Based on the results of the analysis and discussion in this study, some conclusions are presented as follows:

(1) Improving students' generic science skills through an Acehnese culture-based cooperative model on physical material with a normal gain of 0.72 in the high category. The increasing honesty of students in learning through the Acehnese culture-based cooperative model on physics material has increased several indicators of student honesty seen from the improvement of each meeting, namely on the following indicators: a) Not cheating or scanning, b) Expressing his feelings, c) Expressing righteousness / wrong with the material during group discussion, d) Dare and confident answer the teacher's questions, e) Calm and understand the work of the teacher's tasks (2) The positive response of students reaches 90.8%. Student activities in each learning meeting have increased through Acehnese culture-based cooperative learning models. (3) The increase in students' understanding of culture can be seen from the results of interviews conducted after the teaching and learning process is completed so as to increase the attractiveness of students in learning physics. The cultural elements that are associated in learning are seen in terms of food, games, dances, traditional clothing, philosophy and so on.
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The Use of French Grammar in Writing North Sumatera Culinary Recipes

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Abstract. Writing is an activity expressing the way of thinking, feeling in text. Written language requires the writer to have certain skills, especially French learners. Writing culinary recipes in French also requires language skills in the use of positive articles, the formation of imperative speech and lexical mastery of culinary expressions. The text of culinary recipes in French is used as a learning medium that helps learners to increase their language skills. This paper was created to describe the use of positive articles, the formation of imperative speech and mastery of culinary expressions in French. The thing that prompted the writer to make a study about writing this culinary recipe because there were still errors in the students writing about some of the things mentioned earlier. Culinary recipes are chosen because this topic is interesting and familiar in the daily life of learners as well as motivating curiosity about local culture.

Keywords: writing recipe, partitive articles, imperative sentence

1 Introduction

The use of grammar in French is very important. Learning French by knowing grammar will increase the level of knowledge of the written and the oral, and will be able to interpret French correctly even if its use is not for the daily activities but if we control correctly the principles grammatical then the use of French would be better. The advantages of using grammar are to develop the art of translation, to help acquire vocabulary, to improve the knowledge of real sentences and to develop a conceptual reflection on the structure of the French language.

A correct grammar can be seen when writing a text. Writing is the ability to express ideas, opinions and feelings to others in text. According to Akhadiah (1998: 16), writing is the activity of delivering messages (ideas, feelings and information) in writing to others. The activity of writing it is not as easy as imagined. In writing, one must pay attention to the rules of grammar, unlike to speak where we can repeat the same word several times.

Writing courses are taught in 3rd semester. After attending writing class in one semester, some skills are expected to be mastered by students such as the ability to use the right articles and imperative sentences. To stimulate student’s creativity in the use of articles and imperative sentences, new learning media need to be sought so that writing activities are not boring, one of them is by writing recipes. Writing recipes requires students to be adept at using articles, especially positive articles. Writing a recipe usually aims to instruct the reader to do as written so that it is very appropriate to be used in the learning of imperative sentences.
Culinary recipes are also chosen, because food is something that is close to the daily life of students so that it is easier for students to learn grammar.

2 Study Literature

2.1 The Function of Food

This article aims to show that language learning through culinary recipes is very rich in knowledge. Understanding food is very broad. Eating is important to make a living (Papadopoulou :2016). Cooking and processing food is an activity that aims to answer vital needs and to make an important element of a new lifestyle. Eating is a social act. Élisabeth de la Fontaine. (2011) said eating as a social act because eating is a collective experience through acceptance from others. In eating activities, the situation is a moment to know others. The existence of a person at a meal shows a social role. For example, there is no party without food. Food becomes a communication tool for sharing experiences with others. However, religion also forbids followers to protect themselves from certain foods of Olivier. (2003: 244) in some beliefs are prohibited from eating certain foods. In this case, the adherent must show proof of loyalty in fulfilling the demands of religious regulations. In addition, eating allows for physical changes that result in disease and obesity.

2.2 Writing and Culinary Recipes

Writing recipes in French is found in old methods or new methods of learning French. Writing recipes in French learning is usually called cooking. In general, writing recipes can be found in any French teaching method such as: French Methods Alter Ego 1 (2006: 35, 114-117), Version 1 (2001: 14-15, 94-105), Editorial 1 (2016: 33, 47) and Tendance 2 (2016: 24-26). According to Stenkløf (2014: 67), the recipe is a text that contains a description of the cooking ingredients and how to do something about it. So, a cooking recipe is a process that indicates all the ingredients and operations needed to perform food preparation in the kitchen using utensils. In particular, it specifies, for a given number of persons, the quantities of each ingredient, the preparation and cooking times and, where appropriate, the method of cooking. The different operations to be performed are often described using specialized terms specific to cooking techniques. Recipes are often a variation of the staple diet of a particular crop.

Writing and cooking recipe have a very close relationship. The cooking recipe is a kind of injunctive text. This text is a text that proposes an action or gives instructions to a recipient. According to Amira (2017: 15), writing the injunctive text must be considered several things, namely the use of verbs, articles, adjectives, cooking terms, vocabularies and even prepositions. Based on the above explanation, it can be concluded that writing the recipe must be fit to the rules of grammar so that the recipe is grammatically structured.

2.3 Writing and Grammar

Writing is one of the most complex aspects of language skills. It’s said complicated, because writing is a source of other language skills and still needs to be supported by linguistic knowledge in a satisfactory way. According to Cuq and Gruca(2002: 178) writing is a complex process and acquiring written production skills is not an easy task, because writing
a text is not about producing a series of suitable linguistic structures but about making a series of problem-solving procedure that is sometimes difficult to distinguish and structure. This is in agreement with Nunan's (1989: 57) opinion that writing it is a complex cognitive activity because at the same time the author has to establish a number of varieties. Variety in sentence level includes content layout, order, sentence structure, vocabulary, punctuation and spelling, while variety outside phrase consist and combine sentences in one paragraph. According to Tarigan (2008: 3), writing is a language skill used to communicate indirectly and not face-to-face with others. While Crimmon's own writing ability (1984: 3) is the ability to pour thoughts into written language through sentences that are linked together, complete and clear so that thought can be communicated to the reader with success.

Based on some of the above opinions, it can be concluded that writing is a human activity that is done in a directed and conscious direction towards ideas, thoughts, feelings or experience in the form of organized writing systematically using logical sentences, so that others can understand the purpose of the authors.

In writing activities, the learner must also learn grammar to better understand the meaning of the article. According to Tanriverdieva (2002: 44), the grammar of language is the set of rules that govern language as a system of social nature subject to collective agreements. It can be concluded that the activity of writing is inseparable from the use of grammar. According to Nugraheni & Suyadi (2011: 27) argues that good writing is determined by the systematic writing used. A writing will be meaningful and interesting when using good sentence arrangements. Words should be arranged in grammatical sentences and cohesive passages. In addition, the text must be written using proper spelling and punctuation to make the meaning unambiguous. Thus, knowledge of grammar becomes an important preparation for students to write.

2.4 Load of Grammar in Culinary Recipes

2.4.1 Noun and Article

Nomina or often called a noun is a type of word that can usually serve as the subject or object of the clause. According to Bescherelle (2006: 188), the noun is a word that designates a person, an animal, or a thing. The noun is the core of the nominal group (sometimes called the leader of the group). Simone (1998: 16), says that the noun is a word that serves to designate, to "name", animate beings and things. In French, each noun is preceded by a determinant that indicates the gender and the number. The nouns are sorted by gender (male and female) and number (singular-plural). According to Loiseau (1993: 12), nouns generally preceded by a determinant that shows the type and number of names.

Example:
- Male noun: un verre, un four, un bol, un kilo, etc.
- Feminine noun: une casserole, une cuillère, une cuisinière, une tasse, etc.

In French, each noun must have an article. The article is a grammatical unit accompanying a French noun which serves to designate and limit the names that follow. The article is a linked morpheme that can not be left alone without a noun. This article has several functions. In general there are 3 types of article in French, these are: 1) Articles that work as unknown and unclear nominal markers are called indefinite articles 2) Articles that function as clear nominal markers are called definite articles and 3) the article used to declare the partial name (usually in the form of a kitchen or beverage) is called a partitive article. The use of articles varies in form according to gender (masculine-feminine) and number (singular-plural) of noun.
a. Indefinite Article

The indefinite article expresses the fact that the noun with which it is associated denotes a thing or a living being unknown to the participants in the communication, in the sense that it has not been discussed during this one. It also indicates that what is named is not individualized in relation to the class of which it is a part, and the article only directs attention to the thing or being named without the exactly determine it.

The indefinite article, that is French nominal articles that function as a marker the noun are uncertain and not yet clear (Delatour, 2002: 37-39). According to Monnier (1998: 26-27), the indefinite article indicates that the being or the object designated by the noun remains indeterminate. It agrees in kind and in number with the name designates.

Singular (feminine): une,
Example: Une orange, une poire.
Singular (male): un,
Example: Un avocat, un chocolat

Plural (Feminine / Male): if the article un and une is formed in the plural, it becomes des and the noun is added with s.
Example:
- Une orange becomes des oranges
- Un avocat becomes des avocats

b. Definite Article

The definite article indicates that the noun with which it is associated is known to the participants in the communication situation, that it is individualized to a high degree, that it is exactly defined, that it names a certain thing or a certain being.

Singular (Feminine): la,
Example: la crêpe

L’ (before vowel),
Example: L’escargot

Singular (Male) : le,
Example: le gâteau

Plural (Feminine / Male): if the article le andla is formed in the plural, it becomes les and the noun is added with s or x.
Example:
- la crêpe becomes les crêpes
- le gâteau becomes les gâteaux

c. Partitif Article

The partitive article / species of the indefinite article is used in front of a concrete or abstract name to indicate an indeterminate quantity, a part of a whole that cannot be counted and for this reason it is used with non-accountants.

Example: avoir du courage, boire de l'alcool, boire de la bière.

According to some grammars, des is not only an indefinite article, but also partitive, when it is used with non-numeric names without singular: prendre des legumes.
The partitive article, which is an article accompanying a French noun that serves as a partial name marker (usually cooking or drinking). According to Grevisse (2008: 745), a partitive article is an article listed in front of a name whose quantity can not be counted. The form of this article is a composite of the preposition of + defined article (le,la,les,l'). According to Monnier (1998: 32), the partitive article indicates an indeterminate quantity that is part of a whole. It is used before names of things that are not counted, which form a mass.

- **Singular Feminine**: de la,
  
  Example: Je mange de la glace, de laviande, de lasalade

- **De l’ (before vowel)**,
  
  Example: Je bois de l’eauminéra.

- **Singular Male**: du,
  
  Example: Jebesoin du beurre et du sucre

After a negative verb, the partitive article becomes de/d’ of when it determines a direct object and after the verb être in negative sentence, the partitive article does not change. A plural noun if followed by an adjective then the article of des is changed by de.

Example:

J’aimangédela tarte

If the sentence above is formed negative, article du of the is changed by : Je n’ai pas mangèdeta

- C’est du thon

If the sentence aboveisformednegative, article du is not changedbecauseit uses the verb être: ce n’est pas du thon.

- Ils achètent de vieux livres.

The nounlivres uses the article de becauseit uses the adjective before the name.

So, for the indefinite article uses un (singular male), une (singularfeminine) and des (plural male / feminine). The definite article uses le (singular male), la (singularfeminine), l’ (vowel and h) and les (plural male / feminine). The partitive article uses du (singular male), de la (femininesingular), de l’ (beforevowel and h) and des (plural male / feminine).

### 2.4.2 Imperative Sentence

The imperative sentence expresses an order, suggestion, request or order / expectation. The imperative sentence of French can be in the form of inversion (reversal of subject and verb arrangement), conjugated in présent form ending in a period (.) Or an exclamation point (!). This sentence is used by someone to tell or command to do something as we wish. This sentence requires that the opponent speak to respond in the form of actions or actions requested by the speaker.

### 2.4.3 Imperative Function

Kridalaksana (2008: 91) explains that imperative incorporation is a form of sentence or verb to express an order or necessity or a prohibition to carry out an act. It's different from the definition by Dubois (1973: 251) which states that:
(1) Imperative is a mode expressing an order gives one or more interlocutor (in affirmative sentences) or defense (in negative sentences).

Example:
Mangez régulièrement.
Ne mangez pas beaucoup de viande.

(2) Generative grammar, the imperative is a type of sentence (or modality of sentence), like the interrogative and the assertion (declarative sentence); it is a constituent of the basic sentence which, compatible only with the second person (o including a second person, committee you), triggers an imperative transformation; this one, including others, erases the pronouns subject of the phrase.

Example;
Vous + venez + demain, becomes Venez demain.

Mania (2004) declares restorative as a mode of action. It is not used to narrate, to describe, but to order, persuade, advise, etc. The implies a dialogue (real or fictional) in which the speaker tries to act on someone or something. The purpose of the imperative is motivated by various emotional movements.

To give instructions in a recipe or a job mode, one uses it is attractive. Aggressive estimation use to express:
- A commande : Mettez le beurre dans une casserole.
- A demand : Passe le sel, s’il te plaît.
- A wish : Mange ce plat chaud.
- An advice : mangez ce plat sans sucre.
- A prohibition : ne mélangez pas avec une cuillère en métal mais en plastique.
- An instruction: Ajoutez le sucre.

### 2.4.4 Formation of the Imperative

The imperative has only 3 people (you, us and you). It is based on the present indicative. The verb is conjugated without the subject pronouns.

<table>
<thead>
<tr>
<th>INFINITIF</th>
<th>PRÉSENT</th>
<th>IMPÉRATIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manger</td>
<td>Tumanges</td>
<td>Manges-le chaud</td>
</tr>
<tr>
<td></td>
<td>Nous mangeons</td>
<td>Mangeons-le chaud</td>
</tr>
<tr>
<td></td>
<td>Vous mangez</td>
<td>Mangez-le chaud</td>
</tr>
</tbody>
</table>

### 3 Conclusion

Writing a text needs a consistent sentence and the correct grammar. So, there is a very narrow in writing texts with the use of grammar. The text is the cooking recipe. This text uses Touarees the adjectives, tutoring lessons, the pronouns, the imperative modes, the articles like 're indefinite article, the definite article and the article particle. To achieve for cooking recipe exists certain expressions of lyilization of the phrase mode implication which is a more method of commissions an order, a request, a wish, a council, a prohibition an instruction.
Tables. All included tables must be referred to in the main text and the table title and caption are to be positioned above the table. The captions need to be written in Times New Roman, 9pt.

References

[8] Loiseau, Yves.: Point par Point (1997)
Implementation of the Children’s Pattern in Family Based on Cultural Success in Medan City

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Abstract. The purpose of this study is to describe the implementation of parenting type in the family of Batak, Minang, Malay, Javanese, Acehnese, and Nias in Medan. Patterns to be analysed are authoritarian, democratic, and permissive parenting. This analysis will provide an overview of the application of the type of parenting in the family based on ethic culture that lies behind the family. The sample in this study are families from the tribes of Batak, Minang, Malay, Javanese, Aceh, and Nias which is live in the city of Medan. This study used descriptive method. The result showed that the average family of Batak, Minang Malay, Javanese, Aceh, and Nias in Medan applied 46\% authoritarian parenting, democratic 83\%, and 35\% permissiveness.

Keywords: parenting, family, culture, ethnic

1 Introduction

Parenting is a trip with a long-term goal carried out by parents towards their children in the family. Family is the environment that children first recognize and become the first and foremost environment in child development (Handayani, 2017). The pattern of interaction between parents and children, such as how to apply the rules, teach values / norms, give attention and love and show good attitudes and behaviors so that they are used as role models for their children is called parenting (Theresia, 2009).

According to Baumrind (in Santrock, 2010), parenting is in principle a parental control. The same thing was stated by Kohn (1971) who stated that parenting is the way parents interact with their children including; giving rules, prizes, penalties, and giving attention, as well as responses to children's behavior.

Parenting is a way, form or strategy in family education carried out by parents to their children. The strategies, ways and forms of education carried out by parents to their children are certainly based on the expectations of parents. It is hoped that the education provided by parents makes children able to survive according to their nature and environment by growing the potential in the form of inner strength, mind and physical strength in each child. (Anto, et al. 1998). The parenting style given by parents to their children also determines social behavior and the level of intelligence of children. Parenting is influenced by the parenting style they get first when they are still children. Past care will affect discipline patterns, conflict resolution, or even life goals (Shihab, 2017). Parenting has a long journey in the process.

Every family has a style of caring for their children. Parenting is influenced by the age of parents, the involvement of parental members such as extended parents, parents' education,
husband and wife harmony, and prior care experience. Dayakisni and Yuniardi (2012) stated that culture is also one of the factors that influence parenting parents towards their children.

One city with a multiethnic population is Medan. Medan is the capital of North Sumatra Province, Indonesia. The city is the third largest city in Indonesia after Jakarta and Surabaya, as well as the largest city in Java. Medan city is the gateway to the western part of Indonesia. Bordering the Straits of Melaka makes Medan a city of trade, industry and business that is very important in Indonesia. In 1632, Medan was used as the center of the government of the Deli Sultanate, a Malay kingdom until the Europeans arrived, and the Dutch East Indies gave the status of the city and made it the center of the residency of East Sumatra. Entering the 20th century, Medan became an important city outside Java. Therefore, no wonder, today Medan is a multiethnic city where the population consists of people with different cultural and religious backgrounds.

Besides Malays and Karo as early inhabitants, Medan is dominated by ethnic Batak, Javanese, Minang, Chinese, Mandailing, Nias, Aceh, Indian and other ethnic groups. These cultural tribes have their own characteristics and cultural values that are inherited by their ancestors and influence the parenting style of their children. Because culture is one of the factors that influence children's parenting in the family. Therefore, it is interesting to observe how the implementation of childcare patterns in families with Batak, Mandailing, Karo, Nias, Malay, Minang, Javanese and Acehnese cultural backgrounds who live in Medan City.

2 Methodology

This study uses descriptive method with a qualitative approach. Descriptive research is directed to provide symptoms and facts or events systematically and accurately (Rianto, 1996). Research with descriptive methods can reveal the situation as it is (Handayani, 2016). The qualitative approach makes it easy for researchers to uncover the things that are the purpose of this research (Gandamana, 2015). Data can be collected through observation, interview, documentation, or technical combination techniques (Sugiyono, 2010: 309). Descriptive method is used to obtain an empirical description of the application of childcare patterns in families with grassroots backgrounds of Batak, Nias, Malay, Minang, Javanese, and Sundanese cultures, which are in the city of Medan.

The population in the study were all families with various ethnic groups / cultures in the city of Medan. The sample in this study were families with Batak, Nias, Minang, Malay, Javanese, and Acehnese cultural backgrounds, each family represented by a minimum of 5 families, who had settled in the city of Medan.

During the study the data was collected through several data collection techniques which consisted of filling out questionnaires about parenting, interviews with parents, and documentation. Important factual events that occur during the study will be recorded in full through the researchers' field notes. Data analysis was carried out qualitatively and used descriptive statistics. The questionnaire that will be used in this study is processed by quantitative analysis, namely by using the formula: If the statement is negative, then often (0), sometimes (1), never (2). If a positive statement, then often (2), sometimes (1), never (0). The results of the percentage of quantitative calculations are interpreted using the rule in table below.
Table 1. Categorization of Percentage Results

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Categorization</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>None</td>
</tr>
<tr>
<td>1%-30%</td>
<td>In part</td>
</tr>
<tr>
<td>31%-49%</td>
<td>Almost half</td>
</tr>
<tr>
<td>50%</td>
<td>Half of it</td>
</tr>
<tr>
<td>51%-80%</td>
<td>Most of the</td>
</tr>
<tr>
<td>81%-99%</td>
<td>Almost entirely</td>
</tr>
<tr>
<td>100%</td>
<td>All of it</td>
</tr>
</tbody>
</table>

3 Results And Discussion

Every family has their own parenting style. They have a way to educate their children, one of which may be influenced by the cultural background of their parents. Medan, which is the largest metropolitan city on the island of Sumatra, has a very heterogeneous population. In this city, family lives from various cultural backgrounds. We distributed questionnaires to children from 8 different family cultural backgrounds, namely from families with Batak, Nias, Karo, Mandailing, Minang, Malay, Javanese, and Acehnese cultural backgrounds. The eight cultural backgrounds of this family have the same tendency in the style of educating their children, which tends to use democratic-authoritarian parenting. The results showed that the average family with a Batak, Nias, Karo, Mandailing, Minang, Malay, Javanese, and Acehnese culture in the city of Medan applied 46% authoritarian parenting, 83% democratic, and 35% permissive. The copyright form is located on the authors’ reserved area.

![Fig. 1. The bar chart of an average trend of parenting in cultured families in Medan City](image)

Based on the diagram above, we can see that families with Batak, Nias, Karo, Mandailing, Minang, Malay, Javanese and Acehnese cultural backgrounds in the city of Medan, almost all or 83% tended to educate and care for their children using patterns democratic foster care. As many as 46% or almost half tend to educate and care for their children using authoritarian.
parenting, and as many as 35% or a small proportion tend to educate and care for their children using permissive parenting.

Figure 2 below will show a parenting pattern of each family with a cultural background of Batak, Nias, Karo, Mandailing, Minang, Malay, Javanese and Acehnese in the city of Medan.

Based on the diagram above, we can know that all cultural tribes that researchers observe, have the same tendency, namely the democratic type of parenting becomes the most widely used parenting style, then authoritarian, and what few families use is permissive parenting. Families with Acehnese and Karo ethnic backgrounds are the most likely to use democratic parenting, which is 95% or almost entirely. But if we observe the number of incompetence for authoritarian and permissive parenting, families with ethnic backgrounds in Aceh, are more likely to use authoritarian parenting than permissiveness. The diagram shows the tendency of authoritarian parenting is greater than permissive parenting, namely authoritarian parenting 36%, while permissive parenting 25%. Therefore, we can say that families with ethnic cultural backgrounds in Aceh tend to have democratic-authoritarian parenting. The results of the research questionnaire showed that families with Batak, Mandailing, Nias, Minang, Malay and Javanese ethnic backgrounds had the same tendency as the families of this Aceh cultural background, which tended to have democratic-authoritarian parenting.

It's different from families with Karo cultural background. Only families with ethnic backgrounds have democratic-permissive parenting. The tendency of permissive parenting is greater than the trend of authoritarian parenting, namely the tendency of permissive parenting by 40%, while the tendency of permissive parenting is 33%.
Baumrind (in Santrock, 2010) states that parenting is all forms and processes of interaction that occur between parents and children in the form of certain parenting in the family that will influence the child's personality development. Baumrind divides parenting into three styles of parenting, namely democratic, authoritarian, and permissive parenting.

Parents with democratic parenting will prioritize the interests of children, but do not hesitate in controlling children. Parents are also open, flexible, and provide opportunities for their children to grow and develop with rational rules, so parents have a close relationship with their children, they will invite their children to get involved in making rules and implementing rules with full awareness (Santrock, 2010).

Parents with authoritarian parenting tend to set an absolute standard that must be obeyed. Not infrequently followed by threats. This type of parent knows no compromise in communicating, so usually one-way communication occurs. Parents with permissive parenting lack the demands or control of their children (Santrock, 2010).

In fact, in society, not 100% of parents use only democratic, authoritarian, or permissive parenting. Based on the results of the questionnaire and shown in Figures 2 and 3, it can be seen that parents, especially with the background of Batak, Mandailing, Karo, Nias, Malay, Minang, Aceh and Javanese ethnic backgrounds, have a tendency to combine parenting in educating their children. In this case, researchers classify into two, namely democratic-authoritarian, and democratic permissive. The point is that democratic-authoritarian parents are more democratically dominant, but under certain conditions there will be authoritarian parenting. Likewise democratic-permissive parenting, meaning dominant democratic parents, but under certain conditions, permissive parenting will emerge.

Ahmad (2012) stated that the culture of parent's origin influences parenting to their children, even though the environment does not originate from the environment, but sometimes other languages and parenting are still used from their original culture. A child in the family will be nurtured according to the cultural values that are believed by both parents (Rahayu and Amanah, 2010). Parenting among Sumatran cultures that are applied using democratic and permissive parenting, parents give more freedom to children in determining choices so that children become more free in determining their attitude. Parents are not fixated on the cultural values that exist in educating children, the most important is the attitude of parents as a figure in guiding and educating children. As for the Javanese children parenting is applied not according to their own will or will, but always adheres to Javanese cultural values.
and traditions. Parenting style in Javanese culture is more dominant in authoritarian parenting and power assertion, parents have a dominant role in educating children and determining children's desires, parents also limit children's behavior so that children's behavior does not go beyond the limits of Javanese cultural values that are highly upheld high by the community. As a result, children become stiff and can not be free to express because all children's behavior is limited by the existing culture.

Based on this research, families with Batak, Mandailing, Karo, Malay, Minang, Nias, Aceh, and Javanese ethnic backgrounds show a dominant tendency to use democratic parenting, even in certain conditions in the Batak, Mandailing, Malay cultural backgrounds, Minang, Nias, Aceh and Java, authoritarian parenting emerged. As for families with Karo backgrounds, permissive parenting appears. This is due, in addition to the ancestral cultural factors, also because of the level of parental education, previous parenting experiences, and the challenges of the times.

4 Conclusions

Families with Batak, Mandailing, Karo, Nias, Malay, Minang and Javanese backgrounds living in Medan, on average applied 46% authoritarian parenting, 83% democratic, and 35% permissive. Based on the results of the study, families with a cultural background in Aceh and Karo showed the greatest tendency of adopting democratic parenting by 95% or almost entirely. The data also shows that there is a combination of parenting practices in the family. For families with Batak, Nias, Mandailing, Malay, Aceh and Javanese cultural backgrounds, they adopt parenting that tends to be democratic-authoritarian. Meanwhile, for families with grassroots background in Karo culture, they show a tendency for democratic-permissive parenting. This is influenced by the level of education of parents, the age of parents, experience in previous care, challenges of the times, and the culture of their ancestors.

ACKNOWLEDGEMENTS. We would like to gratefully acknowledge funding from Lembaga Penelitian Universitas Negeri Medan.

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The Women’s Collective Experience of Violence Victim
of Military Operation Area in East Aceh

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Abstract. The experience of women in the period of Military Operation Area (Daerah OperasiMiliter/DOM) implementation in Aceh was a bad experience as a very painful social practice. This is not only felt by victims but also by families who witnessed the suffering. All forms of violence have arisen the attitude of women victims of DOM, namely a sense of same fate, deep physical and mental injury. This is not only experienced personally, but rather becomes a collective experience. This collective experience is a memory of the suffering felt by all women victims of DOM in East Aceh. This is a real form of collective experience between victims of violence. This can be seen in the form of violence categorized in the realm, namely physical, psychological, sexual and economic violence.

Keywords: collective experience, military operation area, violation, women

1 Introduction

Women are part of society which also participates in all aspects of life including: religion, education, social, legal, political, economic and cultural aspect. All of these affect and are affected by women. History notes that Acehnese women have a central role in almost all lines of life. Both as rulers, clerics, fighters, educators and politicians. However, along with the change of time, the progress of Aceh's women has decreased slowly due to the prolonged conflict in Aceh.

As has been known historically, Acehnese women played quite influential roles, giving birth to women who had great works and gait which influenced the continuation of the development of the kingdom of Aceh and in the struggle for the independence of the Republic of Indonesia from the hands of the invaders.

A woman with her life experience during the Military Operations Area was a standpoint that could be analyzed socially. Women's perspectives are considered important and valuable to reveal an incident of violence throughout the conflict in Aceh. The events can be explained in real and what way the female victims are without any political elements and obscure an incident, also about what and how to become Acehnese women. A perspective on the events experienced by women directly about oppression, violence, as well as the massacre of the entire Acehnese people.

The incident of violence in the Military Operations Area (Daerah OperasiMiliter/DOM) from 1989-1998 between the Free Aceh Movement and the Indonesian National Army (TentaraNasional Indonesia / TNI) can be presented objectively as well as partially by women.
Partially in accordance with the meaning of Harding and Wood (1993) that the standpoint of women or other minority groups will always be partially in accordance with the situated knowledge of women, so as not to give a clear view of the same thing. Therefore the violence that afflicts women varies according to the form of violence and reactions issued by women obtained from their situated knowledge. Subordinate groups such as female victims provide a more complete picture of the world and therefore better than the images given by respectable community groups.

The experience of violence felt by victims makes them condemn the event, even what cannot be forgotten is the actions of the perpetrators. Until now, the feeling of the same fate has become a collective experience (collective memory) of women victims of DOM in East Aceh. Collective experience here is the experience on the depth of violence felt by victims both physically, psychologically, sexually, and economically.

2 Conceptual Framework

2.1 Standpoint Theory Harding

The feminism movement is not a revenge movement in order to undermine the existence of men in their work to run the social and world system and structure. The feminist movement is purely prioritizing aspects of equality of roles and rights in actualizing oneself as the highest human needs. This equality covers political, economic, cultural, ideological and environmental fields (Nugroho: 2008)

Because the struggle for feminism aims to equalize the social position of men and women, feminism is often considered to reintegrate humanity. This means that considering humanity, men and women are same, and therefore social opportunities should also beequal both for men and for women. Dzuhayatin (2002: 4) expresses the construction of feminism itself is built on the awareness of women's oppression. This awareness makes feminism have the character of 'siding' and not infrequently 'suing'. It does not even close the possibility that feminism's "alignments" towards the fate of women "translated" as a threat to men.

Chafetz (Ritzer, 2012) assumes that women occupy a low position in society, which he calls gender stratification. In families, for example, women (or wives) are in an oppressed position in relation to economic, sexual and property ownership functions, as well as the distribution of inheritance. Problems of injustice and gender inequality in families and communities have led to various reactions from various circles of society. Socio-cultural differences underlying the injustice and gender inequality in various places have long been observed and analyzed into diverse feminist theories.

Patriarchy historically is not only the first structure of the system of domination and subjection, it still continues as a pervasive and lasting system of inequality, a model of basic social domination (Lerner, 1986). Through participation in patriarchy, men learn to defend other humans in humiliation, see them not as humans, and control them. In patriarchy, men see women learn what subordination is (Ritzer, 2012: 805). As the thoughts of Acehnese women are the result of the construction of patriarchal culture that has developed so far in the daily lives of Acehnese women. They are used to the assume that women are normally in the kitchen, wells and mattresses. A stereotype that the author thinks is discriminatory tasting. Because of this kind of thinking, it causes women to assume or 'accustomed' to play only on the domestic side.
According to Murray and Wendee (2000) the feminist perspective considers that government regulation has to do with government politics and a rigid / formal political system, but is related to human relations in daily life. In feminist studies it is no longer talking about sex and gender issues that are associated with social and political theory. The theory addresses the understanding of governance politics in a capitalist environment and political power in countries with liberal democracies.

2.2 Resilience

With regard to one's mental attitude to survive in conflict, it can be linked to resilience. Resilience is a manifestation of attitude (trait). This is a hidden capacity that appears to fight individual destruction and protect individuals from all obstacles to life. Individuals who have good intelligence, adaptability, social temperament, and interesting personality ultimately contribute consistently to self-esteem, competence, and the feeling that they are lucky (Benaag 2002: 3).

That is the attitude of the individual who is resilient. Resilience is also called by Wolin & Wolin as a skill when facing the challenges of life or the capacity of individuals to remain "healthy" and continue to improve themselves. In addition, Benaag (2002: 3) also states that this is a process of interaction between individual factors and the environment. This individual factor serves to withstand self-destruction and make positive self-construction, while environmental factors serve to protect individuals and "soften" the difficulties of individual life.

Resilience is influenced by external factor support and the resources that exist in a person (eg family, institutions that care for women), personal strength that develops in a person (self-esteem, spirituality, self-monitoring ability and helpfulness) and social skills (overcoming conflict, communication skills) (Nuryanti: 2011).

2.3 Memoria Passionis

Metz (A. Luluk Widyawan, 2006) reminds us of the importance of remembering memories that have passed including the memory of suffering, misery, and various other troubles. Because this will bring a very positive impact. Not only will people continue to be grateful for the conditions they are living, but also will help them in motivating themselves to continue to reach a better direction.

Furthermore, Metz distinguishes memory into three types. First, memory of the good old days, the past being a harmless paradise and a disappointing escape from the present. Second, clean the past from everything that is dangerous and oppressive. War, for example, is remembered by soldiers as a form of adventure, cruelty that happens and is forgotten. Third, is a dangerous memory, namely the memory of suffering, because the memory that forms is one's identity. Memory loss is known as forgetting to delete identity. Therefore, the memory of suffering demands to be told through storytelling from the victim (Ryadi, 2004: 9).

Meanwhile, Guy (2005) describes that recall is a subject of liberation to work. Self-contemplation of memory is a kind of "new birth" of acceptance in "being" in a new lifestyle from the side of the dark part of life because the finite cannot escape. Memory as if rediscovering a pillar in his world. Derrida, an expert in measuring memory, does not stop at this memory. This does not mean that he ignores the inevitability of recall, with a form of understanding that is in line with Walter Benjamin. However, more is intended to revive the ruins of the past so that we can become forces that are cut off from a sustainable time. But he
is more concerned with memory (gedachtnis), though by pointing to differences (Basis, 2005: 54).

Memoria as revealed by Shindunata (1994) is that those who suffer in the past time are important keywords in modern political theology. This theology views itself as a fundamental theology. The memory of those who suffer is one characteristic of this theology that distinguishes itself from fundamental theology in general. In particular, political theology pays attention to the fate and safety of those who suffer, lose, and become victims in history. It wants to help modern humans realize the importance of memory for its political consciousness. Without that memory, humans will only become like a robot: an intelligent being but without feelings and morals.

The events that happened specifically to Acehnese women were inspiration and memory for their struggle in the present. If for victims who are suffering, persecuted, and oppressed, revealed to the present, then what will happen is what Walter Benjamin calls a "salvation of the past". And this past salvation can only occur in conditions that are possible in the present. Therefore, the understanding of past events through memory, means to understand history as something that has a relationship to a subject who remembers it in the present. If Acehnese women remember their past suffer, then it needs a form of compensation, settlement and even responsibility. Since she ventured to remember her past even though it was full of suffer, but she makes it as a whip for her to survive.

This is in line with the meaning of violence asserted by Galtung (Rupesinghe, 1994), that it is an assault on the physical and psychological mental integrity of a person from various sources. The definition of violence is characterized by physical, biological or spiritual pressures that are directly or indirectly carried out by someone in another person who has exceeded a certain tolerance threshold.

Discussions related to memoria passionis experienced by women victims of violence due to the implementation of DOM in East Aceh, inevitably also discussed gender. Violence originating from gender assumptions or gender-related violence is basically caused by violence, both at the family level, and by the state. The position of women is considered weaker than men, so often there is oppression among women during the war.

3 Method

3.1 Research Design

The method used is a feminist case study research method. This focuses on the analysis of the experiences of selected women groups in various cultures and time periods (Reinharz, 2005: 225). This refers to the opinion of Harding (1993) which explains that in science, the perspective of women in a study is very important to achieve good science. In addition, according to Harding (1993), scientific research in the perspective of feminism requires a stronger objectivity. Harding saw that objectivity in every research that had been applied so far had not been tight enough.

Research on feminist case study of DOM victim is closely related to how research subjects interpret the events they experienced. Therefore, social realities that occur in the field must be obtained through an observation that can describe how women victims of this poverty can tell about their suffering during violence. Of course, the writer must appear, not only able to describe the phenomena that exist through thinking or just reviewing through various
3.2 Research Location

In relation to the violence that occurred and the location of DOM, the research was mapped based on the target village typology. The first typology is villages that often suffer from DOM violence; the second typology is that the community lives in a traumatic situation, especially women who suffer from DOM violence; third typology, a village that has a history of violence and has many women victims of DOM violence. From the total typology, the most suitable area to become a research center is in East Aceh, precisely in the District of Idi Rayeuk, Rantau Peureulak, Peureulak Timur, Langsa, and East Birem Bayeun.

3.3 Informants

The informant in this paper is all Acehnese women who experienced violence due to the implementation of the DOM status in Aceh. Women who were selected as informants were those who had been arrested, experienced violence, both physically and psychologically, losing family members directly or indirectly, humiliation, until they were traumatized. In addition, community leaders are spread in a number of areas in East Aceh.

3.4 Data Collection

The data collection process is carried out by utilizing several data collection techniques commonly used in feminist case study research, namely observation, in-depth interviews, document studies, and documentation.

3.5 Data Analysis

Life history analysis technique is used in this study to analyze data obtained in the field. This technique is important to know the things experienced by the resource person, in this case the women victims of DOM violence in Aceh, in accordance with the purpose of the study, namely to obtain in-depth understanding and answers through qualitative analysis related to the experiences of women victims of DOM and efforts to maintain self-survival and his family.

This analysis can be used to see the actions, reactions, interpretations, and views of life of women victims of violence in Aceh today. This is to understand how the experiences of women victims of DOM are created, as well as their influence in terms of the point of feminism, their impact, and the survival strategies applied in life at this time.

4 Results And Discussion

4.1 Collective Experience of Violence on Women Victims of DOM Enforcement in East Aceh
The experience experienced by women during the DOM implementation in Aceh was a
dreadful experience as a very painful social practice, not only for the victim but also for the family
who witnessed it. The experience received is not only in a Personal Experience, but rather a
collective Experience. Not only social experience, as described by Kuntowidjojo (1991) which
leads to the entire Acehnese society, collective experience is a memory of the suffering felt by
all women victims of DOM in East Aceh.

Although it is difficult to know the exact number of human rights violations committed by
the military on women, but the results of the FPHAM investigation in Aceh from 30 July. d 13
November 1998, there were 7227 cases of violations consisting of 1321 people dead, 1958
missing, 3430 people were tortured, 128 raped, 81 were sexually abused, and 38 motorbikes
were looted.

Moreover, in the prolonged conflict in Aceh it was women who suffered the most. The
reason is that various acts of violence against women are constantly felt and experienced by
women in Aceh (Pane, 2001: 272). Feelings of mutual affinity make Acehnese women must
rise from the downturn of their lives. From the data compiled, Pane explained, during the
period from January to May 16, 2001, in the three conflict centers, North Aceh, East Aceh and
Bireuen, 20 women were victims of violence. Seven of them died. This number is of course
even more, if the entire area of Aceh is recorded. Because, there are victims who live in the
interior, if killed by violence directly buried their families without being taken to the hospital
for divisum. This was done because most of the people of Aceh believed that there was
nothing. In addition, many injured victims then died as a result of not getting proper treatment
because the victims' families were hindered by financial conditions in the form of inadequate
costs.

These various cases of violence certainly made the disappointment to women,
powerlessness against the system, and unpreparedness to accept conditions. Then, it made
some of them psychologically disturbed. Extraordinary violence has tarnished Aceh's women's
dignity for years due to the cruel acts of the TNI. They were disappointed with many parties,
ranging from the government, military / police officers, Free Aceh Movements, local
government and Acehnese figures who just kept quiet seeing the endless conflict.

With various advocacy and forms of popular demand to revoke the status of DOM
conducted in Aceh, the TNI still diligently entered the village, established posts, and
conducted strict patrols. Intimidation and violence carried out by conflicting parties make
citizens in an uncomfortable situation. The pattern of spreading fear to citizens and the
hallucination of security forces often makes citizens a target of violence, which creates an
atmosphere of fear among citizens.

On the other hand, not a few of the local residents who became free Aceh movement
activists, whether they were active in guerrilla and entered the forests, or who remained
ordinary villagers but in fact he was a communication officers who had the function of
collecting and providing information to free Aceh movement soldiers. This can be triggered
by several things, the first is because of the desire to achieve the independent of Aceh. The
second thing is because he had seen his family, relatives, including husband, wife and
children, murdered viciously in front of them. Of course, there is a form of inner turmoil to
take revenge on the perpetrators. To fight personally, surely he will not be able to. Therefore,
guerrilla entry into part of the free Aceh movement is the only way to fight the perpetrators of
the killings.

As it turned out, the army seemed not to want to run out of members, they were
vigorously carrying out doctrination and coercion of Acehnese youths to enter into part of
Unit Ksatria Penegak Pancasila (UKPP). The people were forced to become ABRI members
through UKPP since 1991. Coercion was filed so that they were according to the TNI’s will. The goal is not to become part of GPK / GAM. Even though the people are more calm planting, farming in their fields and fields. All day they have to practice. Indeed, they were paid by TNI, but they did not like the job at all.

In each village in DOM, the army formed militias which inevitably increased the scale of violence and human rights violations. In the words of the local military commander, young people are always considered to be the spearhead who is considered very aware of who is a member of the GPK. Refusal to be involved in TNI militia organizations or failure to demonstrate a strong enough commitment to quell the enemy by identifying, arresting and killing suspected rebels, sometimes made them get punishment from by TNI, in the form of being arrested, mistreatment and torture.

Through various efforts to free themselves from adversity, the women victims of DOM carried out various forms of application, ranging from complaints to local law help association, student organizations, local governments, to the Indonesian Parliament. Various Acehnese students both inside and outside Aceh are constantly looking for ways to end this long conflict. One of them is through dialogue channels, such as seminars involving various groups.

All forms of violence have led to the attitude of women victims of DOM, namely a sense of same fate and resentment or hurt by the central government’s treatment of them. This is a tangible form of collective experience which was only the experience of individual victims of violence. This can be seen with the form of violence categorized in four (4) domains, namely physical, psychological and sexual violence; lost husband; arrest, search, burning of property, and terror; and torture and imprisonment.

Collective experience becomes a story of Aceh’s dark history when talking about women and conflict. There have been various scientific writings that have voiced injustice that occurred to the people of Aceh, especially the women. This inevitably led to the presence of Acehnese women in the conflict as an inong balee force. The formation and presence of the Inoeng Balee troops (Widowed women) indirectly is a form of mutual commitment that is in the souls of Widow women whose husbands are tortured, even killed by the TNI. They also carry arms in order to uphold something they consider to be honorable and to revive the dignity of Acehnese women through the values of the struggle and the upholding of Islam.

The parties who have common interests and interests differ from one main issue, then reconstruct the thoughts, steps and actions of violence (conflict). In other words, ethnic conflict and communal conflict is a social dynamic as a whole, where mass groups and elites have the same contribution in the conflict, behind every conflict there must be a ”master mind” (provocateurs), who utilize the condition of the community so that it impacts conflict.

4.2 Impact of Violence Experienced by Women Victims of DOM Enforcement in East Aceh

Conflict is not a strange thing in human life. Throughout life, humans will always be faced with conflict. Almost impossible, conflict can disappear on this earth, both individually and in groups. The Aceh conflict period which broke out since 1976 is one example that conflict will always occur, especially when group expectations are not in accordance with reality.

As the conflict in Aceh began when free Aceh movement's pioneer, Hasan Tiro proclaimed the this movement on December 4, 1976. This conflict did not end just like that, but like a coal in the husk continued and peaked during the DOM status. Even after the
revocation and enactment of Civil and Military Emergency, Aceh became a very gripping region.

The conflict in Aceh is a form of disagreement between two or more members of an organization or group within an organization that arises because of having different status, goals, values and perceptions. The impacts arising from conflict can become functional conflicts and infective conflicts. Conflict is said to be functional if the impact can provide benefits or benefits for the organization, on the contrary it is called infunetional if the impact is actually detrimental to the organization. The conflict in Aceh is a form of infective conflict that is very detrimental to all parties, not only free Aceh movement and the TNI, but also the Acehnese women who felt suffering throughout the conflict, even today.

Repressive violence by the state apparatus is closely related to the revocation of basic rights to survive and to be protected from pain and suffering by the state. Repressive violence is related to three basic human rights, namely civil rights, political rights and social rights. Social rights are related to freedom of thought, religion, freedom, organization and privacy equality before the law. Political rights relate to democratic rights to participate in political life such as participating in elections and freedom of speech and opinion. While social rights are related to the prohibition to create or have a trade union or prohibition to strike.

In addition to repressive violence, there is also alienative violence that refers to the revocation of higher individual rights, such as the right to psychological (emotional), cultural or intellectual growth (rights to emotional, cultural or intellectual growth). The importance of incorporating human rights into this type of alienative violence is to assert that humans also need to fulfill non-material needs, job satisfaction, engage in creative activities, children's needs for affection, a sense of social ownership or cultural identity.

One of the most violent forms of alienative violence is what is called ethnic cleansing (ethnocide), which is a policy or action that actually changes material or social conditions under one of the dominant cultural identities of a particular group. This violence also indirectly, grounded thousands of ethnic Acehnese for the domination of the Indonesian-Javanese rulers.

In the end, the prolonged conflict that occurred in Aceh, from 1989-2004, has given rise to various incidents of violence against women such as abuse, sexual harassment, rape and murder which cause deep hurt to Aceh women. Victims of conflict that affect Acehnese women are generally experienced by every woman, especially in the east Aceh area. Ranging from children, adolescents, to adult women (married) became victims of violence. For 12-year-olds, there were those who did not continue their education to a higher level because they were afraid of frequent gunfire between the TNI and the free Aceh movement members. Viewed from adult women, most of the Acehnese women as victims of conflict now bear widow status because their husbands died during the conflict.

Acehnese women who bear the status of widows must carry out their lives by supporting their children to become dependents while educating and guiding them to become adults who are useful for religion, and the nation. Awkwardness must occur where usually this is a joint responsibility with the husband to make a living and educate their children. This condition then worries the hearts and minds of Acehnese women who are victims of conflict (especially widows who have children). Even though the psychology of the mother alone is not necessarily able to guide her to get out of the experience. Data on the field shows that it is the child who revives the spirit of their mother's life. They take care of their mothers when they still feel pain, even providing for the remaining fields. So that it is not only the mother (widow) who must make a living, but also the child (both male and female) who acts as breadwinner when their mother is still in an unstable state.
In addition, due to the low level of education, most women victims work as farm laborers. Because lack of education, it causes difficulties in getting a better job. Based on the work pursued by Acehnese women both during the conflict period of the DOM and post-conflict, the average of them have a job as a farm laborer. In addition, this is because they do not have their own land to grow crops during the planting season (rice in the fields). They often work in neighboring fields that have a piece of land, and some of them also go to the fields of the other sub-districts where the distance is tens of kilometers. Generally, the harvest is divided into two between farm laborers and farmers' land used.

4.3 Aceh's Hikayah as Motivation to Revive

The Acehnese rose to defend their property. The Aceh War broke out from 1873 to 1914. The Dutch suffered many financial losses and the lives of their soldiers. All of this was due to the development of the myth of the Hikayah of Sabil War, which always encouraged Acehnese people to oppose oppression. This was able to motivate the Acehnese because there was a "guarantee of heaven" to the people who did jihadi fisabilillahor struggle in His way. Here is the poem of the hikayah: Who is willing to give up life and property / For the cost of war in the way of the Divine / Allah bought it in high price / High heaven as the exchange is certain. Not only in the form of hikayah, this is also socialized to children since childhood through singing before going to sleep.

The song lyrics lull Aceh children as follows:

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“Dododaida, bunga mekar dalam istana.
Cepatlah besar muda belia.
Membantu perang tolong Negara.
Cepatlah besar muda belia.
Membantu perang bela agama.
Perang hai perang dijalan Allah (Sabilillah).
Syahid dalam perang, perang Sabilillah.
Jika syahid anak dalam perang,
Ridha Tuhan permata hati.”
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This hikayah and song show that if the people of Aceh are constantly pressured by various violence, they are not reluctant to fight with violence as well and this has been taught by parents since childhood. The impact of this civilization is Aceh's long-standing conflict with the center. Amien Rais said that the actions of TNI in Aceh were acts of genocide, the extraordinary elimination of humans. Therefore, both the government and TNI directly, must dismantle the mass graves of the DOM victims, then bury them again in Islam. For writer, this concept is more about ethnocide, namely the massive elimination of humans in one type of ethnicity, that is Acehnese.

In TNI’s side, they are responsible for the killing of Acehnese during the DOM period and it would be dealt with, so it will not cause a burning grudge among the people of Aceh. But unfortunately, it did not occur. The law in this country clearly looks downward, but blunt upward. The lower middle class society must feel the injustice of the law in force in the Republic of Indonesia. Whereas in the realm of the apparatus, they prefer action with violence in the field, so that mass graves appear rather than bring the victims to court. A normative form of positivistic law in the country of Indonesia, that every guilty person must be tried, not
arbitrarily killed. One of the most recent mass graves was mass graves after the massacre of Tengku Bantaqiah and his followers in West Aceh.

5 Conclusion

For victims, the collective experience related to the violence that was experienced during the DOM implementation in Aceh, will not disappear at any time. Like the wound, he felt for life, every time they feel pain, his memory of suffering in the conflict period is repeated. This may be a threat to the psychology of victims when they have to face the turmoil of life and even physical violence again in this time. Symptoms of psychiatric disorders always accompany the remnants of the lives of the victims, and that potential will always surround the scope of their lives. Family, determination, and proximity to the Divine is the one who is able to direct him to stay positive and work in life.

References

Multicultural Education Based on North Sumatera Folklores as a Source of Character Building in Early Childhood

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Abstract. Early age is a golden age in child development. Therefore, it is ideal to shape children characteristics by introducing them to various folklores. North Sumatera is known as a source of ethnic diversity as well as the stories of its people. North Sumatera folklore is also a multicultural learning medium that is important for early childhood. This study aims to reveal: (1) the values of character and multicultural education contained in the folklore of North Sumatera; (2) the role of North Sumatera folklore which has been reconstructed as a medium for character building as well as a source of learning for multicultural education. The research design uses qualitative research methods with an ethnographic approach by taking various informants, including early education teachers, traditional leaders who understand North Sumatera folklore and early age experts. Research techniques use interviews, observation, literature studies and documentation. The results of this study are that there are several values of character education. The value of multicultural education that can be embedded in children includes the value of diversity, religious tolerance, mutual respect and being able to work together. The value of the character education that is formed can also play a role as a learning media for multicultural education.

Keywords: early age, North Sumatera folklores, character education, multicultural education

1 Introduction

Today folklore has rarely been played especially among the younger generation for early childhood. Schools that should be important places to introduce folklore no longer include folklore in the learning curriculum. Likewise, parents have very rarely read or introduced folklore to their children. Folk stories also become less competitive with other polarized stories among the younger generation. The disappearance of folklore in various circles among the younger generation should be the concern of education and cultural experts. Although not all subfields in folklore have the same type as evidence of their impact (Pryor, A and P. Bowman, 2016).

Experts have expressed the importance of schools to become an arena in introducing folklore to students (Hamer, 2000; Altman et al., 1978; Rosenberg, 1990; Nusz, 1994; Bulger, 1991), but the efforts that done by experts do not also make attention focused on making schools an arena learning folklore especially in Indonesia. Early age is a time of
anxiety in child development, therefore it is ideal to shape the characteristics of children by introducing various folklore.

North Sumatera is known as a source of ethnic diversity as well as the stories of its people. They are should many efforts to introduce North Sumatera folklore. We can introduce folklore for children from early childhood with a story telling as well as a learning media for children to know and understand the ethnic and religious diversity that exists in North Sumatera. By introducing North Sumatera folklore for early childhood will provide a foundation for the formation of good children's character because it contains moral, social and spiritual values.

North Sumatera folklore is also a multicultural learning medium that is important for early childhood. North Sumatera is an area rich in folklore originating from various backgrounds in Indonesia. North Sumatera can be said to be a multicultural area. Various ethnic groups in North Sumatera have stories of their own people. Various folklores originating from North Sumatera can be used as a learning resource for character and multicultural education, especially for early childhood. Although we realize that almost all folklore is inseparable from the content of mystical or magical elements, some forms of violence and love in it are inappropriate for early childhood. Therefore, for the needs of character and multicultural education it is necessary to reconstruct folklore so that it can be used as a medium, source or means of learning for early childhood. There are many genes of research in multicultural education. However, the most important main objective is to conduct research and provide multicultural education for teachers so that they can develop it in their learning (Bennett, 2001).

This study aims to reveal: (1) the values of character and multicultural education contained in the folklore of North Sumatera; (2) the role of North Sumatera folklore which has been reconstructed as a medium for character building as well as a source of learning for multicultural education. The research design uses qualitative research methods with the ethnographic approach of Spradley (1980) by taking various informants, including early education teachers from kindergarten TK YPI. Amir Hamzah, traditional leaders who understand the folklore of North Sumatera, early age experts and fairytale village practitioners. Research techniques use interviews, observation, literature studies and documentation.

2 Reconstruction North Sumatera Folklore For Early Chidhood

Generally, almost all folklore contains mystical elements, love and violence. Surely this folklore content should not be introduced for early childhood. However, there is still much folklore that contains character and multicultural values that are good for early childhood. Therefore, it is necessary to attempt to reconstruct folklore so that it can be used as a medium or source of learning in early childhood. Early age is the most strategic stage of child development in forming good children's characteristics and multicultural education. In this age children can absorb learning from the people closest to the child's life such as from parents and teachers at school. When children are left to choose stories they like, they tend to choose stories that they already know and that reflect their culture. Therefore, according to Bieger (1996) it is very important for parents or teachers introduce various stories that reflect different cultures, themes and views. Through learning of North Sumatera folklore that has
been reconstructed, it is hoped that it can shape the characteristics and multicultural education for children.

In the reconstruction of North Sumatra folklore, the value of character education is the focus on the importance of the introduction of diversity. Diversity in North Sumatra is a necessity faced in the social and cultural life of its citizens, especially at the kindergarten school YPI. Amir Hamzah Medan which carries the vision as a multicultural school.

In the story reconstruction process, the teacher must sort and determine the material with a multicultural perspective. The teacher first examines holistically the material will be used and delivered in the learning process. After the process of reviewing, selecting and defining the material, the teacher makes a learning plan as outlined in the Daily Learning Implementation Plan (RPHH). In this design, the teacher makes a theme about my country. In this theme, there are learning objectives, namely: children can correctly state about Indonesia in general, such as symbols, flags, traditional clothing. In addition to being able to speak, the teacher develops the material by directing children to contextual situations and conditions through folklore that have a multicultural value, especially in North Sumatra. These multicultural values also become a source of character education that is needed for early childhood in kindergarten.

3 The Content Of Multicultural Values In North Sumatera Folklore

In North Sumatra Province, there are indigenous groups including the Toba Batak, Mandailing or Angkola, Karo, Simalungun, Pakpak or Dairi, Malay and Nias. The seven ethnic groups are called host populations. Groups the ethnicity inhabits territories, which also represent their cultural identity. In addition, each ethnic group has cultural characteristics that become a marker of their identity. When these ethnic migrate from their original regions to the centre of Medan, they retain their identity. So far, every ethnic living in Medan city continues to express its cultural identity. This is what makes Medan City a multicultural city which, besides being a home for the host population, is also a meeting place for various migrant cultures from outside Sumatra, such as Java, Sunda, Aceh, Padang, etc.

With these conditions, the introduction of multicultural values is designed through folklore in early childhood in kindergarten education institutions. The content of multicultural values in the folklore chosen is about the story of Si Mardan and Sampuraga. The selection of this story is based on the review and analysis of the two folklore. The content of multicultural values in Si Mardan and Sampuraga's stories are some of the similarities found in narrative stories, while the two stories come from different cultural regions. Si Mardan is a folklore originating from Asahan which is a representation of the Malay ethnicity. The Sampuraga story comes from Padang Bolak Mandailing ethnic in North Sumatra.

Narratives of folklore that develop in society represent the culture of the speakers. Story motifs and characteristics found in folklore in one or more different stories in different places and cultures are the result of cultural contacts between storytellers (Ahimsa, 2006: 376). The stories of Si Mardan and Sampuraga have in common, both of them have the motive of 'wandering' by a boy. The motive of migrating to a number of ethnic North Sumatra, especially Toba and Mandailing is a cultural mission that must be carried out (Pelly, 2013). Another motive is the "struggle of a mother" that is responsible for raising and educating her child (Baiduri, 2014). Both motives are characteristic in both folklore originating from North Sumatra.
The similarity of people's motifs found in North Sumatra can be analyzed based on adjacent spaces. Geographically, Asahan and Padang Bolak is still in the administrative area of North Sumatra. The proximity of this space allows for contact and distribution of culture and stories, of its people.

The folklore equation, if it is reviewed and analyzed based on Levis-Strauss structural theory, it will be found the lowest unit relationship (mytheme) story which gives a picture of the relationships that are arranged which can then be analyzed for similar motives. In its analysis of folklore, both legends and myths are influenced by linguistics. In a story that develops and is passed on orally, there is an order and repeatability (regularity). Furthermore, humans are genetically able to compose the symptoms faced (Ahimsa: 2006: 65-70). Based on the theory put forward by Levi Strauss, it can be found that the smallest unit relationship (miteme) is the form of the cultural mission of “wandering” and appreciation of the efforts and sacrifices and responsibilities of a mother to her child.

From the story of Si Mar dan and Sampuraga, it was discovered how cultural values were internalized through the delivery of folklore that interpreted the cultural mission of each ethnic group. How the efforts of a boy who struggles to achieve a cultural mission through “wander” activities that become the motives and characteristics of stories appearing in the two stories show the occurrence of cultural contact in the community of folklore speakers. Therefore, these two stories show the structure of universal societal thinking through folklore that lives and develops in the speaking community, and it reflects universal character and multicultural value’s education.

4 Conclusions

Based on the identification of research mapping on North Sumatra folklore, there are several contents values of character education and values of multicultural education. The content of character education values are moral, personality and social values. Moral, personality and social values are the basic capital of a person during living a life. The success or failure of a person in his life depends on these values. These values are the values of basic characteristics that should have been formed from an early age.

In addition to the important moral, personality and social values contained in North Sumatra folklore includes the values of multicultural education, which contain: (a) the value of diversity; (b) religious tolerance; (c) mutual respect; (d) solidarity and (e) able to work together in difference.

The folklore of North Sumatra, besides containing the values of character education, can also play a role as a learning media for multicultural education because each region in North Sumatra has a story about their respective regions that represent the history and culture of their society. Thus the folklore of North Sumatra can be used as a source and media that are very effective in growing and developing moral values rooted in the culture and personality of the Indonesian people. Efforts to introduce cultural diversities through North Sumatra folklore to children from an early age will shape children's understanding of cultural differences and diversity in North Sumatra. Multicultural education obtained through North Sumatra folklore can be a capital of local intelligence that serves as an anticipation of conflicts that may arise due to differences in each culture. Thus multicultural learning through folklore is expected to provide understanding to children from an early age, different cultures that exist in North
Sumatra are not only seen through the perspective of cultural differences but universality of the thinking system of every culture that has character and multicultural education values.

References

Learning Model of Helped Discovery Learning Computer Based Instruction (CBI) on Fashion Technology of Fashion Education Study Program of Universitas Negeri Medan

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Abstract. This research is a research and development with the aim to determine the effectiveness of Discovery Learning models in the Fashion Technology course of Fashion Design students, Medan State University developed using Computer base learning (CBI) and to find out the learning outcomes of Fashion Technology students of Dressing Education Study Program. This research is done because of the gaps that arise in student learning outcomes because of the lack of balanced mastery of theoretical and practical competencies in students, in addition to the constraints in the learning process, including because the material achievements are very limited, student activity is still low, the learning model used is not appropriate, and learning still uses the teacher center learning method, the use of learning media that has not varied, it is a major obstacle for students in achieving their competence. The purpose of using discovery learning models is to help students in learning, as well as providing practical-realistic opportunities for lecturers and students for independent learning, useful and continuously developing, and increasing student flexibility, by combining the best aspects of face to face and learning. The advantages of discovery learning models help students improve cognitive skills and processes. The data collected from the results of product trials is used as a basis for determining effectiveness, and attractiveness of products developed before being used in the field. The results of the trial of material experts showed a percentage (78.33), were in good enough qualification, so that the CBI media needed to be revised. Learning design experts judge CBI media to be in the percentage (82.33%). This percentage is in good qualification, which means it needs a little revision. The percentage of instructional media experts is almost the same as teach design experts, namely (82.85%). This means that the Computer Base Learning (CBI) media are in good qualifications and need a little revision. Field test results with a percentage (82.14%) by students and (87.27%) by lecturers. Both are in good qualifications, so CBI Media needs a little revision. The expected result of this study is the increase of student competence in the Fashion Technology course through discovery learning models with a computer base learning (CBI) approach as a medium.

Keywords: Discovery Learning Model. Computer Base Learning Media and Fashion Technology
1 Introduction

The Fashion Technology course is a basic course in the Fashion Study Program, whose content includes the introduction and operation of sewing machines, the introduction of basic stitches in sewing, the introduction of basic materials, the introduction of sewing techniques, received by first semester students. Based on observations in the learning process of the Fashion Technology course, it is seen that: 1) lecturers need the right learning model in the learning process so that learning is more effective. Previously the learning model that took place was still carried out conventionally which was supplemented by giving assignments and demonstrations. Learning like this makes the lecturer dominate learning activities so that it creates limited space for students, 2) Students make the lecturer the only source of information so that learning only prioritizes congenital aspects, without regard to affective and physical aspects. Students tend to keep all the difficulties encountered while studying without any effort to solve them. When learning students tend to be passive and as if they have understood what has been taught, 3) Laboratory learning time is limited, so the lecturer only pursues the target so that the material delivered is completed on time, the rest of the students are given homework assignments.

Furthermore, interviews were conducted with several students, saying that 1) in the learning process of fashion technology there were still many students who did not understand about sewing machines and there were even some students who were not good at operating sewing machines, sewing techniques and the basics of sewing and stitching. This is because the material is only conveyed with conventional learning without media that can attract students to learn, 2) Conventional learning models using power point media that are still very simple and monotonous are not in accordance with the curriculum that has been applied that learning is student-centered.

Computer Based Intrusion (CBI) learning activities are general terms for all learning activities that use computers, both in part and in whole? Computer Based Instruction (CBI) is used with the function as an individual learning system. CBI software development must consider the principles of learning, the principles of planning a learning system, and the principles of individual learning. In CBI students interact directly with computer-based interactive media, while teachers act as modelers and learning programmers (Rusman, 2012).

The application of CBI in practice can be taken in various ways, if seen from the application of the way of presentation and the objectives to be achieved, including: 1) Model Drills, 2) Tutorial Models, 3) Simulation Methods, 4) Instructional games models. The tutorial model is learning guidance in the form of providing guidance, assistance, guidance, direction and motivation so that students learn effectively and efficiently. In tutorial learning, computers act as lecturers so that all interactions occur between computers and students while lecturers are only facilitators and monitors (Arsyad, 2015).

With the use of discovery learning models with Computer Based Instruction (CBI) learning media, students are expected to easily absorb material, so that learning objectives are achieved. The effectiveness of learning is easy with the development of computer technology that supports learning programs, as expressed by Robert, Hinich, Molenda and James D Russell (2001) states that "computer systems can delivery by enabling them to interact with the lesson program into the system: this is referred to computer based instruction. "Computer systems can deliver learning individually and directly to students by interacting with teaching materials programmed into computer systems, this is what is called computer-based learning.

Computer Based Intrusion learning media is a medium that arouses students' interest in Fashion Technology courses, because this learning model is expected to help lecturers in
presenting material, so that lecturers and students are more motivated, active and easy to understand the material. This research is an effort to develop the Discovery Learning model by utilizing Computer Based Intrusion (CBI) media in Fashion Technology courses in the Fashion Study Program of Medan State University.

2 Literature Review

2.1 Discovery Learning Model

Discovery Learning Model According to Bruner, learning by discovery, where students are faced with a problem or situation that seems odd so that students can find a way of solving (Markaban, 2006). Discovery learning model tries to lay the foundation and develop a scientific way of thinking, students are placed as the subject of learning, and the role of the teacher in the Discovery learning model is the learning guide and learning facilitator. Bruner's basic idea is the opinion of Piaget which states that students play an active role in learning. The Discovery Learning model is understanding concepts, meanings, and relationships, through an intuitive process to finally come to a conclusion (Budiningsih, 2005). Discovery is done through observation, classification, measurement, prediction, determination, and inferior. The process is called cognitive process while Discovery itself is the mental process of assimilating concepts and principles in the mind (Robert B. Sund in Malik, 2001). Discovery learning has the same principles as inquiry. There are no principal differences in both of these terms, in Discovery Learning emphasizes more on the discovery of concepts or principles that were previously unknown.

Applying the Discovery Learning model, the lecturer acts as a mentor by providing opportunities for students to actively study, as the opinion of lecturers must be able to guide and direct student learning activities in accordance with the objectives (Sardiman, 2012). This condition aims to change teacher-oriented teaching and learning activities to be student oriented. Discovery learning model of teaching materials is not presented in the final form, students are required to carry out activities gathering information, comparing, categorizing, analyzing, integrating, reorganizing materials and making conclusions.

Learning Objectives of Discovery Learning from various opinions namely by the discovery according to Bell (1981), namely: a) natural discovery students have the opportunity to be actively involved in learning. The reality shows that student participation in learning increases when discovery is used, b) Through learning with discovery, students learn to find patterns in concrete and abstract situations, also many students foresee (extrapolate) additional information provided, c) Students also learn to form a question and answer strategy who are not ambiguous and use question and answer to obtain information in deciding something objectively.

The preparation step of the discovery learning model (Discovery Learning) (Suciati&Prasetyiarawan in Budiningsih, 2005) are: 1) Determining learning objectives 2) Identifying student characteristics (initial abilities, interests, learning styles, etc.) 3) Selecting the subject matter. 4) Determine topics that students must learn inductively (from examples of generalization) 5) Develop learning materials in the form of examples, illustrations, tasks and so on for students to learn 6) Organize lesson topics from simple to the complex, from the concrete to the abstract, or from the active, iconic to the symbolic stage. 7) Assessing student learning processes and outcomes.
2.2 Learning Outcomes of Clothing Technology

Learning outcomes are changes in behavior in students that can be observed and measured in the form of knowledge, attitudes and skills. These changes can be interpreted as better previous improvements and developments that do not know to know (Hamalik, 2008). Learning outcomes are patterns of deeds, values, understanding, attitudes, appreciation and skills (Suprijono, 2014). Learning outcomes include cognitive, affective, and psychomotor abilities. Cognitive domains are knowledge (knowledge, memory), comprehension (understanding, explaining, summarizing, examples), application, analysis (outlining, determining relationships), synthesis (organizing, planning, forming new buildings), and evaluating. Affective domain is receiving, responding, valuing, organization, characterization. Psychomotor domains include initiatory, pre-routine, routinized. Psychomotor also includes productive, technical, physical, social, managerial, and intellectual skills (Bloom in Suprijono, 2010).

Fashion Technology Material is a skill that studies methods or techniques, methods of making or finishing clothing. Objectives of Fashion Technology Courses; 1) To provide knowledge and skills to students in taking fashion technology courses. 2) Students can know, understand and operate large and small sewing tools. 3) Students know part of the settlement technique using hands and some use sewing machines. The preliminary study was carried out in the study (Dina 2014 and 2015) in the textile knowledge subject, the ADDIE learning model was developed with the development of digital modules using the Edmodo application, the results of which were very satisfying for students, stated that in this study students could improve their learning outcomes maximally, and motivate student learning can develop.

3 Research Methodology

The study was conducted in the Fashion Technology Study Program of Universitas Negeri Medan Fashion Design Education Program, namely the development of the Discovery Learning model with the help of Computer Base Learning (CBI) media, in Fashion Technology courses that use the IQF curriculum. The development model used in the development of this Fashion Technology learning model is to utilize CBI as a medium of teaching material. The test subjects at this stage were three material experts, three learning design experts and learning media experts. The data collected through the formative evaluation are grouped into four parts, namely: (1) first stage evaluation data in the form of test results of subject content experts, learning design experts, and instructional media experts, (2) second stage evaluation data in the form of test results data try individuals and field trials, in the form of data from reviews of students and lecturers of Fashion Technology.

This design phase is carried out, first, formulating learning objectives that are SMAR (specific, measurable, applicable, and realistic), compiling learning outcomes, and the work done. Next compile the test, in accordance with the learning objectives that have been formulated. Then determine the learning strategy, CBI Computer Base Learning media.

The steps of the development stage are: 1) Potential and Problems, including: (a) identification of learning problems/needs and determining standards of material competence; (b) conduct learning analysis; (c) identify the characteristics of the initial student and needs analysis; (d) compile basic competencies, indicators and learning outcomes (e) compile tests;
(f) compile a learning model that is realized in the form of a syllabus and learning design; and (g) developing lesson material, 2) Determining product models, including: (a) adjusting learning models that are in line with student learning characteristics; (b) developing fashion technology teaching materials; (c) Determine discovery learning models, 3) Collection of materials, including: (a) collection of materials / materials; (b) drawing and animation; (c) recording and audio collection, 4) Creating a software model, which includes: (a) software modeling; (b) making manuscript; (c) making storyboards (d) making flowcharts, 5) Developing and making discovery learning models: (a) Model production planning; (b) the production process of the tutorial program; (c) questions and answers; (d) response assessment; (e) reciprocal response; (f) repetition; (g) segment of lesson settings; (h) closing, 6) Review and product testing phase I, stage II, stage II.

Test data is used to determine wealth, effectiveness, and attractiveness of the product being developed. Types of data are: (1) aspects of learning and the correctness of the contents are obtained from material experts and learning designs; (2) media and learning designs are obtained from media experts; (3) the quality of the display and presentation of material, obtained from individual trials, small groups, medium groups, and large groups; (4) the power of dance on multimedia-based learning media is obtained from the activities and responses of students during the learning media trials.

4 Results And Discussion

The results of the questionnaire dissemination of needs found that (62.75%) of the students stated that they really needed the development of Learning Model assisted by Computer Base Learning Media in the learning of fashion technology and (95%) the lecturers said that they needed the development of Discovery Learning model as an additional modification of teaching methods, improve learning that is more effective and interesting.

Based on the results of the needs analysis, it was concluded that the development of discovery learning model assisted by CBI media was still very much needed by lecturers and students in the fashion technology learning activities. The initial product of discovery learning model developed in broad outline contains material components with discovery learning model design. To obtain complete data used as material for product revisions, the initial CBI product was tested. The stages of product trials were carried out as follows: (1) validation by material experts, (2) validation by learning design experts and media experts, (3) small group trials of 5 students, (4) revision I by validator material expert, expert learning design and media experts, (5) medium group trials, (6) revision II by validator material experts, learning design experts and media experts, (7) field class trials by 32 students, (8) expert revisions material, learning design experts and media experts, (9) final products.

Based on product validation through a series of trials and revisions conducted, the Computer Base Instructional (CBI) products on Sewing Machine Recognition competencies are valid. The trial was carried out in 2 stages: (1) evaluation of material experts, teaching media experts, (2) field trials. The results of the validation in the form of a score of assessment of the components of Computer Base Instructional Media (CBI) development of fashion technology learning on all aspects include: the feasibility of material content, the feasibility of presenting learning, and the feasibility of language seen in table 1.
<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator Assessment</th>
<th>Respondents</th>
<th>Score</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Clarity of learning objectives for fashion technology</td>
<td>5</td>
<td>100</td>
<td>Very good</td>
</tr>
<tr>
<td>2.</td>
<td>Truth and accuracy of the material</td>
<td>5</td>
<td>100</td>
<td>Very good</td>
</tr>
<tr>
<td>3.</td>
<td>Accuracy of material coverage</td>
<td>4</td>
<td>80</td>
<td>Good</td>
</tr>
<tr>
<td>4.</td>
<td>Depth of learning materials for fashion technology</td>
<td>4</td>
<td>80</td>
<td>Good</td>
</tr>
<tr>
<td>5.</td>
<td>The truth of the concept of fashion technology</td>
<td>5</td>
<td>100</td>
<td>Very Good</td>
</tr>
<tr>
<td>6.</td>
<td>Accuracy of the order of fashion technology learning material</td>
<td>4</td>
<td>80</td>
<td>Good</td>
</tr>
<tr>
<td>7.</td>
<td>Attracting fashion technology material</td>
<td>4</td>
<td>80</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td></td>
<td>88.6</td>
<td>Very Good</td>
</tr>
</tbody>
</table>

The results of material validation in the form of a score of assessment of the material components in the discovery learning model assisted by computer base learning (CBI) seen from table 2 below.

The assessment results of material experts include aspects of content feasibility, presentation feasibility and language feasibility in the development of discovery learning models in fashion technology consisting of several topics: (1). Introduction to Sewing Machines, (2). Sewing Machine Operation, (3). Introduction to Basic Skewers, (4). Introduction of the type of seams, layers and decomposition, (5). Maintenance of sewing machines.

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator Assessment</th>
<th>Respondents</th>
<th>Score</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Preliminary quality in discovery learning models</td>
<td>4</td>
<td>80</td>
<td>Good</td>
</tr>
<tr>
<td>2.</td>
<td>The quality of presentation of material in the fashion technology course.</td>
<td>5</td>
<td>100</td>
<td>Very Good</td>
</tr>
<tr>
<td>3.</td>
<td>Involvement and role of students in learning activities</td>
<td>4</td>
<td>80</td>
<td>Good</td>
</tr>
<tr>
<td>4.</td>
<td>Feedback quality</td>
<td>4</td>
<td>80</td>
<td>Good</td>
</tr>
<tr>
<td>5.</td>
<td>Material presentation time</td>
<td>4</td>
<td>80</td>
<td>Good</td>
</tr>
</tbody>
</table>
6. Quality tests or questions on Clothing Technology 5 100 Very Good

Average 88,6 Good

Table 3. Score of assessment by design experts about presentation.

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator Assessment</th>
<th>Respondents</th>
<th>Score</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Motivation</td>
<td>4</td>
<td>80</td>
<td>Good</td>
</tr>
<tr>
<td>2.</td>
<td>Clarity of description of fashion technology material</td>
<td>5</td>
<td>100</td>
<td>Very Good</td>
</tr>
<tr>
<td>3.</td>
<td>Clarity of the examples given in the module</td>
<td>4</td>
<td>80</td>
<td>Good</td>
</tr>
<tr>
<td>4.</td>
<td>Use of new information</td>
<td>4</td>
<td>80</td>
<td>Good</td>
</tr>
<tr>
<td>5.</td>
<td>Feedback on test results for students</td>
<td>5</td>
<td>100</td>
<td>Very Good</td>
</tr>
<tr>
<td>6.</td>
<td>Maximizing the learning process</td>
<td>4</td>
<td>80</td>
<td>Very Good</td>
</tr>
</tbody>
</table>

Average 86,7 Good

Table 4. Score of assessment by media experts about the feasibility of content

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator Assessment</th>
<th>Respondents</th>
<th>Score</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>The accuracy of the selection of Standard Competency and material for fashion technology</td>
<td>5</td>
<td>100</td>
<td>Very Good</td>
</tr>
<tr>
<td>2.</td>
<td>Suitability of fashion technology material with learning indicators</td>
<td>4</td>
<td>80</td>
<td>Good</td>
</tr>
<tr>
<td>3.</td>
<td>Providing training in the form of quizzes</td>
<td>5</td>
<td>100</td>
<td>Very Good</td>
</tr>
</tbody>
</table>

Average 93,3 Very Good

Based on the results of the validation of instructional media experts that the feasibility of the content of the development of discovery learning model design is considered very good, namely the accuracy of the selection of Basic Competency and Competency Standards and the material of fashion technology and the provision of training.

The material expert assessed CBI media development in fashion technology learning based on the above three aspects, namely aspects of content feasibility (88.6%), presentation
aspects (86.7%), and language feasibility aspects (85%), overall these three aspects are categorized very good. The percentage of the results of expert material research is shown in Figure 1 below:

![Fig. 1. Score acquisition CBI media development in learning fashion technology by material experts.](image)

Based on the responses of the learning design experts said that the Computer Base Learning (CBI) media in the learning of fashion technology generally shows very good and acceptable but there are some suggestions and input to improve the feasibility of the product. The percentage of the results of the learning media expert assessment can be seen in Figure 2 below:

![Fig. 2. Computer Base Learning (CBI) media scores by instructional media experts.](image)

The results of the assessment in the small group trial on 5 students based on three aspects, namely the feasibility aspect of the content (57.3%), presentation eligibility (58.9%) and language eligibility (60%). Overall included in the category "enough". Percentage of small groups is seen in Figure 3 below.
The results of the evaluation of the development of Computer Base Learning (CBI) media in the learning of fashion technology showed that the products developed were suitable for use and there were suggestions for improvement so that the development continued in the group trial being revised II. The average percentage of assessment results in the medium trial is based on three aspects, namely the aspect of 70% content feasibility, 75% presentation eligibility and 77.6% language feasibility. Overall included in the good category. The percentage of assessment in the large group/field trial in 32 students was based on three aspects, namely 93.3% of the content feasibility aspects, 93.8% presentation eligibility and 91.6% language feasibility. Overall included in the excellent category.

The results of the evaluation of Computer Base Learning (CBI) media in the learning of fashion technology were stated to be very good and there were no suggestions for improvement so no fourth revision was made. It can be seen from the small class trial, the medium to large class trials/field trials have increased from the response of students, in Figure 4 below.

The revised and refined aspect is based on data analysis and testing and includes suggestions from material experts, learning design experts and instructional media experts and lecturers and students as CBI media users. The findings obtained during the research included...
that in the learning of Fashion Technology, not all material can be delivered by lecture method alone, but there are several materials that require varied methods, strategies, approaches or learning models that make students more active and motivated. To learn many stimuli should be given to students in order to interact with the environment actively, find and find various things in learning. From the findings, the researchers chose the discovery learning model, because through the model students conducted experiments, learning would be more interesting with experiments, because with experiments, making their own discoveries, not only theories accepted by students but there was continuity and proof between theory and fact. The above explanation in accordance with the advantages of the discovery learning model is expressed by (Divine, 2012) namely with this model the activities and experiences are carried out directly so that it attracts attention to learning and allows the formation of abstract concepts that have meaning, and gives many opportunities for students to be directly involved. The application of the discovery learning model is adjusted to Bruner's constructivism theory which includes the idea of learning as an active process in which learning is able to form new ideas based on what their current knowledge is and their past knowledge. The phrase in Ampera's writing (2018) that learning to use an appropriate learning model will facilitate maximum competency achievement. With this model can also change what students initially understand abstractly into concrete. Learning by applying the discovery learning model has indirectly carried out what actually must exist in learning, namely providing direct experience in the introduction of sewing machines, making observations, understanding the results of observation, and applying concepts.

5 Conclusion

Based on the results of development research carried out and discussions that have been described can be concluded in the study namely; 1) In the study of the development of fashion technology learning was carried out in seven stages, namely the needs analysis stage, the initial product development stage, the expert validation and revision stages, the small group trial stage, the medium group testing stage, the large group/field trial stage and the product stage end. 2) Based on the results of research on Computer Base learning media (CBI) learning the fashion technology assessment from media experts, material experts and experts in overall learning design in very good criteria. 3) Based on the results of student response questionnaires that have been conducted, the Computer Base Learning (CBI) media learning media received responses in the criteria strongly agree that the learning media attract attention, increase learning interest, motivate students and look attractive so that the media is declared effective used as media Computer Base Learning (CBI) learning in fashion technology courses in the Fashion Design Education Study Program.

References


The Development of Learning-Tools Oriented Learning Problem Based to Improve Ability Solving Problem and Self Studying of Students SMA Negeri 1 Kualuh Selatan

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Abstract. The objective of this study is to expose: 1) validity of learning-tools oriented learning of problem-based to develop; 2) be practical learning-tools oriented learning problem base to develop; 3) the effectiveness of learning-tools of learning oriented problem based to develop; 4) improvement capability problem solving in those students adopting a learning-tools oriented learning problem based to develop. In the study was taken that (1) the learning-tools in developed was valid to the total average of validity RPP = 4.60, students book = 4.45, teachers’ book = 4.47. LKS = 4.52, test ability to solve problem was in valid enough and valid in reliability of 0.910, and questionnaire in self-study was in valid category and valid sufficient with reliability of 0.97; (2) the learning-tools in development meets a practical criterion viewed from a) teachers’ assessment in category easily to execute; b) students’ valuation was in highly easy to conduct; and c) how to execute the learning is in the best category; 3) the learning-tools meets the an effective criterion; 4) average rise ability in solving problem on student from the test I through test II was 0.29 point with improvement for full-program to study classically was 15.12%.

Keywords: learning-tools, model learning problem based, ability to solve problem. Self-studying.

1 Introduction

Mathematics is acknowledged the queen science is at once science serving high required in dealing with global era. Mathematics constituted as an essential science as base to life forever. So, scholar with certain rate on mathematics highly required to all students for future one may get gain proper career and maintain in global era, surely not career without mathematics.

In reference with it, mathematics is one of lessons have highly important role in education, by mathematics is allowable to develop one’s way of thinking critically, creative, systematic, and logical. In addition, mathematics may contribute in daily life every things in simple such as basic calculation through matters in very complex and abstract such as to apply numerical analysis in engineering and so forth.

One of competences highly need to develop in mathematics as contained in curriculum such as aspect of solving problem. Solving problem is an important thing for one is led in
endeavor to find the solution since it may present a concrete experience so by that experience may use in solving the problems alike.

It is relevant to NCTM (2010:1) program insist that the term of solving problem shall rely on the function of mathematics having highly potency to present an intellectual challenge in order to improve the development and know mathematics by students. Solving the problem is constituted a part of curriculum for the mathematics itself is highly important in process of learning and how to solve it, for the students is allowable to get many experiences in uses knowledge and basic skill to apply it for daily life dealing with problems.

Solving the problem should be an essential course in learning mathematics on school due to the student become more competent to select relevant information, then analyze it, research ever; (2) intellectual satisfactory may arise inside that seen as intrinsic problem; (3) potency intellectual of student improved; (4) student may know how to find by process and find invention (Hudojo, 2005:133). With premises as above, it sees surely one’s ability to solve problem must get special approach, since it has truly highly strategic role in develop potency to the student, particularly on mathematics.

Unfortunately, the student can not solve the problem yet properly, then it may cause the result of learning mathematics never existed as hope. According to the result research of Trends International Mathematics and Science Study (TIMSS) in 2003 that Indonesia was in 34 ranks out 45 countries. In such performance is seen more poor relative to the program for International Student Assessment (PISA) for 2003 put Indonesia on the lowest rank of 40 countries sample, meant just one level higher than Tunissia. For Indonesia attended TIMSS for 1999, 2003, 2007, and PISA in 2000, 2003, 2006, 2009 the outcome showed not any change to each joint as participant (Wardani and Rumianti, 2011:1).

Seen low ability to solve the problem as on the result of observation in early and by interview with teachers of mathematics on SMA Negeri 1 Kualaah Selatan that mostly student got difficulty in solving the problem. The result of observation also indicated mostly student is massively in learning mathematics and showed poorly response upon the learning and courses is taking place.

The research was done on 5th September 2016, provided test of competence how to solve problem in material trigonometric upon 25 students Grade XI SMA Negeri 1 Kualaah Selatan, indicated to a maximum score 100, 36% students got score 0 for nothing the student can answer, and they acknowledged having not know how to answer, and another 48% got score arranged 10 – 40, 12% got score ranged 50-60 and only 4% students got score 90. This result indicated how poorly ability to solve the problem, whereas this material they had learned in course of class-room.

That poor condition must be treated, lead the student be custom to solve the problem in class-room. The activities with taking solving the problem according to Ruseffendi (1991:341) consisted of 1) formulate the problem clearly; 2) re-telling the problem in a form that may can be solved; 3) to make hypothesis and strategy to solve, 4) set own procedure how to solve them; 5) make evaluation upon the solving. In relating with Ruseffendi, Polya (1973:5), the solution upon solving the problem contained 4 phases for solving, they are: (a) to understand the problem, (b) make own plan to solve, (c) take solution refers to own plan, (d) make review. The steps with ability to take solution upon the problems as above, for each should know them for hope by this ability, in future the student may get self-ability to solve the problem in mathematics and any problem that he may find in daily life.

Beside ability to solve the problem, the request in Curriculum 2013 at present it not only rely on hardskill, but also soft-skill, noted one of them is willingness to self-study. The
learning as designed is hope to allow each student not only to receive information and knowledge alike by explanation of teachers but they must be able to create own concept and principle. This approach is one of reality things in self-study as student.

Sumarno pointed out that self-study is a process of design and self-monitory properly upon a cognitive and affective process in solving own academic (by Purnamasari, 2014: 4). Under self-study shall encourage student start studying by own-self not depending on teachers, parent or other people. This self-study process permit students a worthy opportunity to deepen their awareness on the environment. In self-study approaching grant student to make own positive choices how a student may deal with worries and confusions in daily life. This motive allow the student may act according to own initiative to set up environment. How principle to have self-study in mathematics is due to demand in curriculum for the student can face the problem in class-room or out where they life more complex and also let them reduce dependent on other people in daily life (Fauzi, 2011:11).

Based on particulars as mentioned above, it can be concluded that self-study approach is highly required for each individual can take initiative, with or without other helping, mainly in arranging whatever activities to be done such as to formulate the purpose of studying, sources of knowledge (either as people or material), how to diagnose the requirement in study and control one-self the process of learning.

How essential self-study approach on student is not conformed with the reality yet as seen in field. Upon the questionnaire that has been presented to 20 students of Grade X SMA Negeri 1 Kualuh Selatan, then take conclusion that average self-study with 2.61 from maximum score 4. This rate is categorized poor in 2.6 rate is perhaps below 3. By an analysis done then obtained that : (1) 40% of students not capable to evaluate the process and the performance; (2) 50% students having no initiative to study; (3) still 65% of students can not diagnose yet the need for study; (4) 80% of students can not control self yet; and (5) for another 55% student can not explore and employ the resources available to explore.

By the cases and findings in field, poorly ability to solve the problem on students are because of several factors they are : First, the plan of learning provided by teachers is not conformed with the criterion to develop the learning-tools properly. This case correlated with : (1) the learning activity under RPP is not specifically to indicate the student and teachers in activity; (2) RPP in use by teachers is still the copy of other teacher made already previously and provided in generally; (3) the steps in the learning not contained allocation of time on each process of learning; and (4) there is no any rubric of score on the assessment on the student.

Secondly, Books of learning used on SMA Negeri 1 Kualuh Selatan found with some weakness, they are : (1) the questions available not indicated the steps that may measure one’s ability to solve the problem in mathematics; (2) mostly present formula immediately and then use it to solve the problem later, the book of learning contained not the steps how to find formula so mostly students only memorize that occasion forget later how to use; 3) the hand-book that students use is not attributed to their character as student.

Thirdly, the students have no any pieces paper to make activity, so the process how to develop ability to solve the problem and how to communicate mathematics not run well.

Fourthly, test ability of student contained shortage of point development of capability and self-study in student. By several factors as above, the learning-tools is the dominant factor how lower ability how to solve the problem and self-study.

In order to enrich their ability how to solve the problem and to have self-study, it is highly required a learning-tools to support. It means, now there is a challenge to those teachers how to develop a learning-tools own refers to the Regulations No. 14 of 2005 regarding Teachers
and Lecturers, pointed out that teachers competence covering a competence in pedagogic, competence in personality, competence in social and competence in professional and to attain it by profession.

Under required professional competency, so each teacher is obliged to arrange own learning-tools completely and systematically for the learning-approach can take place interactively, inspired, favorable, challenge to and motivate student to take part actively, and allow space sufficient to say initiative and creative and make own self-study according to talent, interested, and physical development as well as psychological. The learning-tools is acknowledge a tools to use in the process of learning (Trianto, 2011:201). Some learning-tools as required such as RPP, syllabus, LKS, books and evaluation devices. In addition, the learning-tools is also used as reference to those students with their portion to take part effectively. Nur (in Sulistyaningisih, 2012:2) stated that the learning-tools may provide easiness and assist the teachers in preparation and also to execute the learning-studying in class-room.

How to develop all the learning-tools above mentioned, it must be relied on a model of learning for the tools available to develop become unity to equip each other and focused on the purpose to gain. There are many models of learning can be used in order to enrich their ability for soling the problem and how to get student self-study, one of the models supporting to the character of mathematics is known as learning problem based. (PBM).

PBM model is acknowledged a learning model based upon several problems requiring researching authentic namely how to know solve truly upon a reality problem (Trianto, 2011:90). The problems was adopted to link one’s willingness to know, ability in analysis and initiative of students over the material of learning. This model may coach the students how to solve the problem according to their knowledge. The process itself mayframe up new knowledge be more profitable to all students.

The statement as above shall be correlated with the opinion Donalds Woods (in Amir, 2010:13) pointed out that PBM is more than large environmental effective to study and know his/her life in solving the problem, team cooperation and how to communicate. Under a self-study may offer freedom to the student to find how their live refers academic values. The student may take own conclusion and responsible for the points as consequences of that decision. The student also own arrange and adjust their actions to achieve the targets as want to.

Model PBM encourage students not only just thinking in concretely, but also to think ides abstract and completed. Apply PBM model can assist student become scholar. Under supervision by teachers, the learning with PBM model can encourage students to ask many questions, to complete self assignments in learning, and solve the problems that student find in daily life.

By expose to background and see weakness ability to solve the problems and self-study of the student SMA Negeri 1 Kualuh Selatan indicated that quality of learning-tools used not good as well. So, it is required development of any learning-tools highly quality and refers to the criterion fulfilling with valid value, practical and effective. One of criterions to be taken is how to achieve indicators of rising ability of solving the problem.

The result of development in learning-tools oriented PBM model is highly expected as alternative to set up a better learning-tools and it may improve their ability to solve the problems. In correlating with it, the learning-tools in tri-gonometry using the PBM model is not used widely yet. Therefore, this study is interested with developing it more under a learning-tools with a problem based learning-model (PBM).
2 Method

This study is a development research, with Model 4-D Thiagarajan.

2.1 The Subject and Object of Research

The subject of this research are all students Grade X-2 and X-3 SMA Negeri 1 Kualuh Selatan. The object involved the learning-tools oriented learning problem based to develop.

2.2 How to Develop the Learning-tools

The learning-tools in to develop as in this study covering: RPP (the Draft of Learning, Books of Teacher (BG), Books of Student (BS), Paper of activity (LKS), instrument test of ability to solve the problem and questionnaire of self-study. Thiagarajan, Semmel, and Semmel with 4-D comprising of four stages of development either define, design, land disseminate. The summary of modified 4-D model is presented on figure 1 as follow.
2.3 Instrument and Data Analysis Technique

The instrument in collecting the data in this study comprising of Firstly, validity of learning-tools using validity sheet of tools. Secondly, the learning-tools itself is practical with
(1) sheet available on teacher against practical product, used to assess the practical point of RPP, book of teacher, book of student, LKS, test of ability, and questionnaire; (2) sheet of assessment to the ability of solving problem, and questionnaire of self-study; (3) sheet of observation conducting the learning used as guidance to observer in monitoring the course of mathematics with PBM model.

Thirdly, instrument of assessment to effectiveness of product consist of (1) test ability of solving problem, used to measure ability in solving problem by student; (2) sheet of observation of activity on student, used to gain data of activities; (3) sheet of their respond use to get data of students’ respond.

In analyzing the data, used a descriptive statistic analysis based on average score of each learning-tools that has been validated, done it based on any correction, with suggestions given.

Further, in order to assure practically existed learning-tools, viewed from:

a. Teacher’s assessment against practical learning-tools as developed can be done in classroom fulfilling minimal “easy to execute” criterion.

b. Students’ view adjust that the learning-tools as developed should be easy adopted in course there fulfilling minimal “easy to execute” criterion.

c. In administering the learning-tools as developed should be run minimal in “good” category. Thus, in order to see effectiveness of the learning-tools, viewed from:

a. Full-study done by student classically is analyzed under considering for all students categorized completed if the student individually get achieved score ≥ 2.67, whereas for any learning shall be noted completed classically if it achieved 85% students joint to the test achieving the score. To have note completed the equal is as follow

\[
PKK = \frac{\text{Students Completed}}{\text{Total Student involved}} \times 100\%
\]

b. The students activity is analyzed there even describe out the result of activities during doing studying. To find average frequency and average percentage of time to use, the students should follow the stages below:

1. Make frequency of each category of activity in one meeting.
2. To take average percentage of frequency in each category of activity by dividing average frequency for each category of activity with amount frequency of monitoring on each meeting.

c. The response of student should be analyzed by assessment percentage amount of students show positive response on each category as required, under a Borich formula (Herman, 2012:5).

\[
PRS = \frac{\sum A}{\sum B} \times 100\%
\]

Remarks:

\[
PRS : \text{Percentage numbers of students respond positively.}
\]

\[
\sum A : \text{Proportion of student take it}
\]

\[
\sum B : \text{Total students (respond)}
\]

The respond is noted effective if the numbers of student respond it higher or similar to 80% of amount subject to research on each test. Still, the process given by student is seen by conformity of students’ respond with the indicator of capability to solve the problem and its mathematics communication.
3 Results

3.1 Description of Stages in Development of Learning-tools Problem Based

In developing the learning-tools is done using a 4-D model comprising of four stages, they are define, design, develop, and disseminate. In details how to develop them, is mentioned as following:

a. To define Stage
   1) Early Analysis of end
      In field indicated that for longer the teachers have not the learning-tools properly, covering the Learning execution plan (RPP) as used perhaps not the description of learning process as executed, it shall be copy format from other teacher, since the teacher in this case never plan own self about RPP, not use LKS as supportive, and hand books used not contain any questions helping the student in improving ability to solve problem and to self-study.
   2) Analysis of Student
      By cognitive, student grade X-2 and Grade X-3 SMA Negeri1 Kualuh Selatan have capable to think on a formal operational. Piaget stated out on such aged, student SMA level have approached a maximal intellectual efficiency, but on shortage experiences shall limit their knowledge and capability to use what he/she knows. In addition, by interview to Head of School and teachers board school indicated that all the class-room run in similar ability (homogeny).
   3) Analysis on concept
      Analysis on concept aimed at identifying, mention, and arrange systematically the concepts student shall learn about mainly trigonometric become concept mapping. This concept map further is suited to the learning problem based. The concept map to produce then is put on Book of students (BS) and books of teacher (BG).
   4) An Analysis of Duties
      The analysis of duties covering a general works and special works. The general works refers to a core competency in curriculum 2003, while specific duties refers to a basic competency and indicator achieving the performance conformed with analysis of material in this case with material is going to improve.
   5) Formulate the Purpose of Learning
      Specification the purpose of learning is noted there disseminating indicator of achieving the performance more specifically bases analysis of concept and analysis of duties about main topic of trigonometric.

b. To Design
   1) Arranging the test and questionnaire
      The test in use are test of ability solving problem on mathematics by description. For the questionnaire containing statement to find self-study by student.
   2) Finding Media and Tools
      Media in use to this research such as tools simplify the calculation. Other media in use such as illustration figures to simplify student correlate trigonometric with daily life and experiences.
   3) By Format
      Choosing format on the learning-tools is referred to principle, characteristic and steps in PBM model. Whereas format of book by teacher, book on student and LKS is made colorful and as attractive as possible.
   4) Early Design
On this stage produce RPP for 4 sessions, students’ book, teacher’s book, LKS on each session, test of ability solving problem, alternative for solution and score of point each question and questionnaire about self-study, for this design is known Draft I.

c. To Develop

The result from stage define and design may produce early plan for a learning-tools either known draft I. Following finished the learning-tools problem based in plan by draft I, go to test of validity over expert review and field test.

1) Result of Validation by expert

Before field test, the learning-tools and instrument, need firstly to validate the learning-tools and the instruments to those five validation-officials. By the result, then obtain criterion learning-tools and instruments to develop under “valid” and can be used by a bit revision. Further, instrument of research namely test of ability for solving and questionnaire for self-study should be tested in class-room outside sample, then do validity test and reliability.

2) Test I

Following fulfilling criterion valid as develop the learning-tools, then to all learning-tools is known draft II. Format of this draft II is tested on the research area such as they test I done on Grade X-2. The result of data analysis in test-I is a learning-tools that has been developed having fulfilled criterion to valid and practical, but not fulfilled be effective due to found indicator be unachievable under completing to full classic to develop the problem 70.59%. The result of full completing classically solving the problem on test I as well as the result of questionnaire in self-study can be seen on Table 1 and 2.

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage (%)</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed</td>
<td>24</td>
<td>70,59</td>
<td>2,753</td>
</tr>
<tr>
<td>Not Completed</td>
<td>10</td>
<td>29,41</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Result by Questionnaire in Self-study as Test

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage (%)</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>5</td>
<td>14,71</td>
<td>47,88</td>
</tr>
<tr>
<td>High</td>
<td>9</td>
<td>26,47</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>17</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Very Low</td>
<td>3</td>
<td>8,82</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

P From Table 1 can be seen that average ability in solving problem on Test I is 2.753 by maximum rate 4.0. Percentage of student do completed is 70.59%. This percentage is obtained by dividing frequency of student do completed noted 22 student out 34 x 100%. Refers to criterion of assessment, this percentage not fulfill classical completed as decided namely ≥
85%. Whereas, result of questionnaire in self-study as obtained as showed table 2 indicated that average self-study of student seen 47.88 of maximum rate 72. Percentage of self-study with highly category is 14.71%. So, it is necessary to revise on Draft II upon some component of learning-tools as developed.

3) Test II
Following done a Test I on Draft II, then make correction to produce a learning-tools fulfilling an effective require. The result of revision on Test I producing draft III to be tested on further class namely on Grade X-3. This Test-II is done 4 times session refers to the plan on learning (RPP) that has been improved. The test-II was done to assess the effectiveness of learning-tools (draft III). Beside correcting to test I, this test II is also done to see improvement ability of solving problem and self-study by student. In whole, the classical completed rate of ability in solving problem by student on test II can be seen on Table 3 and the result of self-study by student is on Table 4.

Table 3. Classical Completed Rate ability Solving the Problem by Student on Test II

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage (%)</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete d</td>
<td>30</td>
<td>85,71</td>
<td>3,04</td>
</tr>
<tr>
<td>Not Complete d</td>
<td>5</td>
<td>14,29</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>35</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Table 4. The result Questionnaire of Self-study on Test II

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage (%)</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>5</td>
<td>14,29</td>
<td>49,82</td>
</tr>
<tr>
<td>High</td>
<td>15</td>
<td>42,86</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>9</td>
<td>25,71</td>
<td></td>
</tr>
<tr>
<td>Very Low</td>
<td>6</td>
<td>17,14</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>35</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Based on data on Table 3, seen that average ability solving problem on Test II noted 3.05 of maximum rate 4.0. Percentage of student completed is 85.71%. Refers to criterion of assessment, this percentage has fulfilled already classical completed decided on ≥ 85%. It is concluded that classical completed criterion is fulfilled. Further, on students’ activity is obtained that on test-II all students’ activity ranged on ideal time as determined with tolerated limit 5%. On students’ response is obtained the student responded positively on the learning-tools oriented learning problem based. Concluded that the learning-tools problem based as developed on test-II as the revision of test-I has fulfilled already the learning-tools in practical and effective.

d. Disseminate
Disseminating of learning-tools problem based as developed in this case done under providing a learning-tools over forum MGMP in school where the test to use later.

### 3.2 Improvement Ability Solving Problem and Self-study of Students Using a Learning-tools Oriented Learning Problem Based as Developed

Bases to the result of analysis improvement ability solving problem by students on test-I and II indicated that average ability in solving problem on test I is 2.75, whereas on test II is 3.04. Percentage of student completed it on test I is 70.59% and not completed 29.41%. Refers to the assessment criterion, percentage in completed as this 70.59% not fulfilled classical completed as decided namely ≥ 85%. While on test II, percentage of student completed full is 85.71% and not completed 14.29%. Percentage completed with this 85.71% has fulfilled already classical completed as decided.

Whereas result of analysis improvement ability in self-study obtained that average self-study by student on test-I is 47.88, whereas on test II is 49.82%. This average is obtained from dividing total score in all students with numbers of student. Percentage of students on test-I with category self-study with very high is 14.71%, with high 26.47%, low 50% and very low 8.82%. Percentage students on category very high is 14.71% obtained from numbers of student as included into category with self-study with high rate (in this case 5) divided numbers of student namely 34 and x 100%. Whereby, percentage of student on test II with category self-study is very high 14.29%, high 42.86%, low 25.71% and very low 17.14% respectively.

Representation category self-study on student obtained on test II got increased on high category. Having rise up high 16.3%, and this also indicated that percentage self-study of highest is on test I ranged on low category, whereas on test-II ranged on category high. The result of research showed ability solving problem and self-study using the learning-tools as developed got rising. Concluded that the learning-tools problem based influenced to a rising ability solving problem and self-study on students.

### 4 Discussion

Based to validation, the learning-tools has been done valid by validator. In essentially, the result of validation RPP, comprising of four sessions indicated that component in RPP of category such as quite good, good, and very good with average total 4.60. Beside RPP, the result of validation on books of student also indicated that components in that books got such as goo and very good of average totally 4.45. Further, validation on books of teacher also indicated that components in that book got such as quite good, good, and very good with average total 4.47. The result of validation LKS also got such as category good and very good with average total 4.52. This also indicated that components in LKS is categorized good.

Further, validation of test ability solving problem is available of category not valid, valid still upon validity of content, can and be acceptable upon language and to write the questions and to recommend without any revision, a small revision, and high revision. Following done revision, the questions that has been improved fulfilling already criterion valid and is acceptable to measure ability of solving problem as on field test. It is also done on questionnaire of self-study, the result of validation indicated that components such questionnaire as self-study also ranged on category of valid, quite valid and one point
A statement is not valid upon validity of content; can and be acceptable upon the language and how to write; and to recommend without any revision and small revision. Following done revision, another 35 points statement as developed has fulfilled already criterion valid and be acceptable.

Bases to field test, concluded that product expandable has fulfilled criterion practical. Upon practical product can be seen from the data of assessment on teacher and student upon practical of product, and observation to realization of learning mathematics with PBM model using product as expanded.

Average score of assessment of teacher against practical of product is available on category “very easy to execute”. Assessment by teacher, percentage of student make adjust on product is on category minimal “easy to use” is 100% so it can be noted that product as expanded practical to use.

The learning on mathematics is done refers to model as used on RPP, namely PBM model. Average percentage done on mathematics with PBM model used product as expanded is 91.67%, it means the implementation has achieved minimal limit noted product as expanded practical to use in mathematics. In generally, product expanded fulfilled the practical criterion if existed consistency between adjust by teacher and student with condition applied in field. Bases to test I and II, the learning-tools oriented learning problem based as expanded has fulfilled category effective if viewed from : (1) completed learning students classical; (2) activity of student within time tolerated as decided; (3 ) student respond it positively on the learning-tools component problem based.

Average ability solving problem by student in test II is 3.04 with percentage completed is 85.71%, this point is seen criterion classical completed is fulfilled.

By monitoring, students’ activity seen that it is on criterion limited learning effective as noted on Chapter III. On test I, aspect ask questions achieved 14.47%. Even it is still in criterion as decided, tending to ask their teacher not to other student in the same group. On test II of this aspect increased up to 15.51. Even though, on test-II the students has questioned fellow student.

Many questions asked to teacher but it correlated the teacher adjusted to condition of student can not fulfilled. This outcome is noted as one of references to revise books of student and LKS. One of points to improve is the question of point d on LKS is detailed specifically and some formulas required in solving, but student do not remember need to add on book. In order to adjust the activities, alternative to repair such as : (a) teacher lead students completed question point d and try using the outcome obtained in finding one of points known or give other solution to respond the problem given, (b) adding guidance and explanation details on the problem available found on book. Following repair, the activities of students on test II available on a tolerated limit decided.

Additionally, analysis to students’ respond related with their feeling agains aspect of component of learning-tools namely their opinion upon the material, books of student, LKS and atmosphere of learning is lower than aspect of other tools. Bases to comments and interview done over to students giving negative respond, their reasonable is their refusal on group study.

Further, analysis to students’ respond is related renewal component of tools either books of student, LKS, material and atmosphere achieved 80%. Although achieved already 80%, some comments of student on questionnaire shall be consideration to revise tools before test II. One of comments by student seen about atmosphere of learning in noises with group-study.
By aspect of enthusiasm students to attend the session, mostly students respond it positively above 90%, it means students interested with involving in further learning activity. Aspect of clearly language used on books and LKS has achieved 90% already, but regarding words, sentences or instruction questioned by student during learning is noted referred repairing of language. The words or sentences not understood well added available explanation or replaced in more simple one and solution to problem in book is added conclusion or important concept need to understand. Aspect of interesting upon books and LKS is also achieved 80%.

By repairing done as on test II, aspects of students’ respond either on feelings of student against the tools, renewal on component of tools and clearly of language on books and LKS is persistent in category good. So, the final tools resulted has fulfilled criterion effective.

According to a research by Sinaga (2007) indicated that students respond positively to the learning-tools bases problem focused on Batak cultures. By exposes of research showed that concluding the components of learning-tools problem based as expanded contributed positively to students’ respond.

By having improved ability solving problem and by self-study using the learning-tools problem based as improved is seen properly, bases to average on both tests, found improvement ability of 0.29 point with 15.12% having improved completed, still improved in self-study of 1.94 point, by category, is found improvement with high category.

The result of research as above is relevant to Smith (Amir, 2010:27) stated out that various dimension and profitable of learning problem based for students such as to improve their capability to solve problem, easier to remember, improved understanding up, improved knowledge relevant to daily practicing, also to enrich their ability on leadership and cooperation, competency, and motivation.

This point is supported in outcome by Susanti (2015) got product with learning-tools problem based as expanded improving their ability solving problem and ability to connect mathematics. It is concluded that the learning-tools problem based possibly to improve ability solving problem.

5 Conclusion

By the result of analysis and understanding to this problem, can be taken conclusion as following:

1. Validity of learning-tools as expanded including into category valid with average rate validity RPP in 4.60, books of student in 4.45, books of teacher in 4.47, LKS rate of 4.52, test of ability solving problem in category sufficient valid and valid, as well as point of statement questionnaire with self-study as student.

2. The product as the learning-tools in mathematics for SMA Grade X with PBM model that has been tested and got into criterion practical. This bases to the result of research of students indicated that product as tested got already fulfilling criterion practical. The result by teacher indicated that product as tested got already criterion “very easy to conduct”. The data was supported by data results of observation conducting learning mathematics with PBM model with average percentage applied achieved 91.67%.

3. Effectiveness of learning-tools fulfilling criterion effective, they are: (a) achieving completed studying with percentage of classical completed in 85.71%; (b) activity done by
students fulfilled criterion of ideal time tolerated as decided; (c) respond of students over learning-tools is in category good.

4. Average improved ability solving problem by students on test I into test II is 0.29 point and its classical completed improved in 15.12%.

5. Average improved self-study by students as in test I into test II is 1.94 point. In category, seemly improved on category high on test II.

References

Effectiveness of the Use of the Construction Pattern Module in the Fashion Study Program of Medan State University

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Abstract. The purpose of this study is to find out how far the effectiveness of the use of modules can provide benefits to knowledge, technology, skills, discipline and work ethic and creative attitudes, students of the Fashion Design Education Study Program. This is behind the quality of the graduates of Fashion Design in implementing in school success standards and out-of-school success standards. The first criteria includes aspects of student success in fulfilling curricular demands that have been oriented towards the demands of the workforce. While the second criterion includes the success of students who are skilled in performance skills in accordance with national or international learning outcomes after they are in actual employment. Based on the results of the research carried out, the results can be taken by using modules on competency to change the pattern according to the design, overall obtaining an assessment in good fierce criteria, and overall material experts assess the results in very good criteria. The results of student questionnaire responses on the Construction Module Pattern in the criteria strongly agree if the module can attract attention, increase interest in learning, motivate and look attractive so that the module is declared effective to be used as a learning medium in learning Pattern construction for Fashion Design students. The research instrument used in the study is the instrument of student response to modules and learning outcomes test instruments. The scale used for student responses to modules is a Likert scale. Data analysis techniques used are descriptive and inferential statistical data analysis. Learning outcomes of students with pattern construction modules with an average of 81.25. The average student learning outcomes in the high category.

Keywords: Pattern Construction Module.

1 Introduction

Vision and mission Clothing Study Program is to provide knowledge, technology, skills, discipline and work ethic and creative attitude, and as one of the sources of producing skilled workers in the fashion sector so that skilled and qualified resources will soon be able to fill various jobs in business and industry. This is in accordance with the function of national education, namely developing the ability and shape of dignified national character and civilization in order to educate the lives of the nation, aiming at developing the potential of students to become believers and devoted to God the Almighty, noble, healthy, knowledgeable, capable, creative, independent and become a democratic, personality, and work-oriented citizen and responsible and productive.
According to Syah (2009) there are several factors that can influence student learning which are divided into three types, namely: internal factors of self in students, external factors from outside the student, the next factor is the approach to learning, namely ethnic learning students that include strategies, models, media used and this of course requires teachers who are able to teach. In this regard, Sanjaya (2010) suggests that lecturers as educators have an important role in the learning process, namely 1) as a learning resource, 2) as a facilitator, 3) as manager, 4) as a demonstrator, 5) as a mentor, 6) as a motivator. While learning is a conscious effort from the lecturer to direct students to interact and be supported by learning resources that are professionally and effectively delivered by the lecturer in achieving the expected goals.

Hamalik (1994) states that lecturers are required to be able to understand, use available tools in an effort to achieve the objectives of the expected learning goals. From this statement, it is implied that the lecturer must have sufficient knowledge and understanding of the learning media. Based on the initial observations that the authors did to some lecturers needed a good learning module in the learning process so that learning was more effective. Previously the lecturers only used media books, handouts, blackboards as media and only a few specific materials that used power point media. It is also known that the constraints in using the media because there are still many lecturers do not have the expertise to develop and use the media are not even familiar with computer technology, so the learning strategy is carried out conventionally. The learning system that is conducted is centered on the lecturer, namely by delivering the learning material by lecturing, the next demonstration the lecturer gives assignments or training to students. From the observations of some students it was stated that the learning media was very necessary because learning became more interesting and students could use the media as an individual learning tool.

Achievement of student learning outcomes that have not been maximized, this does not mean that students do not have the ability to draw construction patterns are suspected there are many more factors that cause low learning outcomes construction patterns such as factors within students, which include physiological factors, interests, talents, and motivation. Factors outside the student self are learning models, learning media, learning facilities and infrastructure, learning resources, approaches, techniques, tactics used during the teaching and learning process and learning strategies. However, the low learning outcomes from observations, due to lack of media use. Students are always conditioned to receive information as it is so that students become passive and wait to be given information without trying to find the information. This causes the learning atmosphere to be less attractive and communicative so that students are less motivated to learn and difficult to understand each step in the Pattern Construction course.

The Construction Pattern course is continuous learning from a complex unit. Other characteristics of these subjects in the learning process require students to do step-by-step work so as to realize the learning objectives as examples for archetypal drawing material, usually done with media handouts and with demonstrations that only focus on the lecturer during learning, but students cannot yet clearly understand and unable to repeat the process appropriately and correctly, therefore this leads to conducting research to create learning media, which makes it easy and motivating to learn independently and can repeat it if it is not understood after learning or without the presence of a lecturer. Referring to the acquisition of learning outcomes, to achieve the expected learning outcomes, learning must be carried out maximally so that all indicators are achieved. This is not only supported by lecturers who can create conducive learning for students, they also need improvements in the learning process so that students are more motivated and more active in learning Pattern Construction. Students
easily understand the material and improve learning outcomes. One effort that can be done is by using learning media. With the use of instructional media, it is expected to be able to assist the lecturer in conveying the subject matter so that learning can run effectively and efficiently and students can more easily understand the concepts of pattern construction learning.

Munadi (2011) learning media can be understood as "everything that can deliver and channel messages from sources in a planned manner so as to create a conducive learning environment where the recipient can do the learning process efficiently and effectively. Thus, the purpose of using the media in the learning process is to streamline and streamline the learning process itself. The use of learning media allows students to adjust their speed in mastering learning. Unlike the way of direct learning, generally the speed of learning comprehension is determined by the lecturer, so it can be seen that the learning media is very influential in the effectiveness and efficiency of learning.

With the use of learning modules, it is expected that students will easily absorb the material, so that they will achieve the expected educational goals. Learning effectiveness is facilitated by the development of learning modules. In this study the Pattern Construction Module developed which serves to overcome weaknesses in learning media. Handoyo (2003) says that the module is the presentation of information in the form of text, images and sound integrated so that it becomes effective and efficient. Modules can stimulate human senses and are very influential on student learning outcomes as expressed by Munir(2008) that approximately 90% of one's learning outcomes are obtained through the senses of view, 5% through the senses of hearing and 5% through other senses. Thus the appearance of the packed learning module becomes more attractive because there are pictures of fashion patterns in it. Through the Construction Pattern module students are expected to be more interested in learning and motivated in participating in learning.

2 Theoritical Study

2.1 Fashion Pattern Construction

Fashion patterns a piece of paper that is a prototype of clothing parts or sewing products. Pratiwi (2001) states that patterns are pieces of cloth or paper that follow the size or shape of a particular body. This statement is supported by the opinion of Muliawan (2002) who defines a pattern or pattern in the field of sewing as a piece of cloth or piece of paper used as an example to make clothes when the material is cut. The pattern is used as an example so that no errors occur while cutting fabric. In addition to using homemade patterns, people can sew at home using ready-made patterns (finished patterns) published by women's magazines. Pratiwi, (2001) states that archetypes can be divided into several types based on their manufacturing techniques, their parts, methods and types. Fashion patterns based on manufacturing techniques can be divided into 2 types, namely:

Draping pattern is a pattern made based on a person's body shape and then gives folds on the ballooned and unwanted part. When finished, the cloth or paper is removed from the body and flattened in a flat place, and the marks are marked. When finished, the cloth or paper is removed from the body and flattened in a flat place, and the crease marks are marked. This pattern was used before the construction pattern was found and is still used by fashion designers who use a high-level settlement system. The construction pattern is a pattern for making a pattern of clothing that is basically dior pattern can be with a pattern drawing with a
systematic calculation. This pattern is based on individual bodies. Making it is complicated and takes longer to create this pattern.

Pratiwi (2001) argues that the basic pattern according to its parts can be divided into 3 types, namely: a) Agency Patterns; The basic pattern of the upper body, which is the pattern of the body starting from the shoulders, neckline to the waist. The basic pattern of the body is divided into two, namely the pattern of the body of the face and the pattern of the back body, b) the Basic Pattern of the Skirt; The basic pattern of the skirt, which is the basic pattern from the waist down to the knee or to the ankles, and c) Basic Patterns of the Arm The basic pattern of the arms, namely the pattern of the upper arm to the elbow, wrist or the desired length of the arm.

2.2 Module Effectiveness

According to Sudjana (1990) that effectiveness is a learning process with regard to the paths, efforts, techniques, and strategies used in achieving goals optimally, appropriately, and quickly. Furthermore, effectiveness is defined as showing the level of achievement of a goal. A business can be said to be effective when the business reaches its destination. Thus explained that the effectiveness shows more on the specific results, namely the effectiveness shows the success in terms of whether or not the target is achieved. Learning effectiveness is important to measure in order to know the extent to which goals have been achieved.

For lecturers, student learning effectiveness is a measuring tool to assess success, not the teaching and learning process that has been carried out, while students have an interest in knowing the effectiveness to measure the extent to which students master the material taught by the lecturer. Lecturers must pay attention to various things that can affect the achievement of effectiveness and conduct evaluations at any time so that it can affect the extent to which students have been able to accept and master the material that has been displayed. Learning effectiveness is the level of achievement of learning goals. The achievement of these objectives in the form of increased knowledge and skills and the development of attitudes through an educational learning process. Learning effectiveness has the following aspects: increased knowledge, increased skills, improved attitudes, improvement in student achievement and behavior. Accurate measurement of achievement is very important, because lecturers cannot help students effectively if they do not know the skills and knowledge of the students and what material is the problem. The achievement of students was intended so that knowledge and skills can be mastered by students as a result of Surakhmad's (1994) experience, factors that influence effectiveness include the ability of lecturers to use learning media. The use of learning media is influenced by the objectives, students, situation, facilities and instructors themselves. The better and more precise the use of a method and media, the more effective the achievement of the goals that have been set, so that the learning outcomes are better. Effective learning is determined by its use. Because, the learning process shows a high percentage of student involvement in the right time, so that the achievement of goals is achieved by good student attitudes. Thus it can be said that the effectiveness of the process of learning objectives on target in accordance with the goals set.

Purwanto (2007) Modules are learning materials that are designed systematically based on a particular curriculum and are packaged in the smallest learning unit and allow to be studied independently in a certain time unit. The goal is that participants can master the competencies taught in training or learning activities as well as possible. Its function as learning material used in learning activities of students.
Module teaching is carried out according to the rules of the implementation guidelines that are able to contribute in order to improve achievement / learning outcomes, so that in learning the principles with the module needs to be considered. The achievement of goals by students is an effect of how the module in According to James D Russell (1992) the principles in module learning are as follows: 1) Modules using independent instructional packages, meaning that they are studied individually or in groups of the same age through multisensory learning observations with student order maximally 2) Modules within normal limits are very suitable for individual differences, even though the teacher simultaneously serves all the needs of students 3) Modules are prepared on the basis of special instructional goals, the modules are very realistic, accessible to every student who learns them with all the characteristics he has 4) Modules using the concept of association structure and sequence of knowledge 5) Modules using a variety of relevant tools and media 6) Modules portray active students participating in learning 7) Modules always encourage students to monitor certain responses 8) Modules using knowledge mastery strategies thoroughly. In accordance with the above module principles, it can be seen that the teaching of modules opens opportunities for students to learn according to their respective speeds and ways, therefore they use different techniques to solve certain problems based on their individual knowledge

### 3 Research Methods

This research is a research and development (R & D) was carried out on the Construction Course for Fashion Design Education Study Program at UniversitasNegeri Medan, which uses the development of the Dick and Carry Model in the Pattern Construction course, namely the development of the Dick and Carry model in the Pattern Construction course. The initial step of this research is; conduct preliminary research, which includes: (a) identification of learning needs and determining competency standards for courses; (b) conducting learning analysis (c) identifying the characteristics of students; and (d) writing basic competencies and indicators (e) writing benchmark reference tests, (f) developing learning strategies that are realized in the form of syllabi and learning designs; (g) developing learning materials.

The data extracted are as follows: (1) the learning aspects and the truth of the contents are obtained from the material experts and the design of the learning model, (2) the attractiveness of learning is obtained from the activities and responses of students during the learning trial with Dick and Carrey in the Pattern Construction course.

The instruments used in this study were (1) questionnaire needs of lecturers and students, (2) questionnaire sheets for material experts; used to obtain data about the quality of learning materials and the development of aspects of the learning delivery system filled by the lecturer, (3) questionnaire for learning design experts; used to obtain data about the quality of the learning and technical design of the product in the form of design development of Construction Pattern learning by learning design experts, (4) observation test sheets; which is used to obtain data about the results of Pattern Construction learning.

Data analysis is done on the initial data obtained and on the data of the initial product development validation results by experts. With this descriptive technique, the researcher describes the collected data as they are without intending to make conclusions that apply to the general or generalization (Sugiyono, 2010). In the module needs analysis phase, the researcher describes the material needs of the construction pattern. In the validation phase of the initial product development by experts, researchers described the results of the research and
validation from the expert level of feasibility of the learning design. The results of the student's assessment of module design, by describing, the score or mean (Mean), Median (Md), Mode (Mo) and standard deviation or standard deviation (SDi).

4 Research Results And Discussion

The results of the needs analysis obtained answers that from 3 Pattern Construction lecturers (100%) answered the Module had never been in Pattern Construction. While the needs data distributed to 31 semester 1 students (51%) stated strongly agree that the pattern drawing module was not too popular in pattern construction learning.

The collection of learning material is intended so that the presentation of the material in the module does not deviate from the curriculum used. In the pattern construction course, the basic competencies change the pattern according to the design. The main material taught in the pattern construction course is changing the pattern of the blouse according to the design, changing the pattern of the shirt according to the design, changing the skirt pattern according to the design.

The results of the analysis by media experts and material experts in each aspect of the assessment as a whole are determined by the score, then analyzed to determine the feasibility of developing the module. As for the percentage of the results of the assessment of media experts as follows in the aspect of module display, aspects of efficiency, and aspects of technical quality, the effectiveness of the module is summarized below:

<table>
<thead>
<tr>
<th>No</th>
<th>Indicator</th>
<th>Average</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Module display aspects</td>
<td>90</td>
<td>Very Good</td>
</tr>
<tr>
<td>2.</td>
<td>Efficiency aspect</td>
<td>80</td>
<td>Good</td>
</tr>
<tr>
<td>3.</td>
<td>Technical quality aspects, module</td>
<td>90</td>
<td>Very good</td>
</tr>
<tr>
<td></td>
<td>effectiveness</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>86.67</td>
<td>Very Good</td>
</tr>
</tbody>
</table>

Table 1. Results of the average percentage of assessment of the development of pattern construction modules by media experts.
Based on the assessment of media experts, the development of Modules in the overall pattern construction course is very good and feasible to use in the learning process but there are several suggestions and inputs to improve the feasibility of the module products. The results of the analysis of suggestions and input expressed by media experts are as follows: 1) Image selection, 2) Need to add module usage instructions, 3) In the reference menu, you should not use 1,2, and 3 points for bibliography, 5) Adjust layout of images, letters and arrangement in module products.

<table>
<thead>
<tr>
<th>No</th>
<th>Indicator</th>
<th>Average</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Learning Aspects</td>
<td>94</td>
<td>Very Good</td>
</tr>
<tr>
<td>2.</td>
<td>Aspects of Accuracy of Material</td>
<td>85</td>
<td>Very Good</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>89,5</td>
<td></td>
</tr>
</tbody>
</table>

The assessment of material experts said that the development of the Construction Pattern module as a whole was considered very good and feasible to be used in the learning process but there were some suggestions and inputs to improve the feasibility of the module product. The analysis of suggestions and inputs put forward by the expert learning material is as follows: 1) Pattern lines are less clearly visible on the application pattern, 2) The pattern making method is good but the application is not correct. 3) Before the pattern creation application is displayed, the design analysis is explained first. The results of small group trial data analysis on each aspect of assessment as a whole are determined from the average score in each category. The results of the study were then analyzed to determine the shortcomings of module products.

**Table 2.** Results of an average percentage of assessment of the development of the Pattern Construction module by material experts.

<table>
<thead>
<tr>
<th>No</th>
<th>Indicator</th>
<th>Average</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Learning Aspects</td>
<td>94</td>
<td>Very Good</td>
</tr>
<tr>
<td>2.</td>
<td>Aspects of Accuracy of Material</td>
<td>85</td>
<td>Very Good</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>89,5</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3.** Results of the average percentage of response assessment for the development of Pattern Construction modules in small group trials.

<table>
<thead>
<tr>
<th>No</th>
<th>Indicator</th>
<th>Average</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Attractive aspects of the module</td>
<td>61,33</td>
<td>enough</td>
</tr>
<tr>
<td>2.</td>
<td>Aspects of the level of difficulty in using modules</td>
<td>62</td>
<td>enough</td>
</tr>
<tr>
<td>3.</td>
<td>Module display aspects</td>
<td>61,6</td>
<td>enough</td>
</tr>
<tr>
<td>4.</td>
<td>Aspect benefits of the module</td>
<td>66</td>
<td>enough</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>63</td>
<td>enough</td>
</tr>
</tbody>
</table>
The results of the assessment on the development of the Pattern Construction module show that the products developed are still in the “sufficient” criteria so that the development is continued in the medium group trial at the second revision.

Table 4. The results of the average percentage of assessment responses to the development of Pattern Construction modules in the medium group trials.

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator</th>
<th>Average</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Attractive aspects of the module</td>
<td>76</td>
<td>Agree</td>
</tr>
<tr>
<td>2.</td>
<td>Aspects of the level of difficulty in using modules</td>
<td>70,67</td>
<td>Agree</td>
</tr>
<tr>
<td>3.</td>
<td>Module display aspects</td>
<td>74,66</td>
<td>Agree</td>
</tr>
<tr>
<td>4.</td>
<td>Aspect benefits of the module</td>
<td>76,66</td>
<td>Agree</td>
</tr>
<tr>
<td></td>
<td><strong>Average</strong></td>
<td><strong>74,49</strong></td>
<td></td>
</tr>
</tbody>
</table>

The results of the assessment on the development of the Construction Pattern module as a whole are stated "agree" and can be continued in the field group trial. The results of the data analysis in the field group trials conducted on 31 students who were attending the Construction Pattern lecture on each aspect of assessment are described in table 5 below.

Table 5. The results of the average response assessment on the development of the Pattern Construction module in the field group trial.

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator</th>
<th>Average</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Attractive aspects of the module</td>
<td>92,67</td>
<td>strongly agree</td>
</tr>
<tr>
<td>2.</td>
<td>Aspects of the level of difficulty in using modules</td>
<td>87,5</td>
<td>strongly agree</td>
</tr>
<tr>
<td>3.</td>
<td>Module display aspects</td>
<td>91</td>
<td>strongly agree</td>
</tr>
<tr>
<td>4.</td>
<td>Aspect benefits of the module</td>
<td>91</td>
<td>strongly agree</td>
</tr>
<tr>
<td></td>
<td><strong>Average</strong></td>
<td><strong>90,54</strong></td>
<td>strongly agree</td>
</tr>
</tbody>
</table>

The results of the evaluation of the module development in the Pattern Construction course in general the response value of the Strongly Agree students so that no more revisions were made. This can be seen from the small group test, the medium group trial and the large group trial experienced an increase from the student responses in Figure 1 below.
The results of the data analysis of the effectiveness test are carried out to find out which products are made feasible or not used as learning media. The effectiveness test is carried out on students and Pattern Construction lecturers. Based on the results of the data analysis of the effectiveness of the test on students and lecturers concluded that the development of the construction module is very effective to use in teaching and learning activities, so as to motivate students in learning which leads to increased learning outcomes.

In the development of this Module, the material described is changing the pattern according to the design with the competency that is changing the pattern of the blouse according to the design, changing the pattern of the shirt according to the design, changing the skirt pattern according to the design. The next development phase designs and produces the initial product in the form of a module with material changing patterns. In the development of the module, the outline of the media program serves to determine the title, purpose and subject matter of the material outlined in the module product. One of the psychological principles in making media is the organization of content, (Arsyad, 2013). So in the development of modules arranged and organized in several sequences as outlined in the flow chart, the order of presentation of learning material starts from the core competencies, basic competencies, indicators, goals, tools and materials for making patterns, the material of each sub competency, namely shirt, skirt, and blouse, pattern making, evaluation and summary.

Based on the results of data analysis carried out, it was stated that the module in the pattern construction course was included in a good classification which meant that it was suitable to be used as a learning medium. The intended feasibility is that module products have fulfilled the characteristics of interactive multimedia. One of the characteristics of the module is self-instructional or independent learning, (Susilana and Riyana, 2009). This is because it is very supportive in realizing production targets and efficiency that must be met by the garment industry so as to get maximum profit.

The use of patterns with different systems affects the efficiency and results of each fashion making. The accuracy of the pattern also influences the results of products in making clothes. If the pattern used in making clothes is not correct, the clothing produced is uncomfortable when worn. In making a computerized pattern there are two types of points that must be considered, namely the Curve point (curved point) and the Grading point (value point). Grading points are points when developed (made into several sizes) must be rated. Most grading points are located in a corner or corner of the image, but can also be in the middle of a line, both in a straight line and in curved lines.

![Fig. 1. Percentage of Group Test Results](image-url)
Dress pattern is a form or picture of a component or part of clothing based on a predetermined measurement. In the pattern drawings consist of lines, curves, and other signs or drawings, such as buttons, pleated marks (darts), pleated marks (pleat), direction of fibers (base line), etc. The pattern that needs to be considered is the point of grading and point curve (Miyoto, 2011). It was concluded that the module was feasible to be used in the learning process of the construction pattern of the fashion students. This is in line with the research conducted by Ampera (2017), wherein the research media developed a pattern-making learning media, stated that the learning media was suitable for use as a learning medium.

5 Conclusion

The conclusions in this study are as follows: 1) this research develops the module, with the material for making competency patterns to change the pattern according to the design. From the results of validation by two media experts, overall obtained an assessment in good fierce criteria. Whereas from the results of the validation by two material experts, overall received an assessment in very good criteria. 2) The results of student responses to the Construction Pattern lecture module in the criteria strongly agree that the module attracts attention, adds interest in learning, motivates students and looks attractive so that the media is declared effective to be used as a learning medium for learning Pattern construction for Fashion Design students.

References

The Readiness of Universitas Negeri Medan to Deal with the Industrial Revolution 4.0

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Abstract. Industrial Revolution 4.0 has urged the higher education to change the way they work. Changes in the form of work indeed require the readiness of infrastructure and human resources. To address these challenges, Universitas Negeri Medan (Unimed), Indonesia, has developed an integrated learning information system to facilitate learning in the digital era. However, the next challenge is to prepare human resources who will use the information system to optimize learning activities. Therefore, this study aims to map Unimed's human resource readiness to carry out learning in the industrial revolution era 4.0. The subject of this study was an active lecturer at the state public university. With random sampling, this study received 158 samples from 7 Faculties in Unimed. Furthermore, the data were analyzed by descriptive statistics to review the competency of using IT for educational and research activities held by lecturers. The results of this study indicate that human resources in Unimed have high readiness and potential in the implementation of digital learning. Policymakers can synchronize competencies and specific needs of lecturers related to their field of work with the SI that has been developed.

Keywords: Readiness, Lecturer, Digital Era, Higher Education; Industrial Revolution

1 Introduction

Industrial revolution 4.0 has changed the way people work. Information technology has eliminated the boundaries between physical, distance, digital and biological elements (Schwab, 2016). This phenomenon also disrupts the way students study. Previous learning activities must be done at certain times, specific places, and with thick textbooks that have the potential to change to be very flexible with the availability of various information in hand (see: Lu and Price, 2018). Classrooms are now available anywhere, anytime, with virtually available textbooks. This change certainly brings new challenges and threats. The availability of information that is very massive if not appropriately managed will only be an advantage that is obsolete because it is not used. To anticipate the phenomenon, it is necessary to update and adjust the competence of academic personnel to meet the demands of the digital revolution. That is important because higher education is now dealing with digital natives who have adopted IT as an essential part of their daily lives (Al-Habyat et al., 2018; Prensky, 2001). However, digital natives will not have a competitive advantage if given a traditional learning approach. Because traditional learning makes digital natives unable to explore their potential, so they cannot use IT as leverage to achieve competitive advantage.

Interestingly, pedagogy in learning continues to evolve, including in the method of delivery of teaching materials, which are also being developed. Educators in higher education
are urged to find innovative ways to restructure the class (Strayer, 2007; Bergmann & Sams, 2012) for example by organizing a flipped classroom, inverted classroom, or blended learning. Flipped teaching is seen as an innovative learning method for higher education (Steed, 2012). This method is built to be able to provide virtual learning so that it can encourage students to participate in learning at all times (Fidalgo-Blanco, Martinez-Nuñez, Borrás-Gene, & Sanchez-Medina, 2017). However, virtual learning is used to assign instructional content in preparation for attending lectures. Thus, the time available during lectures in class can be used for submitting problems, concepts, and involving students in collaborative learning (Tucker, 2012). Thus traditional learning that spends a lot of time in class for teaching theories and practices has been transformed into knowledge confirmation, debate, brainstorming, and proposing the synthesis of a problem, while theoretical and practical learning is carried out independently by students facilitated by lecturers through learning information systems. (Calimeris & Sauer, 2015; Hao, 2016; Lai & Hwang, 2016; Sohrabi & Iraj, 2016). The design will truly support student-centered learning which is needed by higher education.

To face these challenges Mohamad Nasir (Minister of Research, Technology and Higher Education of the Republic of Indonesia-Ristekdikti) explained that there are five essential elements that must be considered and will be implemented by the Ministry of Research, Technology, and Higher Education (Ristekdikti) to encourage economic growth and national competitiveness in the Industrial Revolution 4.0 (Ristekdikti.go.id, April 2018), as follow:

1. Preparation of a more innovative learning system in universities, such as: adjusting the learning curriculum, and improving students’ abilities in terms of data Information Technology (IT), Operational Technology (OT), Internet of Things (IoT), and Big Data Analytic, integrating physical objects digital and human to produce competitive and skilled college graduates especially in the aspect of data literacy, technological literacy and human literacy.

2. Reconstruction of higher education institutional policies that are adaptive and responsive to the industrial revolution 4.0 in developing the transdisciplinary science and study programs needed. Also, the Cyber University program is being pursued, such as a long distance lecture system, thereby reducing the intensity of lecturer and student meetings. Cyber University is expected to be a solution for children of the nation in remote areas to reach high-quality education.

3. Preparation of human resources, especially lecturers and researchers and engineers who are responsive, adaptive and reliable to face the industrial revolution 4.0. Also, the rejuvenation of infrastructure facilities and the development of education, research, and innovation infrastructure also need to be done to support the quality of education, research, and innovation.

4. Breakthroughs in research and development that will support the Industrial Revolution 4.0 and the research and development ecosystem to improve the quality and quantity of research and development in Universities, R & D Institutions, Industry and Society

5. Breakthrough innovations and strengthening of innovation systems to increase industrial productivity and increase technology-based startup companies.

With the readiness of academic staff competencies followed by infrastructure availability, higher education will be able to transform the challenges and threats of the digital revolution into competitive opportunities and advantages. Previous research revealed that to be able to integrate IT in learning academic staff is not enough to only have IT skills, but must have IT skills that are in line with their field of work (Sun, Strobel, and Newby, 2016; Schrum, 1999). So that academic staff can genuinely use information technology for the sake of optimizing learning activities. So that, to these dynamics, universities must prepare themselves well in
developing human resources to be ready to face the learning of the digital era. Furthermore, as a university, Unimed must know the position of preparedness in meeting the industrial revolution era. Unimed can further determine the roadmap and strategies exploit the 4.0 industrial revolution into a competitive advantage. Therefore this study aims to map Unimed's human resource readiness to carry out learning in the industrial revolution era 4.0. Measuring the readiness of human resources in the implementation of learning in the digital age is a critical issue to determine the design of the professional capacity building for academic staff and can also be an essential instrument in the formation of regulations and the development of strategic decisions for university leaders (Christensen and Knezek, 2017).

2 Theoretical Framework

2.1 Industrial Revolution 4.0 and its Impact on Higher Education

History shows that the world has gone through several phases of the industrial revolution starting from the industrial revolution 1.0, 2.0, 3.0 to the industrial revolution 4.0 (Lasi et al., 2014). The industrial revolution 1.0 occurred along with the discovery of water and steam power and the mechanization of production activities that increased efficiency and the amount of production at the end of the 18th century. Furthermore, in the early 20th century, the Industrial Revolution 2.0 occurred with discoveries in the field of electricity that enabled mass production. Momentum is a stepping stone for further findings which soon led the world to achieve industrial revolution 3 with the birth of computers and production automation in the late 1970s. The 3.0 industrial revolution began to show threats to the absorption of labor in various strategic industries. Then Industry 4.0 in 2011 the German government first revealed the presence of the 4.0 industrial revolution. At the Hannover Fair which was presented by showing computerized time. Revolution 4.0 delivering humans to cyber-physical systems and internet use in various formal and non-formal human activities (Baygin et al., 2016).

For Higher Education, Industrial Revolution 4.0 has shifted the workings of higher education organizations. Nowadays, ICTs are available throughout the higher education sector and are an essential part of the institutional infrastructure. Altbach, Reisberg, and Rumbley (2009) in a 2009 UNESCO World Conference on Higher Education report explained that the presence of IT in higher education has expanded exponentially, and touched almost all dimensions of higher education. Student electronic databases, staff, and administrative records, as well as course materials and libraries, are easily accessible. The University's website allows institutions to provide a public image that can be accessed from anywhere in the world, at any time and serves as an information provider for all community members who are interested in being involved with the institution. Sources such as email, instant messaging, and social networking space provide a way for academic collaboration, joint research, and personal and professional networks. Computer laboratories offer students and staff access to hardware and software for courses and research. Continuously available wireless systems and remote-access library databases have changed the notion of time and place to work and study on campuses. Network classrooms, equipped with various audio and visual equipment, have expanded the range of material that can be introduced to students and the methods by which information and ideas can be shared.

Therefore, higher education should pay attention to ideas, human resources, competencies of students, stakeholders and industry sectors as graduate users to address technology attacks.
Thus, higher education cannot avoid the responsibility to provide ideas and actions in the transformation of the administration of higher education (Schuster et al., 2015). The availability of IT in all areas of higher education enables the implementation of computer-based learning at all times (Jeschke, 2015; Baygin et al., 2016). But more than that, real IT integration in all learning activities is not an easy matter (see: Sun, Strobel, and Newby, 2016; Schrum, 1999). Although it is well known that proper IT integration in learning can improve the quality of education (Baygin et al., 2016; Sun, Strobel, and Newby, 2016; Schrum, 1999). To be able to get this effect, academic staff must use IT in every activity in their academic life, for example in interacting with colleagues and students, providing teaching materials, providing projects, controlling student activities, discussion, assessment, conducting research, literature search, data collection, data tabulation, data analysis, dissemination, publication, to the implementation of community service (see: Baygin et al., 2016). Also, higher education must also be able to provide an established information system for the implementation of various academic tasks.

2.2 Readiness to Face Industrial Revolution 4.0

Psychological readiness is not focused on the technology because technological innovation will still be present and owned by each as Rogers et al. (2005) expressed with the terminology of innovation diffusion. The industry will force the innovation that it produces to be absorbed in the market so that diffusion occurs in innovation, including in information technology innovation (Rogers, 2005). However, how the response of IT users to the use of IT is an important issue later. The mental readiness of users in facing the technology becomes a strategic issue that must be controlled by higher education in managing the technology attack itself. Sarwono (1987) proposed attitude factors in the face of advanced technology. "Soul" and attitude are part of the individual. According to Sarwono (1987), the behavior is the basis of adjustment. In this attitude, there are cognitive, affective, and psychomotor aspects that will direct the individual's behavior to technology which then has the potential to become a behavior that is focused on the technology (Sarwono, 1987).

Previous studies indicate that academic personnel has obstacles to IT integration in learning activities (Project Tomorrow, 2016). The integration of IT in learning is one of the most disturbing demands for educators because of the lack of preparation for the implementation of education in the environment (Cristensen and Knezek, 2017). Educators may be accustomed to using IT in their daily activities, but the use of IT for the sake of learning and other academic activities is something completely different (Sun, Strobel, and Newby, 2016). Gaps occur in ignorance of educators about how to maximize the use of IT in instructional design, conducting research, and maximizing other academic assignments (Cristensen and Knezek, 2017). Cochrane (2010) operationalizes these gaps into the following aspects: 1) there is no clear pedagogic theory in the design of IT-based learning; 2) Limited evaluation for the implementation of IT-based learning; 3) Weakness of prolonged studies related to the impact of IT-based learning on the quality of education; 4) The need for availability of support for students in the implementation of IT-based learning; and 5) The need for the availability of support for academic personnel in the implementation of IT-based learning. The Cochrane Study (2010) indicates that education practitioners lack guidance in the application of IT-based learning.

However, from the standpoint of Self-Efficacy, the actual ability to integrate IT in learning comes from repeated implementation experiences that enhance Self-Efficacy Beliefs (Bandura, 1986). The habit of academic personnel in using IT for their daily activities has
become a good starting capital. Academic staff only need to shift their regular activity mode into educational activities in their professional duties. Knowledge in the use of IT already exists, the lecturer changes the implementation in different segments. Referring to the Self Determination Theory (Deci & Ryan, 1985) the intention of human behavior is driven by intrinsic and extrinsic motivation. Intrinsic motivation comes from within an individual because of an individual's interest that results in the need for self-actualization of a person on a matter. While extrinsic motivation is an external drive that can generally be in the form of reward or obligation. Digital Age produces natural demands for new work patterns. Academics are required to change their work style if they don't want to be affected by natural selection. This situation results in strong extrinsic motivation for academics, plus support and demands from the government and higher education with various regulations making the transition of learning to IT-based learning mandatory.

On the other hand, the field of education assignment that is generally chosen because of the passion in academic appointments makes individual readiness in the implementation of IT-based learning better. However, such readiness needs to be identified by a measured construct. So that, the mapping of the readiness of human resources can be concluded empirically and produce policy recommendations with a strong scientific basis.

3 Research Method

This study was carried out by questionnaire assisted survey method. The research population was the lecturers at Unimed. Of the 200 questionnaires distributed, researchers received 158 responses from seven faculties in Unimed. Representation of each faculty in data collection helped the findings of this study in representing the actual conditions in Unimed. This research questionnaire was adapted from the review of Lu and Price (2018). Questionnaires were formed with categorical capable and not respondents that would represent the ability of respondents in the use of IT in the field of teaching and research assignments. The collected data is then tabulated and presented in the form of presentations that show the percentage of lecturers who can use in the field of teaching and research assignments. The sample demographics in this study can be observed in table 1 below. The sample is distributed at the range of age, gender, and education level.

<table>
<thead>
<tr>
<th>Table 1. Sample Demography</th>
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<tbody>
<tr>
<td><strong>Descriptions</strong></td>
</tr>
<tr>
<td>Age</td>
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<tr>
<td>Gender</td>
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<td></td>
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<tr>
<td>Education</td>
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</table>
4 Result

The results of this study are distributed into two areas of the task of lecturers who are most dependent on IT, namely teaching and research. In the use of IT for teaching purposes, the response shows that almost all academic staff at Unimed have been able to use computer hardware as a general function. That is external storage for data mobility needed in teaching, word management in MS Word applications and MS PowerPoint, smartphone usage for communication interests, the use of video recorders in smartphones, communicating via email, the use of MS Excel for general table management purposes, data tabulation, and the use of video recorders. The IT application is a basic need that must be owned by a lecturer in the implementation of IT-based learning. However, more advanced skills are needed to produce better teaching activity. In this aspect, the frequency of lecturers with advanced IT capabilities shows only <80%. This ability is to manage the MS Excel application for the benefit of analyzing data and managing advanced tables, using digital maps and managing program locations, using games in learning, using learning management systems in managing classes and conducting assessments, and the least capable lecturers are in managing animation software to develop interactive learning media with frequencies below 30%. Management of animation software is indeed not mandatory for lecturers; lecturers can transfer these needs to programmers or IT designers. However, ownership of these competencies can be a unique advantage for a lecturer.

Furthermore, in the IT capabilities of lecturers in the field of research assignments shows that in general the lecturers at Unimed already have basic IT skills for research purposes. For example in the ability to use desktop and laptop computers, portable storage, use of MS Word in writing articles, use of printers and scanners, understanding the use of web browsers and search engines, the use of MS PowerPoint and motion graphics for presentation purposes, search for relevant scientific literature, and secondary data search has a frequency above 80%. This figure has been outstanding in supporting the lecturers' research performance at Unimed. Furthermore, the use of more advanced IT in research activities such as to track accurate and quality literature and data, record and cite assisted applications, and use of reference applications and language applications have frequencies below 80%. Even though, the use of the application for reference and language management will be beneficial in writing scientific articles.

<table>
<thead>
<tr>
<th>No.</th>
<th>Skills</th>
<th>%</th>
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<tbody>
<tr>
<td>1.</td>
<td>Hardware (External storage, USB &amp; thumb drives)</td>
<td>96%</td>
</tr>
<tr>
<td>2.</td>
<td>Word Processing (Manipulate text)</td>
<td>95%</td>
</tr>
<tr>
<td>3.</td>
<td>Hardware (Smartphones)</td>
<td>92%</td>
</tr>
<tr>
<td>4.</td>
<td>Hardware (Video recorders or players)</td>
<td>89%</td>
</tr>
<tr>
<td>5.</td>
<td>Communication &amp; Email - Reproduce academic formats</td>
<td>88%</td>
</tr>
<tr>
<td></td>
<td>Task Description</td>
<td>Percentage</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>6.</td>
<td>Spreadsheet Calculating - Understand terminology: column, row, cell</td>
<td>86%</td>
</tr>
<tr>
<td>7.</td>
<td>Data Retrieval &amp; Research - Understand browser uses</td>
<td>84%</td>
</tr>
<tr>
<td>8.</td>
<td>Hardware - Audio recorders or players</td>
<td>81%</td>
</tr>
<tr>
<td>9.</td>
<td>Spreadsheet Calculating - Alignment &amp; adjust column width &amp; row height</td>
<td>76%</td>
</tr>
<tr>
<td>10.</td>
<td>Interactivities - Mapping &amp; location programs</td>
<td>74%</td>
</tr>
<tr>
<td>11.</td>
<td>Interactivities - Games &amp; gaming</td>
<td>63%</td>
</tr>
<tr>
<td>12.</td>
<td>L/CMS Skills - Access grades for units</td>
<td>62%</td>
</tr>
<tr>
<td>13.</td>
<td>L/CMS Skills - Participate in a webinar</td>
<td>60%</td>
</tr>
<tr>
<td>14.</td>
<td>Interactivities - 3D or animation software</td>
<td>22%</td>
</tr>
</tbody>
</table>

**Proficient ICT Skills Regarding Research Activities**

<table>
<thead>
<tr>
<th></th>
<th>Task Description</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Hardware - Desktop &amp; laptop computers</td>
<td>96%</td>
</tr>
<tr>
<td>2.</td>
<td>Hardware - External storage, USB &amp; thumb drives</td>
<td>96%</td>
</tr>
<tr>
<td>3.</td>
<td>Word Processing - Manipulate text</td>
<td>92%</td>
</tr>
<tr>
<td>4.</td>
<td>Hardware - Printers, copiers &amp; scanners</td>
<td>85%</td>
</tr>
<tr>
<td>5.</td>
<td>Data Retrieval &amp; Research - Understand browser uses</td>
<td>84%</td>
</tr>
<tr>
<td>6.</td>
<td>Graphics Manipulation - Create clear, concise &amp; logical presentations</td>
<td>84%</td>
</tr>
<tr>
<td>7.</td>
<td>Data Retrieval &amp; Research - Use keywords in advanced search</td>
<td>82%</td>
</tr>
<tr>
<td>8.</td>
<td>Data Retrieval &amp; Research - Search sites with accurate information</td>
<td>79%</td>
</tr>
<tr>
<td>9.</td>
<td>Data Retrieval &amp; Research - Record, catalogue &amp; cite data</td>
<td>78%</td>
</tr>
<tr>
<td>10.</td>
<td>Word Processing - Use reference, thesaurus &amp; language tools</td>
<td>78%</td>
</tr>
</tbody>
</table>
5 Conclusion

Universitas Negeri Medan (Unimed) has human resources which are accustomed to interacting with IT. The results of this study also show that Unimed's human resources are relatively ready for IT integration in learning. This state is good news considering Unimed is preparing an integrated information system for the implementation of the university's tri dharma (three fundamental task) in Unimed. The irritation of any new SI implementation is prevalent in every organization. Updating IT is always faced with the knowledge stickiness of its users (Szulanski, 1996) which has an impact on the transition leg of an information system. However, with the frequency of readiness of Unimed's human resources in the use of IT in teaching and research activities which are on average above 70%, the leg of the integrated SI implementation will not last long.

Furthermore, an important part that must be a concentration of integrated SI developers in Unim ed is the IS alignment of the IS design that has been built. IS alignment speaks of the suitability of SI design and construction to the needs of the field of user task (Luffman, 2004). Therefore, the need of IT integration is bring the complexity of the academic task in higher education as expressed by Altbach, Reisberg, and Rumbley (2009) in a report to the UNESCO 2009 World Conference on Higher Education. Integrated SI developers must be able to provide one-stop IS to organize all academic life of lecturers. Furthermore, the IT acceptance will undoubtedly be tested continuously as long as the SI is used. Therefore sustainable development and maintenance are other vital issues that follow the implementation of integrated IT.

This study produces new insights related to readiness in dealing with digital age. Individual capability in using SI does not always automatically make the individual able to integrate the use of SI in the field of his work. Lecturers need self-efficacy to be able to dynamically adapt to changes in SI usage for various academic activities. Also, the design and construction of SI require conformity with the field of duty that is often of a unique nature. Therefore SI alignment becomes an essential issue of SI integration in learning activities in addition to the self-efficacy of human resources itself which is a crucial factor. The study can then review the successful implementation of IT integration in improving the quality and learning outcomes of students. Further research will be useful in bridging the gap expressed by Cochrane (2010) and producing the best practices of IT integration in academic activities. The success of higher education in exploiting SI will strengthen the role of universities in generating ideas and solutions from the Industrial Revolution 4.0 attack.

References


The Development Model Coaching of Karate Club in the Junior High School of Medan City

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Abstract. Karate is one of the fastest growing branches of martial arts in Indonesia and in North Sumatra Province. The karate sports is one of the flagship sports branches of North Sumatera Province which is able to produce achievements in every sporting event. Lately, the achievement of the karate sport is stagnant and tends to experience a decline in achievement. The lack of achievement is certainly due to the ineffectiveness of existing coaching models. Based on observations, and interviews with coaches of Karate clubs in Medan's First junior High School, information was obtained that the coaching model running in the Medan City Karate Club was not uniform and not well organized. This research includes the type of research and development (research and development) or more often abbreviated as R and D. This research took place in 3 years, where the first year was focused on organizational arrangement and the development of talent identification tools. In the second year, priority will be given to structuring the quality of the training which in this case is focused on the design of the karate club curriculum. Whereas in the third year it is targeted for structuring the competition system. Broadly speaking, each year the research goes through 3 stages, namely (1) the preliminary study phase, (2) the drafting stage, (3) the testing phase. The population in this study is the Junior Karate Club registered in the Medan City Branch Management. This research activity has also resulted in the organizational structure of the karate club, the talent scouting of karate instrument, and the karate club curriculum.

Keywords: Coaching Model, School Karate Club

1 Introduction

The martial arts branch, karate originating from Japan is very rapidly developing in Indonesia. This is marked by the many standing karate college associations that exist in Indonesia and proved to be held many tournaments between regional and international levels. To improve sports performance, especially in the karate sport, training is needed that can improve all components of the physical condition, because the physical condition component, which is prime, determines the level of achievement.

At first people only develop the skills of the hands, feet, and his body's ability to fight for life to earn a living or to defend themselves. Physical ability and martial skills in modern life are very necessary for humans. Many types of martial skills have been successfully developed by humans and learned from generation to generation such as: martial arts, karate, kungfu, taekwondo, kempo, judo, boxing and others.

Karate should not be viewed merely a technique to fight alone, because in fact the karate has meaning far beyond self-defense. Karate is a way of living a life whose purpose is to give
the possibility for someone to be able to realize their potential, both physically and spiritually. If the spiritual aspect of Karate is ignored, the physical aspect is meaningless.

Aside from being a martial arts sport, Karate is also one of the sports achievements. The numbers competed in karate are two, namely kumite and words. Kumite is a number that matches one-on-one battles in an arena that is 8 by 8 meters wide, individually and in teams with the time and rules set by PB FORKI in 2012. Words are numbers that compare various forms of form in an arena that is 8 times 8 meters, individually or in teams (consisting of 3 people) according to the age class that is followed and the rules set by PB FORKI.

Basically every Kohai (student) who practices for achievement gets the same teaching and training with each other both for kumite and for words. Someone who can do kumite well not be able to perform the movement of said well too, but when it can be said with good movement is certainly someone that can do a good kumite movement. Because all kumite attack movements are contained in words, it's just that the word is a series of movements that must be demonstrated sequentially with the right form and rhythm so to be able to do the word must have a strong memory. The word in karate is divided into several parts, namely basic words, sithe kata, and tokui words. The basic words consist of Taikyoku (Shodan, Nidan, and Sandan), Heian (Shodan, Nidan, Sandan, Yondan, and Godan). (source: Eka, Widya. Indonesian Karate-Do Institute (1996: 1). 26 Shotokan Karate Skills).

Karate is one of the fastest growing branches of martial arts in Indonesia and in North Sumatra Province. The karate sports branch is one of the flagship sports branches of North Sumatra Province which is able to produce achievements in every sporting event. Lately, the achievement of the karate sport is stagnant and tends to experience a decline in achievement.

The lack of achievement is certainly due to the ineffectiveness of existing coaching models. Based on observations, and interviews with coaches of Karate clubs in Medan's First High School, information was obtained that the coaching model running in the Medan City Karate Club was not uniform and not well organized.

2 Manuscript Preparation

2.1 Karate

Karate entered Indonesia was brought by students studying in Japan, and in 1963 in Jakarta the first Dojo was established from the Shoto-kan school with its founding figures: Baut Adikusumo, Karyanto, and Muchtar. Then the wadokai flow was introduced in Indonesia by Ir. H. Chaerul A. Taman in 1970, who had studied karate for 8 (eight) years living in Japan (1962-1970). Furthermore, according to Ivan Yulivan, (2012: 13). Karate sports have a rule that is always followed by karateka, both before and after carrying out an exercise activity, tests, demonstrations, and matches. Being a member or student of a karate college, one must understand and accept and implement sapta prasetia karate. In learning karate must be a warrior spirit, according to the origin of the word itself, namely "kara" means without using anything, and if it is deepened it literally comes from the words "Kara", "Te", and "Do" which have the meaning of the road / teachings with empty hands.

According to Abdul Wahid in Shotokan's book (2007: 1) "Karate is martial arts without using weapons, literally Karate-do comes from the words" Kara ", "Te ", and "Do ".

So overall karate-do has meaning or is a way or teaching with bare hands that aims to improve personal discipline and form a whole person".
Karate training material is divided into 3 groups, namely:

1. Kihon (basic movement)
   a. Dachi (easel)
   b. Uke (rattling)
   c. Tsuki (punch)
   d. Uchi (sabetan)
   e. Geri (kick)

2.2 Kumite (Fighting)

Based on the basic movements in kihon, in this section trained the role of basic movements to fight the enemy both in defense and attack.

2.3 Word

Literally the word means form / form / piece / pattern. In Budo the word is more interpreted as a form of special training that is the essence of a type. Martial arts that are displayed in a series of several kihon fruit arranged in such a way as in a standardization.

Currently karate has been used as a means of competition with two tournaments, namely kumite and the word along with the word application. In kumite someone fights with an opponent. Meanwhile, the word is an official form of training that combines basic karate techniques, such as punching, kicking, defending, and parrying in a set of defined movements. The word combines attacking and defending techniques, appropriate body movements and changes in direction. The word teaches karateka to face many attackers from at least four directions. The tournament began with the formation of the Japan Karate Association (JKA) and Masatoshi Nakayama was the person who introduced this concept.

According to J.B. Sujoto (Technique of Oyama Karate Series Kihon, 2002), the term Karate is written in modern Japanese letters which literally means empty-handed, has the following meanings:

a. Karate is a technique to defend yourself with bare hands or without weapons.

b. Karate also means an empty, clean soul without bad thoughts or self-interest, so that with a clean soul it allows one to learn and understand karate correctly.

2.4 School Karate Club

Regulation of the Minister of Education and Culture of the Republic of Indonesia number 62 of 2014, concerning extracurricular activities in elementary and secondary education, in article one paragraph 1 stated that extracurricular activities are curricular activities carried out by students outside of study hours, intra-curricular activities and kokurikuler activities in under the guidance and supervision of education units ". Article 2 states that the purpose of extracurricular activities is to optimally optimize the potential, talents, interests, abilities, personality, cooperation, and independence of students in order to support national education planning.

The school karate club is an activity formed in order to implement the education and culture minister's regulations on extracurricular activities. Where every school or education unit must provide a training forum to optimally optimize the potential, talents, interests, abilities, personality, cooperation, and independence of students in order to support national
education planning. This is in line with the program of the Ministry of Youth and Sports where it is expected that sports athletes will emerge from sports clubs in schools.

One of the extracurricular activities in schools in Medan City is an extracurricular activity in the karate sport. With the formation of karate clubs in school schools, the martial arts talents in schools can be channeled through karate activities. So that the function of karate extracurricular activities can really benefit school children in developing their interests and talents.

2.5 The Meaning Of Development

Edwin B. Flippo defines development as follows: "Education is related to increasing general knowledge and understanding of our environment as a whole". While Andrew F. Sikula defines development as follows: "Development refers to the problem of staff and personnel is a long-term education process using a systematic and organized procedure by which managers learn conceptual and theoretical knowledge for general purposes".

So, Development is an effort to improve the technical, theoretical, conceptual and moral skills of employees in accordance with the needs of work / position through education and training. Education enhances employee theoretical, conceptual, and moral skills, while training aims to improve technical skills in the implementation of employee work, workshops for employees can increase more knowledge outside the company.

2.6 Coaching

Etymological guidance comes from the word bina. Coaching is the process, making, way of coaching, renewal, business and actions or activities that are carried out efficiently and successfully well. In the implementation of the concept of coaching should be based on the things that are effective and pragmatic in the sense that they can provide the best solution to the problems faced, and are pragmatic in the sense of basing the facts according to reality so that they are useful because they can be applied in practice.

Besides that conceptually, coaching or empowerment, comes from the word 'power' (power or empowerment). Therefore, the main idea of coaching is in touch with the concept of power. According to Wiranto (1999), coaching is an effort to increase the capacity of the community and provide the widest possible opportunity for the poor category population to carry out productive socio-economic activities so as to be able to produce higher added value and greater income. Thus, Sports coaching is essentially directed to increase access for individuals, families and community groups to the resources to carry out the production process and business opportunities. To be able to achieve this, various efforts are needed to motivate in the form of, among others, capital assistance and human resource development.

2.7 Sports Coaching

Almost all countries in the world have a pyramid-based sports coaching system, which follows the coaching stages which are based on pyramid theory, including: production, nursery, and improvement of achievement which is a series of phased, integrated, directed and continuous activities. The three elements above are interrelated and cannot be separated. The pyramid-based coaching system is a tiered sports coaching from the lower layer which is preparation, then continued continuously to the middle layer, nursery, continues to level up to the top of the pyramid, achievement development.
More details on achievement sports coaching involves a number of key components. The results of international research reveal that there are at least 10 components (pillars) that must receive attention in conducting coaching. The ten pillars are; (1) financial support, (2) organization and structure of integrated sports policy, (3) foundation and participant, (4) achievement and identification development, (5) fostering elite performance, (6) sports infrastructure, (7) providing trainers, training and training quality, (8) the quality of national and international competition, (9) scientific research, (10) elite sport environment, media and sponsorship (Rusli Lutan: 2013: 33).

The direct results of the coaching process are maximum achievements in which all abilities both physical aspects, technical aspects, tactics and mentality work well. The purpose of sports is the development and development of sports is part of efforts to improve the quality of Indonesian people aimed at improving physical and spiritual health throughout the community, fostering character, discipline and sportsmanship, as well as developing sports achievements that can arouse a sense of national pride (GBHN, 1988).

3 Research Methods

3.1 Development Models

This study focused on developing a school Karate Club development model consisting of 3 stages. The three stages are (1) the organizational structure structuring stage and the development of talent identification tools (2) the curriculum structuring stage and the training method (3) structuring the competition system. This study takes three years, where the first year is targeted to produce organizational structures and measuring instruments talent identification, while the second year is prioritized for structuring curriculum and training methods, as well as the third year of structuring the competition system.

The research method used in an effort to answer the problem of this research is research and development which is often abbreviated as R & D. Borg and Gall (1989: 784-785) describe ten steps in research and development. However, in this case, the Borg and Gall development research model was modified into three steps, namely: (1) the preliminary study phase, which included literature studies, field studies, and drafting of coaching models; (2) the model development stage, (3) the testing phase of the coaching model. In this case, the research model for the development of Borg and Gall was modified into three steps, namely: (1) the preliminary study phase, which included literature studies, field studies, and drafting a coaching model; (2) the development study phase, the drafting of the coaching model for experts related to karate and experts, an evaluation and improvement of the draft development model according to the input provided; present draft improvement of the coaching model to experts, evaluate and improve draft coaching models according to input from dynamic groups to design coaching models that will be tested; (3) Testing phase of the coaching model, by conducting a quasi experiment of one group pretest-posttest design. (Moleong: 2003).

3.2 Development Procedure

The steps of development research taken in this study are as follows; (1) preliminary study phase, (2) development phase, (3) trial phase. This is done both for year I, year II and year III.
3.3 Product Trial

Trial Design
The design used in this study includes 3 main steps, namely preliminary studies, development of coaching models, and piloting of coaching models. Every major step there are several steps in it.

3.4 Data Collection Instrument

Data obtained from observation, interviews, documentation and test results. To maintain objectivity, observations are carried out by trainers, observers and researchers by utilizing the observation sheets that have been provided. To complete the data, discussions with trainers, observers and experts are carried out.

4 Research Result

In accordance with the first year research stage in this research activity, the research activities have resulted, among others.
1. The organizational structure of a karate club that can be used as a guide in structuring the organizational structure of a karate club in a school in Medan.
2. Structure of identification of talent in the karate sports branch, which will be trialled in small groups, to determine the level of accuracy of instruments in recruiting giftedness for karate sports. And it is hoped that this instrument will be a guide in the nursery program for prospective athletes in karate.
3. The curriculum curriculum for the karate school sports club, with this curriculum the nursery program and the formation of karate sports can be measured and planned well.
4. As the speaker at the national seminar on the results of a research conducted by the Medan State University research institute in 2017.
5. Data on the results of the trial of the giftedness instrument for small group karate sports.

5 Conclusions And Suggestion

The main text should be written using Times New Roman, 10pt, fully justified. Italics can be used for emphasis and bold typeset should be avoided.

5.1 Conclusion

From the research activities entitled the development of a karate club model development in Medan's junior high school, it has resulted in the form of a karate club organizational structure that can be used as a guideline for the karate club, in building a karate club in terms of organization. This research activity has also compiled a special gift test instrument for karate sports which is still in the small group trial stage. It is expected that this giftedness test instrument can be used as a guideline for the club in capturing the seeds of potential athletes in their respective schools. In developing the karate club training program this research activity
has also compiled a karate curriculum that can be used to assist trainers in developing training programs.

5.2 Suggestion

This research must continue in order to narrow the coaching model for the medan secondary school karate club.

References

The Applying of Cognitive Strategies and Empowering Students in Research-Based Learning on Ergonomic Course

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Abstract. The enhancement quality of education which is in accordance with the demands of stakeholders and the development of Science and Technology currently most related to the learning process. Learning is the heart of the educational process in an educational institution. The quality of learning can be viewed from various perceptions. At the micro level, the achievement of quality learning is the professional responsibility of a lecturer, for instance through the creation of meaningful learning experiences for students and facilities / technology which available to achieve maximum learning outcomes. At the macro level, through a quality learning system, educational institutions are responsible for the formation of qualified teaching staff, namely which can contribute to intellectual development, attitude and morals of each individual student as a member of the community. This study was conduct by Sport Science Department Faculty Of Sport Science State University Of Medan. Subject of this study were all of the students who took ergonomics courses in the 2018-2019 academic year. This action research was conducting for 3 (three) cycles, namely cycles I, II, III. Before the implementation of the first cycle action, First diagnostic tests and initial observations were hold about cognitive strategy ability of students (lecture I-II). The model and format of actions that will be given in cycle I are adjusted to the initial observations of students, while the actions applied in the second cycle were determined based on the results of reflection in the first cycle. Likewise for the third cycle was determined based on the result of reflection on cycle II. In accordance with the nature of classroom action research, then procedure for conducting research for each cycle through stages (a) planning, (b) implementing actions, (c) observation and evaluation, and (d) reflection. The application of learning models that apply cognitive strategies and empower students in research-based learning, not only can increase student independence, but students better understand and explore various concepts and principles of ergonomics through research and real practice in the field. Students can test the truth of a theory and produce new theories with various modifications to the approaches and methods of body movements, see the effect of changes in angle of movement and its benefits in achieving adjusting tools, the way and work environment to the ability of ability and limitation of the workforce so as to create working conditions that are healthy, safe, safe, comfortable and efficient. Alignment between theoretical understandings through research and successful practice in the field, this is the core of competency achievement in ergonomics courses.

Keywords: Cognitive Strategy, Research-Based Learning, Ergonomics
1 Introduction

Improving the quality of education which is in accordance with the demands of stakeholders and the development of Science and Technology currently is most related to the learning process. Learning is the heart of the educational process in an educational institution. The quality of learning can be viewed from various perceptions. At the micro level, the achievement of quality learning is the professional responsibility of a lecturer, for instance through the creation of meaningful learning experiences for students and facilities/technology which available to achieve maximum learning outcomes. At the macro level, through a quality learning system, educational institutions are responsible for the formation of qualified teaching staff, namely which can contribute to intellectual development, attitude and morals of each individual student as a member of the community.

Ergonomics which is a multi and interdisciplinary approach which seeks to adapt the tools, methods and work environment towards skill ability and labor restrictions so that a healthy, safe, comfortable and efficient working condition is created (Grandjean, 1993). Indeed health and work safety is not everything, but we did not realize that without health and safety, everything has no meaning.

A thing that cannot be denied anymore that the subjects require mastery of concepts and practices, tend to be less favored by students, no exception to ergonomics courses. This is indicated by the level of competency of students in the last 3 years in the Very Good category of 0%, who get the Good category by 6%, Poor category by 84% and Less Category by 9%. Based on the observations of researchers during the care of ergonomics courses, both when giving lectures and when correcting student assignments and exams, it turns out that students experience difficulties in the process of proving ergonomic concepts and principles. Students do not have the certainty of the truth of the theory which transferred by the lecturer during the learning process, to practice in achieving various competencies specified in the contract. It is also affects the lack of student activity in the learning process. Students sometimes only understand the theory without knowing the truth of the theory scientifically, especially the truth of the theory in practice in the field.

Therefore, the application of a strategy that can stimulate activity, thinking skills and laboratory practices with the carrying capacity of sports technology in ergonomics courses is very necessary. One of the strategies which might be applied is a cognitive strategy by empowering students in research based learning activities. This is in line with Cooney's (1979) statement that teach students for cognitive strategies in understanding theory and empower students in the mini research truth theory allows students to become more analytical in making decisions.

Research Based Learning is one of the steps to achieving effective learning (Chamdani, 2015: 669). In this learning model, students are encouraged to conduct research activities. This model can train students to think critically and carry out research activities, such as do a search, stringing hypotheses, collecting data, process data, and draw conclusions. Trisnasih (2013) concluded that "Research-based learning provides student opportunities to develop contextual concepts that emphasize real conditions with the stages that must be passed by finding new things from the research process.” Jenkin et al, explain the advantages of the Research Based Learning model is provide opportunities for students to not only know the content of teaching materials, but they also have the opportunity to practice doing searches, assemble hypotheses, collect and process data, and draw conclusions, in the end it can help them get better understanding and knowledge (Yahya, 2010: 1).
Cognitive strategy or regulation of cognitive activities according to Winkel (1996: 102) is the way someone handles their own cognitive activities especially in learning and thinking. Further explained that people who are able to regulate and direct their cognitive activities are much more efficient and effective in using all concepts and rules that have been studied, compared to those who do not have them.

Anderson & Krathwohl (2001) stated that three kinds of cognitive strategies that are very important to be taught to students are (a) rehearsal strategies, (b) elaboration strategies and (c) organizational strategies. Rehearsal strategy is a way to memorize learning material into memory by repeating the material.

The RBL approach in this lecture is translated as learning methods involving students through a series of activities that are observative, investigative, analytical, interactive, and communicative (Garvin, 1998).

2 Research Method

This research was conducting for 3 (three) cycles, namely cycle I, II, and III. Before the implementation of the first cycle action, diagnostic tests are first carried out and preliminary observations about students’ cognitive strategy abilities (lecture I-II). Model and format of actions to be given in cycle I were adjusted to the first observations of students, while the actions applied in cycle II were determined based on the results of reflection in cycle I. Likewise the action for cycle III is determined based on the results of reflection on cycle II.

In accordance with the nature of classroom action research, then the procedure for conducting research for each cycle through the stages of (a) planning, (b) implementing actions, (c) observation and evaluation and (d) reflection.

3 Result Of The Research

The application of the RBL model with cognitive strategy training, can improve student learning outcomes from cycle 1 to cycle 3 with the percentage of the number of students who had a moderate level of mastery were 72.6%; 80.6%; 84.7% of 35 students who took the test. Student responses to learning components and activities are positive. The level of ability of the lecturer to manage learning of the 1, 2 cycles was not good with the average value of the ability category is 2.60; 2.72, in cycle 3 it was included in a good category with an average ability score of 3.37.

To improve the effectiveness and effectiveness of the RBL Model in the implementation of ergonomics learning in class, the ability of students to collaborate was not only used as an accompaniment to this model but included in the direct impact of instructional. It was means that the ability of students to collaborate must be used as one of the determinants of success in achieving learning objectives. The learning process will not run effectively if students are unable to collaborate with their friends in solving problems, reconstructing knowledge, and cooperating with each other to complete tasks.

Student awareness of their role in discussion activities, ask / dialogue, submit ideas freely and openly, cooperate in completing research assignments, very decisive for the implementation and effectiveness of the learning model developed. So it is necessary to
develop portfolio assessments, assess performance, extended type response test to measure student growth and performance during the implementation of learning.

Research-based learning strategy and cognitive strategy training is quite effective change the habits of lecturers to dominate class activities, and the habit of students receiving passive knowledge from lecturers, and reduce student dependence on lecturers in completing learning tasks. Application of the RBL Model in the implementation of classroom learning can stimulate the experience of students in solving the problems. Students can build their own way in solving problems using logic and social experience. Likewise the research problems presented can stimulate the desire of lecturers to collaborate with lecturers in other subjects in the implementation of learning tasks.

4 Conclusion

Based on the result of the research it can be concluded that:

1. The achievement of the effectiveness of the RBL Model is concluded based on: (i) the percentage of many students who have a moderate level of mastery was 84.7% of the 35 students who took the test. This percentage showed that the achievement of classical student learning completeness, (ii) percentage of ideal time for each student activity category and the lecturer has been fulfilled, (iii) the average value of the category of lecturers' ability to manage learning is 3.37, including a good category, (iv) student responses to learning components and activities were positive.

2. Produced Research Based Learning Models with cognitive strategy training with the syntax of the model were ; (1) student orientation on problems, (2) organizing student learning based on research problems, (3) presentation and developing work, (4) concept findings and new strengthening of schemata, (5) analyze and evaluate the results of research problem solving.

5 Suggestion

Based on the conclusion of the study above, researchers give advice and recommendations to interested practitioners to implement the RBL Model in the implementation of classroom learning and researchers who want to follow up on this research. Following are the suggestions and recommendations.

1. The learning model that was produced only arrived at the development stage has not been implemented widely in other courses. To find out the effectiveness of the RBL Model in various other appropriate subject matter, recommended to lecturers and researchers to implement this model in a wider scope in other subjects. So that the results of research related to this model can be used as a reference for developing ergonomics learning models.

2. For lecturers who want to apply the RBL Model in another subject in appropriate courses can design / develop their own learning tools that are needed by paying attention to the components of the learning model and characteristics of the study material learned.

3. Lecturers who seek to improve mastery of concepts and student ability to solve problems, and increasing the interest of students studying ergonomics courses, the application of the RBL Model can be used as an alternative answer to the problem.
References


The Development of Technical Training Method Module and Tactic of Tennis Based on KKNI Curriculum in the Field of Techniques and Tactical Training Methods

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Abstract. The purpose of this study intends to develop a field training module based on KKNI in lectures on Technical Training Methods and Field Tennis Tactics that are suitable for use as learning resources in the Faculty of Sports Science. This research was conducted at Unimed sports science faculty student training department. In this study using a quantitative approach, a quantitative approach in research is characterized by testing hypotheses and using standardized test instruments and types of experimental research. Express a relationship between two or more variables and also to find the influence of a variable on other variables.

Keywords: Modules, techniques, tactics and curriculum of KKNI.

1 Introduction

From the data search results in the odd semester through lecturers who have strengthened the Technical Training Methods and Field Tennis Tactics in the last 3 years. Student grades in the 2014/2015, 2015/2016 and 2016/2017 school year show students who are PASS are 100%. But this graduation occurred with almost 90% of graduations with Remedials. This can be seen in table 1.1 below;

Table 1.1 Percentage of the value of the Coaching Department's passing level in the Technical Training Method and Field Tennis Tactics.

Source: Recap of course scores Team of Compassionate lecturers from Unimed's Communication Center

Based on observations and data that have been collected in the Technical Training Method and Field Tennis Tactics, there are still many students who have not been able to graduate normally, but must be remedial for graduation. The cause is one of the absence of training models for training independently for students. For this reason, it is necessary to have an independent training model module for students, which can facilitate and assist students in doing independent training. For this reason, with the research testing the effectiveness of the Goenrich Tennis technique training model, students will learn on their own outside the lecture hours with the modules developed. With the hope of students using the Goenrich Tennis technique training model module, there will be fewer students who graduate through Remedial 1 and Remedial 2.
<table>
<thead>
<tr>
<th>No</th>
<th>Semester value</th>
<th>Pass</th>
<th>Remedial 1</th>
<th>Remedial 2</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gasal, 2014/2015</td>
<td>10 (80 mhs)</td>
<td>70 (80 mhs)</td>
<td>10 (70 mhs)</td>
<td>78 mhs (97,5%) 2 mhs Lulus Polri/TNI AD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12,5%</td>
<td>87,5%</td>
<td>14,29%</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Gasal, 2015/2016</td>
<td>12 (86 mhs)</td>
<td>74 (86 mhs)</td>
<td>15 (74 mhs)</td>
<td>82 mhs (95,35%) 4 mhs Lulus Polri</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13,95%</td>
<td>86,05%</td>
<td>20,27%</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Gasal, 2016/2017</td>
<td>8 (76 mhs)</td>
<td>68 (76 mhs)</td>
<td>20 (68 mhs)</td>
<td>70 mhs (92,11%) 4 Lulus Polri &amp; 2 Lulus TNI AD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10,53%</td>
<td>89,47%</td>
<td>29,41%</td>
<td></td>
</tr>
</tbody>
</table>

2  Ease of Use

2.1 Concept of Module

According to the Directorate of Vocational High School Guidance (2008: 4) revealed that "Modules have the following characteristics: (1) Allows a person to learn independently and not depend on another party (self instruction), (2) Contains all the material needed in learning (Self Contained), (3) Does not depend on teaching materials / other media, or does not have to be used together with teaching materials / other media (Stand Alone / Stand Alone), (4) Have a high adaptability to the development of science and technology (adaptive), (5) Friendly / familiar with the user (user friendly) ".

This can be concluded by researchers, that the module is a form of teaching material that is packaged systematically and interestingly so that it is easy to learn independently. As a unit of independent learning program outlined in detail consists of: 1) Instructional objectives to be achieved, 2) Topics that will be used as the basis of the learning process, 3) Principles of the material being studied, 4) Position and function of modules in more unified programs broad, 5) The role of the teacher in the learning process, 6) The tools and sources to be used, 7) Learning activities that must be carried out and lived by students in sequence, 8) Worksheets that must be filled by students and 9) Evaluation program which will be implemented.

2.2 Concept of Field Tennis

According to (Yudo prasetyo, 1981: 43) argues "The basic principle in the game of tennis is not just hitting the ball over the net and dropping it into the opponent's playing field, but in hitting the ball it is attempted to make a good punch that can direct the ball and can put the ball carefully in the desired place so that the results can make it difficult for the opponent to return it, so that the opponent's punch goes out of the field or is on the net. Thus, it will get the value due to the wrong punch done, because every mistake in the blow results in the acquisition of value for the opponent."
Presented (Jones & Angela Buxton, 2006: 15) in his book that "basic skills in field tennis games are divided into three categories, which include: (1) service (2) groundstrokes (forehand and backhand), (3) volleyball basic tennis court. No points start with: Service: the basic way this movement is to 'throw' towards the ball. Once the ball is played, the rally takes place with: groundstroke. this is the blow you make after the ball hits the ground once. The blow without waiting when you touch the ground is called: Volley. The basic way for a volley is to hit the ball with the surface of the racket.

The basic technique of playing tennis tennis aims to get per point points by hitting and skipping the ball from the net in the opponent's space without being able to return the ball, considering the main purpose of tennis is to score points by entering into the opponent's field. Then the basic technique has a vital role and must be owned by all tennis tennis players. Therefore, the basic technical skills of American tennis must get more attention in training. Researchers here put forward more basic punch techniques with models developed for improving the techniques of field tennis players in North Sumatra Province.

2.3 Concept of Goenrich Model

According to (Sukadiyanto and Dangsina 2011: 6) "Understanding exercises derived from the word exercises is the main tool in the daily exercise process to improve the quality of the function of the human organ system, making it easier for athletes in improving their movements. The definition of training derived from the word training is the application of a plan to improve the ability to exercise which contains material theory and practice, methods, and implementation rules in accordance with the goals and objectives to be achieved ". Furthermore (Ria Lumintuarso, 2011: 99) which "shows in practice practice, the two training methods are used in combination". Consideration of combining training methods is based on technical training that is intended to master the standard form of skill movement. While the method of playing approach is intended for problem solving in real game situations which aims to better master basic techniques in playing tennis. So this goenrich exercise model is based on the approach to playing in development.

2.4 Curriculum Based on IQF

Perpres No. 8 of 2012 each study program is required to clarify the "graduate profile" which is expected through the activities of tracking studies, feasibility studies and needs analysis in the community. The graduate profile reflects the minimum ability that students must master after graduation which refers to four aspects of needs (1) attitude (attitude), (2) the field of work ability, (3) knowledge, and (4) managerial and responsibility. The four abilities must then be translated into a learning outcome in each subject in the study program. So that later, all learning plans or Semester Implementation Plans (RPS) must be based on learning outcomes that are in accordance with the needs of the graduate profile. [7]

According to Law No. 12 of 2012 article 29 explained that the National Qualification Framework is a level of learning achievement that equates the output of formal, non-formal, informal, or work experience in the framework of recognition of work competencies in accordance with the structure of work in various sectors. [8] So this KKNI curriculum invites students to innovatively and creatively think critically for learning every semester.

2.5 Research of Roadmap
This research was conducted to meet the needs of the learning process in the Techniques Method and Field Tennis Tactics courses, while the Roadmap for this study are as follows:

![Fig. 1. Module research roadmap The Goenrich technique training model is based on the IQF curriculum in the Technical Training Methods and Field Tennis Tactics.](image)

### 3 Prepare Your Paper Before Styling

This research is a research on the development of the Goenrich field tennis module based on the IQF curriculum. The research approach in this study is the development (Research and Development / R & D) of the Goenrich tennis field engineering module in the sixth step, namely the main group trial.

This type of research is an experimental study with the Goenrich engineering model module as a tennis treatment or treatment in experimental research. The design of this study is a randomized control group pre test - post test which can be described as follows:

<table>
<thead>
<tr>
<th>Technique Sampling</th>
<th>group</th>
<th>Pretest</th>
<th>Treatment</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Random</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training</td>
<td>Goenrich</td>
<td>P01</td>
<td>X1</td>
<td>P1</td>
</tr>
<tr>
<td>control</td>
<td>P02</td>
<td>-</td>
<td>P2</td>
<td></td>
</tr>
</tbody>
</table>

Information:
P01 : Pre-test experimental group 1
P02 : Pre-test of the control group
X1 : Treatment technique training model
Goenrich developed
- Conventional exercise treatment
P1 : Post-test experimental group 1
P2 : Post-test control group

3.1 Population and Research Sample

The population in this study were all students who took Athletics courses. The sample of this study was 52 students. The number of classes sampled were 6 classes, so the total number of research samples was 40 students.

3.2 Data Analysis Techniques

Data from the pre-test and post-test on the experimental group and control group were analyzed using SPSS 17.0 for Windows with the following analysis according to (Sugiono, 2010: 112):
1. Prerequisite Test Analysis; Following are the steps taken by the researcher during the prerequisite analysis test:
   a. The normality test in this study was used to test the data obtained with normal distribution, carried out using the Kolmogorove-Semirnov test with a significant level of 5%.
   b. Homogeneity test in this study is used to test the data obtained whether homogeneous or not. Using the levenes'test test.
2. Hypothesis Statistical Test: To find out the difference in the effect of treatment on the dependent variable results of Punch before and after treatment each group used Pairedt-test.

4 Results And Discussion

The development of the developed model module has 4 major components to be developed, namely: (1) development of forehand punch; (2) development of backhand punches; (3) developing volleyball; and (4) developing service punches.

After the stages of validation, evaluation and revision of the model modules that have been developed, the next stage is the implementation of the model by testing the effectiveness of the model. The effectiveness test of the model was carried out using a pre-experimental research design in the form of "one group control pretest-posttest design". The students who were the subject of the study were given a pre-test in the form of a technical test using the Hewitt test, then given the treatment in the form of the application of the Goenrich technique exercise model and again carried out a post-test using the same instrument.

On testing the average forehand difference simultaneously between groups to determine differences in the effect of treatment on increasing the dependent variable of Goenrich technique training on students with IQF curriculum before and after treatment between groups using Independent Samples Statistical Test From IBM SPSS21.0 for Windows calculations obtained results as following:

Table 1. Independent Samples Test Forehand Calculation Results Based on the above table it can be concluded that the sig value Equal variances assumed (2-tailed) 0.006 <0.05, it
can be concluded that there are differences in the influence of goenrich technique training and conventional engineering exercises on the ability of forehand techniques. Testing the Backhand average difference simultaneously between groups to determine the difference in treatment effect on the increase in the dependent variable goenrich technique training on students with the IQF curriculum before and after treatment between groups using Independent Samples Statistical Tests From the IBM SPSS21.0 for Windows calculation the following results are obtained:

Table 3. Calculation Results of the Independent Samples Test Forehand

<table>
<thead>
<tr>
<th>Backhand</th>
<th>Df</th>
<th>Mean Difference</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal variances</td>
<td>77</td>
<td>7.365</td>
<td>1.5</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Based on the table above it can be concluded that sig Equal variances assumed (2-tailed) value 0.006 <0.05 can be concluded that there are differences in the effects of goenrich technique training and conventional technique exercises on forehand technique skills.

Different Backhand average testing simultaneously between groups to determine differences in the effect of treatment on increasing the dependent variable of goenrich technique training on students with IQF curriculum before and after treatment between groups using Independent Samples Statistical Test From the calculation of IBM SPSS21.0 for Windows the following results were obtained:

Table 4. Calculation Results of Independent Samples Test Backhand

<table>
<thead>
<tr>
<th>Forehand</th>
<th>Df</th>
<th>Mean Difference</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal variances assumed</td>
<td>756</td>
<td>5.001</td>
<td>7.6</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Based on the above table it can be concluded that the sig Equal variances assumed (2-tailed) value is 0.001 <0.05, so it can be concluded that there are differences in the effects of goenrich basic techniques and conventional techniques on the basic engineering skills of Backhand.

Volley mean difference testing simultaneously between groups to determine differences in the effect of treatment on increasing the dependent variable of Goenrich technique training on students with IQF curriculum before and after treatment between groups using Independent Samples Statistical Test From the calculation of IBM SPSS21.0 for Windows the following results were obtained:

Table 5. Calculation Results of Independent Samples Test Volley

<table>
<thead>
<tr>
<th>Volley</th>
<th>Df</th>
<th>Mean Difference</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal variances assumed</td>
<td>76</td>
<td>6.025</td>
<td>0.08</td>
<td>0.7</td>
</tr>
</tbody>
</table>
Based on the table above, it can be concluded that the sig Equal variances assumed (2-tailed) value is 0.771 <0.05, so it can be concluded that there are differences in the effects of goenrich basic techniques and conventional techniques on Volley basic engineering skills.

Testing service average difference simultaneously between groups to determine differences in the effect of treatment on increasing the dependent variable of Goenrich technique training on students with the IQF curriculum playing before and after treatment between groups using Independent Samples Statistical Test From IBM SPSS21.0 for Windows calculations obtained results as following:

<table>
<thead>
<tr>
<th>Servis</th>
<th>Df</th>
<th>Mean Difference</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal variances assumed</td>
<td>79</td>
<td>7,128</td>
<td>0,091</td>
<td>0,001</td>
</tr>
</tbody>
</table>

Based on the table above it can be concluded that the sig Equal variances assumed (2-tailed) value 0.002 <0.05 can be concluded that there are differences in the effects of goenrich basic engineering exercises and conventional engineering exercises on basic service technical skills.

References

Rekap nilai mata kuliah Tim dosen Pengampuh dari Puskom Unimed.
Peraturan Presiden Republik Indonesia Nomor 8 Tahun 2012 tentang Kerangka Kualifikasi Nasional Indonesia.
Learning Design of Indonesian Phonology Based on Digital Learning Management System

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Abstract. The 4.0 industrial revolution that occurs today, demands the changes of learning process in universities towards learning based on digital. The form of digitalization of the learning process will later penetrate the boundaries of space and time that have been blocking the interaction between the lecturers and the students. This simple writing, then will describe the design of the digital learning process in colleges. The digitalization in this paper means an android-based learning design utilizing software/learning management system (LMS) for activities in the network (online) in Indonesian phonology courses. Some features that can be utilized in managing LMS based learning are: a) Courses, with courses menu, the users can create new classes, join classes that have already existed or browse through the predefined class list. b) Groups which functions like the wall messages of the group members and can also post on the wall messages. When joining a group, the users can search for parts of the group that the users want. c) Resources are to maintain, to track the documents, files and images that users upload in the class. d) Recent Activity is to display the latest news contained in the account. e) Calendar, to display the calendar page that was posted earlier in the Recent Activity. f) Messages are to send messages or view the messages among the fellow users, and g) People is to be able to see a list of the users in a class.

Keywords: learning management system, college.

1 Introduction

There are five components that are very important in learning activities. They are goals, materials, methods, media, and learning evaluation. These five aspects influence among and other. The choice on one certain teaching method will have an impact on the appropriate type of learning media, without forgetting three other important aspects, they are goals, material, and evaluation of learning. In this case, it can be said that one of the main functions of learning media is as a teaching aid that also influences the motivations, conditions, and the learning environment (Hamalik, Oemar, 1990).

Furthermore, Kemp and Dayton (in Yamin and Martinis: 2006) explain in detail the benefits of learning media as: 1) instrument for delivering the learning material, 2) the learning process becomes more interesting, 3) the learning process becomes interactive, 4) efficiency in time and energy, 5) improving the quality of student learning outcomes, 6) allowing the learning process to be carried out anywhere and anytime, 7) improving the students’ positive attitudes towards the material and learning process, 8) changing the students’ role to be more positive and productive, and 9) making the abstract learning material becomes concrete.
Along the time, learning media continues to grow following the rapid wave of information technology change. At first the media was only considered as teaching aids. The instruments used are visual aids, such as models, objects and other tools that can provide concrete experiences, learning motivation and enhance absorption or learning retention. However, at present the learning media are required to be able to penetrate the boundaries of space and time which have been a barrier in learning activities. For that reason, the educators are required to be able to design internet-based learning media that can be used as a means of blended learning.

One the information technology development products today is a Linux-based operating system which was designed for touch screen hand phone devices and tablet computers which is called android. As quoted from Tribun on February 26, 2017, the average Indonesian people spend 5.5 hours playing an Android-based cell phone from waking up to go back to sleep. The time tendency of the students spend with their smart phones can be used as opportunities and threats to the success of the learning process. The lecturers’ role as educators in developing android-based learning media with the LMS (learning management system) system needs to be improved.

The Android-based learning is one activity that offers mixed learning/blended learning face-to-face learning in class and in cyberspace/ in the network. The learning process is easy to use such as using Facebook. The Android-based learning will help the lecturers in opening wide communication opportunities for students so that they are easier to take part in discussions and be cooperative in learning activities. In addition, the Android-based learning also has many interesting features and functions to be used by students. The Applications that can be used in the Android-based learning include Edmodo and Schoology. The LMS design in this paper is an LMS-based android learning using Schoology application.

The activity and the research related to Schoology media have been conducted by the teachers and the researchers. Putri Sugiyarto (2017) in her study at SMKN VII Surabaya states that the learning outcomes of the students who used learning media of e-learning Schoology were better than the students who did not use learning media of e-learning Schoology. In addition, the results of the study showed that the learning media of e-learning Schoology received a percentage of responses categorized as very feasible from experimental class students.

Labo (2016) in his research related to the use of Schoology to increase the student learning activities in the Citizenship Education course at SMA Negeri 1 Tengaran presented the results that there was an increase in percentage. With an explanation of 42.08% at the first meeting, then at the second meeting it was 67.08%, while at the last meeting it was 88.52%. From this percentage increase, it can be concluded that Schoology media has a good impact on increasing student activity in learning.

The advantages of Schoology were also examined by Ansor (2015). His research related to the difference in the effect of using E-Learning based on Schoology and Edmodo on the independence and learning achievement of mathematics resulted in the conclusion that the Schoology media is more effective in increasing the students' independence in learning mathematics. Of the three researches raised by the authors it can be seen that Schoology media has a number of advantages, they are: it can improve the learning achievement, get a positive response, increase learning activities, and can improve learning independence.

Based on the research results, it showed positive values on the results of learning using e learning media of Schoology, the activities of this study will develop Android-based learning media using Schoology in the Indonesian Phonology course at Indonesian Literature Study
2 Research methods

This research approach uses research and development (R&D). This development design is Research and Development or Research Development. The development is in the form of the development of Android-based e-learning media by using the Schoology application as a learning supplement for the Indonesian Language Phonology course at the Indonesian Literature Study Program of FBS Unimed. This article is a Second phase as part of the research and development activities carried out which is the design phase of the program. In this phase, it transfers the obtained information from the analysis phase into the form of documents that will be the purpose of the developed media, one of the documents produced is a storyboard document. So, the research method used in writing this article is a descriptive research method. Some of the things described in this article are the integration of Indonesian Phonology learning materials into the Schoology learning media.

3 Research result and discussion

The meaning of Schoology according to Aminoto, T and Pathoni (2014: 21) is a website that combines e-learning and social networking. The concept is the same as Edmodo, but Schoology has many advantages. Building elearning with Schoology is also more profitable than using moodle, because it does not require hosting and managing Schoology (more friendly users). Certainly, the features are not as complete as moodle, but for e-learning learning, it is very adequate. The features that Schoology has are as follows: Courses, Group, Discussion, Resources, Quiz, Attendance, and Analytics.

The menus contained in the Schoology application include: a) Courses, with courses menu, the users can create new classes, join classes that have already existed or browse through the predefined class list. b) Groups which functions like the wall messages of the group members and can also post on the wall messages. When joining a group, the users can search for parts of the group that the users want. c) Resources are to maintain, to track the documents, files and images that users upload in the class. d) Recent Activity is to display the latest news contained in the account. e) Calendar, to display the calendar page that was posted earlier in the Recent Activity. f) Messages are to send messages or view the messages among the fellow users, and g) People is to be able to see a list of the users in a class.

Yuhdi (2018) explains the steps that can be taken in designing android-based learning using Schoology applications, they are: 1) making courses, 2) using access codes, and 3) adding and managing learning materials with course material. Thus, the design of Android-based learning media with LMS uses Schoology in Indonesian phonology courses conducted at this stage of the research described in the following sections.

3.1 Making a course

In Schoology, we can equate the course as a course/subject, therefore the first step to do the teaching and learning process in Schoology is to create a course. Section names are usually
used to create classes. In this section, Indonesian Language Phonology courses are taken for the Indonesian Literature Study Program of FBS Unimed class A. By using the section, the lecturer will be facilitated to copy all the material, assignments and exams that have been made in the class.

![Figure 1. Creating a Course in the Schoology Application](image)

Based on the Figure 1 above, the course created is Indonesian Phonology. At this stage, the lecturer only enters some important information about the identity of the course, such as the name of the subject, the subject/student who follows the learning in the course and the education level.

3.2 Using the access code

As a student, to get access to courses that have been prepared by lecturers, the student must have an access code. The use of access code by default is openly which means that anyone who has an access code can directly enter the course that has been created. However, to avoid the double user or unwanted users, it can add features require approval.

Based on the Figure 2 above, the giving of the student code to the students who will take part in online learning in Schoology applications needs to be limited so that the lecturers can ensure that members who are registered in the online class are the students in face-to-face classes. Furthermore, the students and the lecturers will be asked to log in using the RCQKT-X3877 access code previously given by the lecturer. Thus, the students wait for the confirmation from the lecturer to enter into online learning in the Schoology application.
3.3 Managing the learning materials with *course material*

*Course material* is the main part in a teaching and learning process. This course material is a place to create various needs and teaching and learning process. There are some parts on this course material, they are: 1) Assignments 2) Tests/Quizzes, 3) Files and Links, 4) External Tools, 5) Discussions, 6) Pages, and 7) Media Album. These seven features can be used to support any activities and give assessment. The lecturer can create any tasks for the students on *Schoology*, by using the button of Add Material which is above the Course Material, then click Add Assignment. Before making the assignment, the lecturer can also make folder at first to arrange the display of the Course Material.

Figure 3.3. above is the management of online learning activities in the *Schoology* application which in this section consists of several parts, they are: 1) Add Material, 2) Add Assignment, 3) Add Test / Quiz, 4) Add File / Link / External Tool, 5) Add Page, 6) Add Media Album, 5) Add Package, 6) Import from Resources, and 7) Find Resources.

The function of LMS with *Schoology* application on this course material is as feature for uploading and sharing materials which means that this LMS provides services to upload the documents, making it easier for lecturers to publish teaching material in accordance with the RPS that has been made. This LMS function can also be a forum and chats which means that LMS as an online and chat forum provides two-way communication services between instructors and participants, both synchronously (as a chat) and asynchronous (forum, email). The function of the LMS feature as Quizzes and Survey means that LMS also provides tests in the form of quizzes and survey material so that it can provide Grade in accordance with the test results for students. The function of LMS as Gathering and Reviewing Assignments means that LMS provides an assessment to students in the form of scores related to the results.
of the tests that have been conducted. The function of LMS as Recording Grades means that the LMS will automatically record Grade according to the learning outcomes that have been done by the students.

LMS which uses the Schoology application is also easily accessible from mobile devices. This application can be easily found on the market applications for Apple iOS and Android phones. Mobile tablet devices, such as iPad and Android can also run this application. Students can check the lecturer's views on the tasks they are working on, navigate the course content, review their grades, view the calendar of upcoming assignments, and Communicate with lecturers at any time.

4. Conclusion

Based on several explanations as stated above, it can be concluded that the stages of design of android-based learning media products which uses the LMS system with Schoology applications in the Indonesian Phonology course consists of: 1) making courses, 2) using access code, and 3) adding and managing learning material with course material. Thus, the next stage of the framework of this development research activity is to test product validity and test the feasibility of the learning media products produced, as well as the stages of production/dissemination of the learning media products to the public.

References


The Development of Karate Talent Scouting Identification Instrument

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Abstract. One important factor in presenting sports achievements is the gift of giftedness. To find out whether someone is talented in a particular sport, an instrument is needed that can be used by trainers in finding talent for athletes who can be fostered in certain sports, according to the giftedness test results. This research includes research and development (research and development) or more often abbreviated as R and D. This research took place in 6 months, where this study focused on developing the talent identification tool for karate sports. The population in this study is the Junior Karate Club registered in the Medan City Branch Management. This research has produced talent identification instruments for karate sports, which have gone through stages, preliminary tests, drafting drafts, expert trials, trials of small groups and large groups. The instrument consisted of several items, namely Anthropometric Test (height, sitting height, weight, arm span, leg length). Physiological Test (Aerobic Test, power endurance test of leg muscles, speed, agility, Power), Biomotor Test (Push-ups, Sit Up, back arch test, flexibility, ankle coordination), complete with assessment norms.

Keywords: Instrument, Talent, Karate.

1 Introduction

Sports is a series of motion skill activities or playing objects that are carried out structurally and systematically given to the human body so that humans become stronger, healthier and skilled both physically and spiritually by using a certain set of rules in their implementation. Sports as physical activity or physical activity can give satisfaction to the perpetrators as individual needs. According to the Law of the Republic of Indonesia Number 3 of 2005 concerning the national sports system the scope of sport includes activities: sports education, recreational sports and performance sports.

High achievement is the result of a series of systematic training processes. A systematic training program if it is not supported by talented athletes in certain sports, the achievements that will be achieved by athletes will not be maximized. One obstacle to achieving high achievement is the difficulty of finding talented athletes. Talent itself is one of the supporting factors that are very supportive and needed in sports achievement. One of the efforts to get talented athletes, among them is doing talent scouting from an early age. H Furqon and Sapta (2008) stated that "Sports coaching should begin at an early age so there is no delay and always continuous, but must consider the condition of the child or adapt to the world of..."
children”. Talent scouting must be multiplied and expanded, so that the potential athletes who have to be nurtured continuously and plan to get high performance.

Three important things that must be known by sports coaches and elementary & junior high school physical education teachers in their efforts to find and develop children who have potential in the field of sports include: (1) talent identification, (2) talent selection (talent selection), and (3) talent development (talent development), Winarno (2006) in (Deborah, 1991).

The three phases that have been stated before are a series of activities that have been structured and systematically designed, which must be carried out on an ongoing basis, ranging from talent identification, talent selection, to sports talent development. Efforts to improve achievement need to choose talented athletes by the right approach or method.

The martial arts branch, karate originating from Japan is very rapidly developing in Indonesia. This is marked by the many standing karate college associations that exist in Indonesia and proved to be held many tournaments between regional and international levels. To improve sports performance, especially in the karate sport, training is needed that can improve all components of the physical condition, because the physical condition component, which is prime, determines the level of achievement.

Karate is one of the fastest growing branches of martial arts in Indonesia and in North Sumatra Province. The karate sports branch is one of the flagship sports branches of North Sumatra Province which is able to produce achievements in every sporting event. Lately, the achievement of the karate sport is stagnant and tends to experience a decline in achievement.

The lack of achievement is certainly due to the ineffectiveness of existing coaching models. Based on observations, and interviews with coaches of Karate clubs in Medan's First High School, information was obtained that in conducting training for karate sports clubs the trainers had not conducted talent scouting for prospective students. And the instrument of talent scouting specifically for karate sports is still not standard. Therefore, an instrument of talent scouting is needed for karate sports, which can be used as a tool to attract talented athletes in karate.

Departing from the background of the problems raised above, the problem of this research focuses on developing a model of identification instrument for the gift of Karate sports for junior high school students in Medan.

The essence of Karate
Karate is a martial art from Japan. Karate itself has the meaning of empty hands. According to the Zen-Nippon Karatedo Renmei / Japan Karatedo Federation (JKF) and the World Karatedo Federation (WKF) in bermanhot (2013: 1), there are several major karate streams namely Shotokan, Goju-Ryu, Shito-Ryu, and Wado-Ryu. In addition to these streams there are other schools that have their own characteristics, such as Kyokushin, Shorin-Ryu and Uechi Ryu. Each flow has its own characteristics. Some of these streams have different emphases in karate techniques, some emphasize Kata, other uses of weapons other than bare hands, and full body contact systems.

In studying Karate, there are several levels that indicate how high the Karate martial arts ability is. Starting from a white belt where everyone who wants to learn Karate will get this belt without going through the test phase. The next level gradually is yellow, green, blue brown and the last one is black.

The basic Karate exercises are divided into three parts, as follows:
• Kihon, which is practicing basic Karate techniques such as hitting, kicking and parrying techniques.
• Kata, is technique practice or karate's flower.
• Kumite, which is sparring.

**Kihon**

Kihon itself is a basic technique which consists of attacking and defending techniques. Kihon is done repeatedly to form a fast and accurate movement response. Kihon training itself consists of various exercises that function to train several aspects of Karate, including Geri (kick), Dachi (foot position), Uke (hand), Tsuki (punch), Uchi (hand shape).

**Word**

The word is a combination or combination of a series of basic movements of punches, blocks, and kicks into a unified real form (Sujoto J.B, 1996: 137). Each aspect has a movement that varies from low to high level of difficulty. There are also several positions that have similar similarities. Word plays an important role in karate training. Each word has an embusen (pattern and direction) and bunkai (practice) that vary depending on the word being worked on. Words in karate have different meanings and meanings.

**Kumite**

Kumite literally means "meeting hands". Kumite is carried out by advanced students (blue belts or more). Before doing the free Kumite (Jiyu Kumite) practitioners studied the regulated Kumite (Go Hon Kumite). For kumite sports flow, better known as Kumite Match or Kumite Shiai.

According to Sujoto J.B (1996: 152), kumite is a method of basic techniques of punching, slashing, and kicking. From the two opinions above it can be interpreted that kumite is a training method that aims to train karate techniques both attack techniques and defense techniques that are carried out in pairs. In the kihon kumite training and kihon ippon kumite exercises all attack techniques, defensive techniques, and counter attack techniques have been predetermined. However, the jiyu kumite training has no prior technical settings, this is because each karateka is free to use the technical capabilities possessed. Kumite shiai, which is currently officially competed, is one form of kumite training in the form of free combat training (jiyu kumite).

Kumite matches that prioritize sports aspects, the techniques carried out by athletes who compete not to injure opponents, but to get value. Victory at the Kumite match is not determined by making the opponent fall due to punching techniques, jolt techniques and fast and uncontrolled kicking techniques. Victory in the kumite match is determined by one's ability to show or display the correct techniques, fast but able to be controlled properly, so that he gets the maximum value.

**Sports Coaching**

Almost all countries in the world have a pyramid-based sports coaching system, which follows the coaching stages which are based on pyramid theory, including; production, nursery, and improvement of achievement which is a series of phased, integrated, directed and continuous activities. The three elements above are interrelated and cannot be separated. The pyramid-based coaching system is a tiered sports coaching from the lower layer which is preparation, then continued continuously to the middle layer, nursery, continues to level up to the top of the pyramid, achievement development.

The direct results of the coaching process are maximum achievements in which all abilities both physical aspects, technical aspects, tactics and mentality work well. The purpose of sports is the development and development of sports is part of efforts to improve the quality of Indonesian people aimed at improving physical and spiritual health throughout the community, fostering character, discipline and sportsmanship, as well as developing sports achievements that can arouse a sense of national pride.
Sports Talent Identification

There are two paradigms that arise in guiding sports talent, according to H Furqon and Sapta (2008). First, that not every child has sporting talent, so that only certain children have the potential to be fostered and further developed. Second, that every child has talent in certain sports. This means that the child will be able to optimally practice in certain sports from the many existing sports.

a. Purpose of Talent Identification

H Furqon and Sapta (2008) stated that the main purpose of identifying talent is to identify and select prospective athletes who have the highest ability in certain sports. The earlier the child shows the suitability of the exercise with the ability to learn, the more successful he is in completing the training program. This will cause him to have more time to practice before reaching the age of peak achievements and will have a positive ending effect on his training. Determination of talent is a process of determining achievement abilities (pre-conditions), where children must have these abilities in order to achieve high levels of achievement and must use appropriate diagnostic techniques.

Three important things that must be known by sports coaches and elementary and junior high school physical education teachers in the effort to find and develop children who have potential in the field of sports include: (1) talent identification, (2) talent selection (talent selection), and (3) talent development (talent development), Winarno (2006) in (Deborah, 1999).

1) Talent Identification

Talent identification is a screening conducted on children and adolescents by using physical, physiological and motor skills as a selection instrument, to identify children who are gifted with sports, so it is estimated that the child will succeed in the training process, and can reach peak achievement. Winarno (2006) in (Menpora, 1998).

Two important components that should not be ignored in identifying sports talent are: Anthropometric Conditions and Motor Ability. Anthropometric conditions include; height, weight, sitting height, and arm span. While motor skills include; throw tennis catch, throw basketball, jump upright, run back and forth, run 40 meters, and run multi-stage.

2) Talent Selection

Talent selection is a screening performed on young athletes who participate in certain sports. The instrument for selecting is to use physical, physiological and motor skills tests. The instrument is used to identify the abilities and skills possessed by athletes, so that the athlete is likely to be successful in pursuing the sport.

This talent selection stage, has begun to lead to certain sports, so that the criteria used in accordance with the characteristics and specifications of each sport, are no longer general in nature such as sports talent identification.

3) Talent Development

Talent development is a follow-up to the identification and selection of athletes' talents. At this stage the intervention takes the form of treatment, to develop the talents of athletes optimally. This talent development is carried out on athletes who have participated in certain sports, and have talent in accordance with the sports that are occupied. Adequate infrastructure support capacity is one of the requirements of talent development, so that with adequate infrastructure support, it will be able to develop the potential of athletes optimally. This sports talent development activity must involve various components in synergy, and be handled professionally, starting from: determining trainers, preparing training programs, and designing competition programs, which are supported by adequate facilities, facilities and infrastructure, and based on sports science.
2 Research methods

2.1 Research methods

The research method used in an effort to answer the problem of this research is research and development, which is often abbreviated as R & D. Borg and Gall (1989: 784-785) describe ten steps in research and development. But in this case, the Borg and Gall development research model was modified into three steps, namely: (1) the preliminary study phase, which included literature studies, field studies, and drafting of the karate sports talent identification draft; (2) model development stage, (3) instrument testing phase. In this case, the research model for the development of Borg and Gall was modified into three steps, namely: (1) preliminary study phase, which included literature study, field study, and drafting of instruments; (2) the development study phase, the distribution of talent instruments in the karate branch to experts related to karate and experts, an evaluation and improvement of the draft development model according to the input provided; presents a draft for improving the guidance model to experts, evaluating and improving the draft instrument.

3 The results achieved

This research has produced talent identification instruments for karate sports, which have gone through stages, preliminary tests, drafting drafts, expert trials, trials of small groups and large groups. The instrument consisted of several items, namely Anthropometric Test (height, sitting height, weight, arm span, leg length). Physiological Test (Aerobic Test, power endurance test of leg muscles, speed, agility, Power), Biomotor Test (Push-ups, Sit Up, back arch test, flexibility, ankle coordination), complete with assessment norms.

4 Conclusion

Identification of giftedness in sports is very much needed as a basis for achievement sports achievements in Indonesia. With the presence of giftedness identification instruments in the karate sport, it is expected to be a tool to find the seeds of talented athletes in the karate sport, which will be fostered later.
References

KKNI Curriculum-Based Athletics Learning Module in PJKR Study Program Athletic Learning Course

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Abstract. This study aims to develop athletic modules with the IQF curriculum in basic athletic lectures that are suitable to be used as learning resources in the Faculty of Sports Science. This research was carried out for students of the Department of Sports Science Faculty Unimed sports science faculty. This study uses research and development (Research and Development / R & D) Athletics Learning modules in the third step, namely the main group trial. The results of the pre-test and post-test data on the experimental group and the control group were analyzed using SPSS 17.0 for windows with the following analysis; Test requirements Analysis (Normality test and Homogeneity test). The results of this study are to produce an athletic learning module training module with the IQF curriculum. Which consists of forms of athletic learning.

Keywords: Module, Athletics and KKNI Curriculum.

1 Introduction

The IQF is a reference framework that is used as a measure in the recognition of education levels. And since the implementation of the IQF-based curriculum in 2017 at the State University of Medan. So this course must also refer to the IQF-based curriculum. The learning process of Athletic Education courses refers to Permenristekdikti number 44 of 2015 article 10 paragraph (2) letter a consists of interactive, holistic, integrative, scientific, contextual, thematic, effective, collaborative and student-centered nature.

The results of the observations of the researchers indicate that so far there is no availability of teaching materials provided as a guide for students to learn about Athletics Education subjects. So far, lecturers still use books that are from outside the campus and even if there are modules or books that are old (eighties). So this module is very necessary as learning material in athletic education courses. Because the module is one of the main printed teaching materials that aims to achieve an educational goal efficiently and effectively. Learning by using this module students can learn according to their learning abilities and rhythms. Students also know how far the level of understanding of the material has been presented. The use of this module is considered appropriate for individual learning, so students can learn even without being accompanied by a lecturer. That's why this module teaching material needs to be developed so that it is always suitable and acceptable to students and can facilitate students in receiving learning materials. In this study the researchers wished to develop an Athletic Education learning module with an IQF-based curriculum.
2 Theoretical review

2.1 Development

Researchers use research and development models. There are many definitions of research and development or in foreign terms research and development (R & D). This is because R & D is used by various fields, so there are different pressures and focus when the definition of R & D is formulated. Even so, there are many fundamental similarities from the various definitions formulated.

According to (Sugiyono, 2008: 112) research and development or in English, Research and Development is research used to produce certain products, and test the effectiveness of these products. Then according to (Sukmadinata, 2005: 164) research and development is a process or steps to develop a new product or perfect an existing product, which can be accounted for. (Dwijoyo, 2004: 3) also argues that development research is a research oriented to produce or develop products, for example developing sports school models, developing physical education curricula, developing sports learning strategies / methods, developing sports learning media, developing books sports learning texts and so on. In this study focus on developing basic athletic skills learning for students, especially the Department of Physical and Health Education as lectures and to help facilitate learning.

2.2 Module

According to (Mbulu, 2001: 89) reveals that the notion "Module is a unified whole, consisting of a series of learning activities, which in fact have provided effective learning outcomes in achieving goals that have been clearly and specifically formulated". Then (Syamsudin, 2005: 168) defines "Module is a printed teaching material designed to be studied independently by the learning participants. Modules are also called media for independent learning because they are equipped with instructions for self-study. This means that readers can do learning activities without the presence of a teacher directly ".

This can be concluded by researchers, that the module is a form of teaching material that is packaged systematically and interestingly so that it is easy to learn independently.

2.3 Learning

According to (Kusnaka, 2003: 12) a model usually describes the whole concept of interrelatedness, in other words the model can also be viewed as an effort and to conclude a theory as well as an analogy and representation of the variables contained in the theory that. While (Snelbecker, 1974: 32) defines the model as the embodiment of a theory or representative of the process and variables included in the theory. According to [9] Robins (1996: 25) "A model is an abstraction of reality, a simplified representation of some real world phenomenon".

The learning in question is effective learning so that learning objectives can be achieved. Every lecturer must also be able to adapt to technological developments so that learning can keep up with the times, and not seem old-fashioned.

Athletics, In simple terms Athletics is a sport that consists of Lari, Lempar, and Jump. each branch consists of several types. here we will explain about the types of athletics and their pictures, understanding and explanations. Athletics is a physical activity which consists of harmonious and dynamic movements such as walking, running, jumping and throwing. From
the third movement is the movements that are the most original and most natural of humans, and are movements that are very important and invaluable to humans (Abdoellah, 1985: 38).

2.4 Curriculum based on IQF

The curriculum is an educational tool which is the answer to the needs and challenges of society. So the curriculum is a set / system of plans and arrangements regarding the content and learning materials and the methods used as guidelines for using teaching and learning activities. Basically the curriculum serves as a guideline or reference. For lecturers, the curriculum serves as a guide in carrying out the learning process. For students themselves, the curriculum functions as a learning guide. Along with the needs and demands of the community which are loaded with the development of science and technology, the curriculum should make efforts to change, develop and innovate these demands. A necessity if the curriculum continues to present with patterns of change as a result of people's thinking, because the "user" curriculum in the end is also the community.

3 Methodology

This research is a research on the development of KKNI Curriculum-Based Athletics Learning Module in PJKR Study Program Athletic Learning Course. The research approach in this study is quantitative which is part of the research and development (Research and Development / R & D) Athletics Learning module in the third step, namely the main group trial.

This research was conducted to meet the needs of the learning process in the Athletics Learning course, while the Roadmap for this study is in Figure 1 as follows:

Furthermore, the results of the pre-test and post-test data on the experimental group and the control group were analyzed using SPSS 17.0 for Windows with the following analysis according to (Sugiono, 2010: 112):

1. Prerequisite Test Analysis Following are the steps taken by the researcher during the prerequisite analysis test:
   a. The normality test in this study was used to test the data obtained with normal distribution, carried out using the Kolmogorov-Smirnov test with a significant level of 5%.
   b. Homogeneity test in this study is used to test the data obtained whether homogeneous or not. Using the levenes’ test test.

Hypothesis Statistical Test: To find out the difference in the effect of treatment on the dependent variable results of Punch before and after treatment each group used Pairedt-test.
Figure 1. Research Roadmap for Athletics Learning Module Modules Based on Our Curriculum at the Athletics Learning Course of the Study Program Study Program. (Source: BudiyonoSaputro, 2017: 10.)
4 Discussion and results

At the stage of validation, evaluation and revision of the module developed next stage is the implementation of the module using the effectiveness test of the module. The module effectiveness test was carried out by conducting pre-experimental research with "one group control pretest posttest design". Students are the subject of the study given a pre-test in the form of basic athletic engineering tests using an athletic instrument test, then given the treatment in the form of the implementation of athletic modules and back post-test using the same instrument.

Testing the average difference simultaneously between groups to determine differences in the effect of treatment on increasing dependent variables of basic athletic engineering exercises on students with the IQF curriculum before and after treatment between groups using Independent Samples Statistical Test From the calculation of IBM SPSS21.0 for Windows the following results were obtained:

<table>
<thead>
<tr>
<th>Atletik</th>
<th>Df</th>
<th>Mean Difference</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal variances</td>
<td>75</td>
<td>5.100</td>
<td>7.716</td>
<td>0.08</td>
</tr>
</tbody>
</table>

Based on the table above it can be concluded that the sig Equal variances assumed (2-tailed) value 0.008 <0.05 can be concluded that there are differences in the influence of basic athletic engineering exercises and conventional technique exercises on basic athletic engineering skills.

5 Conclusion

This development module is used as a guide book as a reference for lecturers and students in delivering athletic learning materials related to the IQF curriculum. Based on the results of the effectiveness of the learning module test, it is empirically proven that the results of module products in the form of athletic learning modules for students have very good effectiveness. This is based on the results of the test using the athletic instrument test shows the average value of the post-test results is greater than the results of the pre-test. So it is stated that the athletic learning module for students is effective to be used in improving student self-study outcomes.
References

Analysis of Formation of Students 'Character Through Rattan Traditional Games at Periuk 2 Private Vocational School, Tangerang City

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Abstract. Many traditional games that contain character values. But nowadays traditional games are increasingly being replaced by digital games. The focus in this study is the analysis of character values contained in traditional mouse rat games with the aim of describing character values in traditional mouse rat games. This study uses qualitative research, where research is based on the philosophy of logical positivism, used to examine the condition of natural objects. Data collection methods use observation, documentation and interviews. Data validity techniques using triangulation. Data analysis techniques use data collection, data selection, presenting data and drawing conclusions. The results of the study show that there are several character values integrated in traditional mouse cat games, namely religious values, curiosity values, honest values, values of responsibility, value of hard work, value of social care, value of love for the homeland, value of democracy and value of discipline.

Keywords: Traditional cat mouse game, character value.

1 Introduction

The education process is basically the right of every human being, as stated in the National Education System Law Number 20 of 2003 Chapter 1 article 1 (1), namely: Education is a conscious and planned effort to realize the learning atmosphere and learning process so that students actively develop their potential himself to have religious spiritual strength, self-control, personality, ingenuity, noble character, and the skills needed by him, the people of the nation and the State. Government regulations on the national education system at this time education applied in schools, especially primary schools, emphasizes character building. The character in question is a character that was formulated by the Ministry of Education and Culture in 2011 is expected to be able to shape the character of students themselves, maybe starting from the elementary school level. Activities that can develop the ability of character building through traditional games of mouse class II in SDN Periuk II are optimal. Second grade students of SDN Periuk II all class II students already knew the traditional game of mouse cats so that in learning using variations of mouse cat games students were very enthusiastic about the games and learning that would be discussed. One of the causes of students 'enthusiasm for the traditional game of mouse cats is an activity that develops students' character abilities in the game so that the child's body is often easy to carry out
learning that uses traditional variations of cat mouse games, so that the child has been stimulated in developing the ability to form traditional mouse rat games.

Character is a person's nature in responding to a situation morally, which is manifested in real action through good behavior, honesty, responsibility, respect for others, and other character values. Poerwadarminta explained that "character is defined as character, character, psychological characteristics, character or character that distinguishes one person from another, Lusiana (2012: 46). Based on this expression, it states that the character is the behavior or manner of an ethical person from each individual who is different. According to Mulyasa (2014: 4). Based on this expression shows that character means the behavior characteristics of a person that distinguishes between one individual and another.

Whereas according to Wynne (2014: 3) character is "to mark" marks and focuses on how to apply the values of goodness in real actions or everyday behavior. Based on this expression, shows that character means applying values of kindness and focusing on real actions or everyday behavior. Furthermore Sani and Kadri (2016: 8) stated that character is a good thing, for example related to honesty, tolerance, hard work, fairness and trustworthiness. But without strong faith in Allah SWT. Based on these expressions, it states that character is the way each individual behaves in accordance with the tolerance that exists in each individual. As for Gunawan, (2014: 2) character is a characteristic possessed by an object or individual (human). These characteristics are genuine, and are rooted in the personality of the object or individual and are a driving force for how a person acts, behaves, speaks, and responds. Based on this expression states that character is a special characteristic that is owned by each individual with each difference. From some of the above expert understandings, it can be concluded that the characters are identical with morals so that the characters are universal human behavior values which cover all human activities, both in relation to God, self, fellow human beings, and the environment manifested in the mind, attitude, feelings, words, and deeds based on the norms of religion, law, karmic order, culture and customs.

Psychologically and sociologically in humans there are things related to the formation of characters. According to Majid and Andayani (2013: 17) revealed that "the most important element in character building is the mind because the mind in which there are all programs formed from his life experience, is a pioneer of everything. Based on this expression shows that character formation there are several important things in it such as the mind and attitude of a person who is part of the character, even the attitude is considered as a reflection of the character of the person. Furthermore Fatchul (2011: 167) states that there are five elements that shape human character, namely Attitude, a reflection of one's own character, attitude also becomes a powerful tool for positive or negative actions because attitude is an action on the expression of a person's soul. Emotion, is a dynamic symptom in a situation that is felt by humans, in general there are four emotions that can be seen from the facial expressions that we often encounter namely fear, anger, sadness, and pleasure. Trust, is a form of knowledge, so that what we know makes us make choices because we believe what we take. Habit and will, is an aspect of behavior that is permanent in a person and is done repeatedly. Whereas the will is the action of one's efforts to achieve goals. Self-concept, is an introduction to oneself or self-esteem, this is very important in shaping character because someone will be easily harassed by others when we are weak in ourselves. Based on this expression shows that psychologically and sociologically humans have several elements related to the formation of character. Furthermore, Helmawati (2017: 20) states that the character building of a person who has the most influence is the environment both family environment, school environment and community environment. From some expert opinions above it can be concluded that
character formation is formed through various learning processes obtained from various places such as home, school and also the neighborhood.

Speaking of students' character is a whole there are behaviors and abilities that exist in students as a result of the carrying out of the social environment so as to determine the pattern of activity in achieving his goals. According to Taufik (2013: 231) elementary students are in concrete operational development. Children think on the basis of real / concrete experience, have not been able to think like imagining how photosynthesis or the osmosis process occurs. However, the ability to add, subtract, sort and classify has developed with simple multiplication and division. Women for a little abstract thinking always have to be preceded by concrete experience. Primary school age children are still in dire need of concrete objects to help develop their intellectual abilities. According to Nasution (2011: 124) the primary school age as a late childhood that lasted from the age of six years to approximately eleven or twelve years. This age is marked by the start of children entering elementary school, and the start of a new history that will change attitudes and behavior. From the explanation of the experts above, it can be concluded that the characteristics of students through traditional game learning are basically formed through a long learning process in the education world.

Children must be directed when playing, so they are not just playing but also learning. Thus we must package children's learning with game methods so that children feel happy and excited when learning. According to Soepandi, Skar and Kawan-kawan (1986: 15), the game is an act to entertain the heart, whether it is using the tool or not using the tool. Whereas what is meant traditionally is all that is said or passed down from generation to generation from parents or ancestors. So traditional games are all good deeds using tools or not, which are inherited from generation to generation, as a means of entertainment or to please the heart (Misbach, 2006: 6). Traditional games are nothing but activities governed by a game regulation which is inherited from previous generations by humans (children) with the aim of getting fun (Misbach, 2006: 5). From the understanding of traditional learning methods and games above, it can be concluded that the traditional game method is an operational procedure that is used to convey the subject matter to students, by packing the learning process with game activities that are born from a particular cultural heritage, so that the learning objectives can be achieved well.

The mouse cat game is this game called the mouse cat because the players are likened to cats and mice. Cats are rat eaters, so here the cat will try to chase mice. This game is played outdoors or home page. Actually this game can be done by children with an unlimited duration of time, until they feel tired. However, if we are included in the learning process, to be more effective and avoid children from getting bored the game can be done with a duration of about 15-30 minutes. This game is usually done by children aged around 6 to 12 years. There are no special equipment prepared for this game. Before the game starts, first, who is the rat, can it be hompiah. If you get one person as a cat, then the rest becomes a rat. The rats formed a circle by holding hands tightly, one mouse was in a circle, and the cat was in a circle, and I was outside the circle. Cats must try to catch mice by breaking through the circle of couplings with mouse rescuers trying to protect mice. If the cat feels unable to break through the circle at one point because it is too strong, the cat can choose another place. If the cat manages to break into the circle, the mice are given the opportunity to save themselves by being given a way out. If the cat manages to get out of the circle, the mouse is given the opportunity to enter the circle. When the mouse is outside or inside the circle keep trying to stay away from the cat. The mouse that successfully touched the cat was declared dead and he acted as a rat. The one who plays the role of a mouse in a circle can alternate. If the cat manages to catch a mouse, the participant who becomes the rat and his team get a sentence.
From the above explanation it can be concluded that traditional games that are quite diverse need to be explored and developed because they contain values such as honesty, sportsmanship, persistence, and mutual cooperation. With traditional games, children can practice concentration, knowledge, attitudes, skills and dexterity that are purely carried out by the human brain and body. In addition, traditional games can also develop aspects of moral development, religious values, social, language and motor functions.

2 Research methods

The research uses descriptive method, which is to describe in depth with what it is objectively according to the data collected. The data comes from observations, interviews, field notes, photographs and other official documents.

3 Research result

Based on the results of observations, interviews and documentation that the researchers conducted in the field, the traditional game of mouse cats in the primary school of Periuk 2 in Tangerang City in grade 2 went well. Even the sports that are in this school are in accordance with the predetermined lesson schedule. Exercise time is carried out according to the schedule. The student is given a sanction, in the form of a warning. If there is still something like that then the sanctions continue. If anyone quarrels I will separate, then I bring students who make the problem in front, then there will be no more noise.

Adapted to the indicators in the book, THEME, if you already know the indikator, that's why the game that approaches the indicator, for example, students are asked to run, I apply it to a game that has a run like a mouse cat. It is more important for traditional games because besides giving knowledge to children that we have traditional games that we have to preserve. It has a very big influence because in traditional games we can teach about gross motor skills, which are about agility, activity, speed and providing creativity to children, as well as increasing self-confidence. The inhibiting factor is from the student himself, when the student's sport is complacent by playing or chatting with his friends, or difficult to line up. So the time for sports is very briefly used up to regulate students so that sports learning is not optimal. How to overcome it by making games for students. So, before they were in the line there was a game first whether it was a game related to the sports movement. The students were more interested in music or with the music movements that students had played upwards or did not want to leave the classroom because hearing music might be different as they left the page to follow sports learning. The supporting factors are in the form of an environment and a wide and adequate field. The inhibiting factors are from the students themselves, when they are playing for a while sometimes the students fall asleep playing or chatting with their friends. So the time for sports is very short-lived to regulate students so that sports learning is not optimal.

Students can have a character, meaning little by little the character can change for the better. I always encourage students in the sense that even the slightest progress I consider to be an achievement, the mistake I consider to be nonexistent. When students are wrong in doing sports movements I correct. As a teacher, don't ever assume that a mistake made by a student is a fatal mistake. When students make small mistakes don't be exaggerated. Good correction,
give rewards, whether it's enthusiasm or praise for the progress of him. The goal is that the body is healthy, secondly to preserve culture, because the name of the traditional game is truly original culture from Indonesia.

For the psychic, I have also applied it to students in the form of knowledge, attitudes, characters, what can be done or not. The way is by giving guidance to students by telling the story first. When students look tired, I will give time for a short break. Then I will tell you about directions that can make them return to study well.

Religious, responsibility, social care, patriotism, hard work, discipline, honesty, democracy, curiosity. The constraints of students are not too many, there are only a few. For the application of the discipline itself, thank God has reached 80% to students. It is very important because in traditional games it contains the personality character of children, for example in the formation of existing religious characters so that in sports learning before the game takes place we must give greetings and so on, teach moral good or bad (behave well and politely), choose and channel children's creativity, giving children responsibility, teaching children about empathy, love and compassion, teaching the principle of good lead with understanding, teaching behavior about helping to help and care for others, teaching children to explore. I always get students to say hello when starting and ending sports learning. One of them should never be lazy when we are still given a complete, healthy body member so we must be grateful, we are still given time to exercise, there are still many people whose terms do not have time or do not have time to exercise, want to exercise but not biased. I always explain to children if they are given time to exercise do not use them for joking. I used to give sanctions in the form of reprimands. For example, if the student is not disciplined then I will instruct the student to move forward as if pinning the warming movement in front. Students are able to obey the rules with a sense of responsibility when doing sports rat mouse learning. Of course when the learning takes place students always help each other friends if their friends feel they don't understand. Of course they all always show their concern for their friends. The students I saw for SDN Periuk 2 in Tangerang City were very enthusiastic about their students. If there is one student who arrives late following sports learning, he will be given a non-severe sanction such as leading a warm up in front. But for students the sanctions have felt quite heavy, because the elementary students are still embarrassed to come forward to be sanctioned. If you make students discipline for school a little difficult because we have to really continue, must be really patient in educating students. Examples of small things from ourselves must be able to exemplify as well. In learning this time students play according to existing rules and students admit their own mistakes. In sports learning students do not differentiate between each other and are friendly towards their peers. Very enthusiastic because they rarely do these traditional games.

Basically, in sports activities with traditional games, mouse cats do not encounter obstacles because in the elementary school of Negeri Periuk 2, Tangerang City, which is the person in charge or sports teacher, is very capable in their fields so that they understand the steps of the game.

The following is a traditional way of playing mouse cats based on field observations in the preparation stage, all players pray before the game starts. Then later in the implementation phase all players do hompimpah, then two children at the end of the hompimpah do faint to become cats and mice. After completing the hompimpah or getting a player who plays a mouse and a cat all players join hands to make a cage (circle) except cats and mice.

Mice place themselves in the cage while the cat is outside, then at the third count, the cat starts looking for a strategy to catch mice by breaking into the cage. Mice try to avoid looking for a strategy so they don't get caught by cats and the cage players try to block the road so the
cat can't enter the cage to catch mice. Instead the cage player frees the mouse to enter and leave the cage, the way the cage player keeps the mouse by squatting if the cat tries to pass under the arm and stand up if the cat tries to jump over the arm.

The game ends if the mouse has been caught and may switch players, players number 9 to 20 children. This game can be done by boys and girls the more players the more lively. From the results of the description of the observations and interviews above, the researcher found the character values that were internalized in the traditional mouse rat game, namely honest values, confidence values, and creative values.

4 Discussion

Based on the description of the above research in the cat mouse game integrated character values are religious values, curiosity values, honest values, values of responsibility, value of hard work, value of social care, democracy, discipline and love of the homeland. Regarding the values of characters integrated in cat mouse games, it should be understood that the development of individual characters includes four components, namely cognitive, affective, willingness and behavior. The cognitive component includes knowledge of good and bad, with a rational basis that will process creatively as a material for moral decisions. Furthermore, the stored knowledge will influence what values will be embedded in the affective component, to produce moral or ethical. These two components will then influence the component of willingness in the form of commitment to bring good and bad behavior. The basis of this commitment is based on knowledge to know the value of what is learned based on the knowledge that has been stored previously. The three components affect the last component, namely, overt behavior surfaces. Overt behavior has two aspects, namely personal virtues and social virtues, which include personal virtues are courage, discipline while social virtues are polite, trustworthy, have compassion for others (social care). If this continues to take place continuously, a habit that will become a permanent character will form. Based on the description above, it can be concluded that the traditional mouse mouse game is a play activity that does not use tools and involves many players, and can be done to fill empty time as a means of entertainment or to please the heart.

Based on the results of the research and discussion of the formulation of the problems described above, the researcher can conclude that in traditional games mouse cats internalized nine character values namely religious values, curiosity values, honest values, values of responsibility, value of hard work, value of social care, discipline, democracy and patriotism. The formation of a child's character can also be influenced by traditional regional games. Where child development can be considered by parents when children are playing. Children are trained to be able to accept defeat in games, learn honestly, obey rules, learn to work together in play groups, learn responsibility, and so on. To find out whether traditional games have an effect on the character building of children, the author conducted an interview with a teacher in the sports field at the Periuk 2 state elementary school in Tangerang City, according to the sports teacher at the school, their students' growth and development.
References

Ethnic Malay Knowledge System against Reproductive Health of Pregnant Women in Paluh Sibaji Pantai Labu Deli Serdang

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Abstract. This paper seeks to explore the system of local knowledge of ethnic Malay communities in the village of Paluh Sibaji Pantai Labu Deli Serdang on reproductive health for pregnant women, such as parenting care for pregnancy, child birth and after child birth. Data was collected through in-depth interviews with a number of informants, consisting of pregnant women or those who had given birth, a number of community leaders, community members who were considered to know about the culture of the local community. The data was analyzed qualitative with the ethnography approach. You still has local knowledge of reproductive health for pregnant women, such as eating food like salted fish, squid, a number of fruits such as pineapple. Pregnant women may not leave the house in the afternoon before sunset due to the belief of a disturbing spirit. The purpose of abstinence is to avoid difficulties during childbirth and also for the safety of the baby to be born. Traditional birth attendants still play a large role as birth attendants. Health workers also have a lot to help in the delivery process in the Paluh Sibaji Pantai Labu Deli Serdang.

Keywords: Knowledge system, pregnancy abstinence, reproductive health, ethnic Malay.

1 Introduction

Community life everywhere is never separated from culture, because culture exists because of its supportive community. Culture has elements, one of which is a knowledge system. One human effort to maintain and develop its culture is its ability to develop a knowledge system. Mitchell (2000) argues that local knowledge systems are rooted in local or traditional knowledge and management systems. Although in principle the objectives to be achieved are the same. Through the existing knowledge system, humans are able to adapt and adapt themselves to the surrounding environment. Every community has a system of knowledge about nature, about all the plants, animals, objects and people around them that come from their experiences, as well as the legacy of knowledge passed down from generation to generation. Thus each community has its own uniqueness that distinguishes its group from other community groups.

In achieving the prosperity of life, relativity people are loaded with a background of life and life views that are reflected in all the habits, values, traditions and customs of the community. The application and application of this view of life and life are realized in forms in the form of values, norms, ethics, beliefs, customary law, found in the habits of the
community. One important aspect of culture is the practice of medicine which includes the practice of belief rituals. Every community must have a traditional knowledge system in maintaining reproductive health.

Cultural wealth from various ethnic groups scattered throughout Indonesia has colored various efforts in the health sector. Realized or not realized, trust factors and cultural conceptions including traditional knowledge underlie people's attitudes and behavior in relation to pregnancy care. These beliefs and cultural conceptions sometimes have a positive or negative impact on the health of pregnant women.

For example, ethnic Malays in Paluh Sibaji have a local knowledge system for reproductive health of pregnant women. It is realized or not realized, the trust factors and cultural conceptions including traditional knowledge underlie the attitudes and behavior of the community in relation to reproductive health. Therefore, research on the health culture of ethnic Malays in an effort to improve health status is very important. The logical consequence must be realized that the diversity of cultures that exist in Indonesian territory, especially in Paluh Sibaji, requires careful understanding for each region with ethnicity in the region.

Specific understanding of culture, by exploring local wisdom can be used as a specific locally specific health effort strategy. Malay ethnic culture that is characteristic of life patterns, and which has become a hereditary tradition, has great potential to influence health both from a negative and a positive side. Understanding community health status based on culture is one of the efforts to improve the health status itself, especially the health status of mothers and children. In some parts of the culture that exist in certain communities also known as abstinence foods that are food or dishes that should not be eaten because of cultural reasons, such as during pregnancy or breastfeeding, and because there is a certain belief in food in its culture.

Until now there were still many rediscovered what the ancestors could do centuries ago, the challenging custom was taught from generation to generation which tended to be adhered to even though the individuals who carried it out might not understand or that would be rational from reasons against food concerned, and just because of adherence to local traditions. But there are also some changes that are caused by reasons of challenging food that is no longer suitable for the development of the times.

Objectively, each particular group of people, especially in the Malay ethnic group in the Pantai Labu Deli Serdang have different health perceptions (healthy concept). This is very much determined by the culture of the community concerned. Everyone who is disturbed by his health will find a way to heal himself from health problems or illnesses. It is increasingly recognized that culture cannot be ignored in influencing the health status of ethnic Malays. Likewise with Malays in Paluh Sibaji Pantai Labu, Deli Serdang they are still familiar with the knowledge system that is still adhered to and serves to maintain reproductive health for pregnant women. Maternal and child health problems are inseparable from socio-cultural and environmental factors within Malay ethnicity wherever they are. Factors of trust and cultural knowledge such as conceptions of various taboos, causal relationships between food and healthy conditions of sickness, habits, and knowledge about health, can have a positive or negative impact on the health of the ethnic Malay community Paluh Sibaji Pantai Labu.

This is a potential and interest of the author to get information that needs to be explored in the ethnic Malay Paluh Sibaji Pantai Labu Deli Serdang From the background above, the writer raised the title "Ethnic Malay Knowledge System Against Reproductive Health of Pregnant Women in Paluh Sibaji Pantai Labu Deli Serdang."
2 Methodology

The location of this research is Paluh Sibaji Pantai Labu Deli Serdang. This location was chosen because of several villages located in Pantai Labu Deli Serdang Subdistrict, Paluh Sibaji Pantai Labu Deli Serdang which is still very thick with the ethnic Malay community's knowledge system on maternal reproductive health. Besides the chosen location is also a location that is found by many ethnic Malays, this location is also the location that is most easily taken by researchers.

The knowledge system of the ethnic Malay community at Paluh Sibaji Pantai Labu Deli Serdang towards the reproductive health of pregnant women in a study conducted with qualitative methods with an ethnographic approach. Therefore the methods commonly used are: participatory observation, in-depth interview, comparative, and holistic, the approach of the qualitative method of ethnographic approach taken is culture in depth description. To complete information or data obtained by the method through in-depth interviews. Data was collected through in-depth interviews with all informants consisting of pregnant women or mothers who had been pregnant and their families including their husbands and parents, village government officials, community leaders, health workers, traditional birth attendants and community members. Especially for pregnant women and mothers who have given birth. The selection of informants using snow ball technique starts with one of the people who can be used as the main source of information to provide recommendations to the villagers who can be used as the following informants who can provide more in-depth information about the object of research.

3 Results and discussion

Perceptions about pregnancy that are owned by the community differ and greatly determine people's behavior towards pregnancy. This perception of pregnancy is formed based on the beliefs and symbols that are owned by the community. Pregnancy experience in particular is a source of symbols about fertility, growth of babies in the womb, and maternal and child health. In the Malay ethnic community in the Paluh Sibaji Pantai Labu Deli Serdang, the type of food that was stabilized during pregnancy and after giving birth was quite a lot. Although not obeyed by all pregnant women, because they no longer feel strong traditional influences suppress the need for these restrictions to be obeyed. Interview results regarding knowledge of reproductive health of pregnant women: "If pregnant women here who do not abide by abstinence, children born are often affected by the disease, bunyu itih / Lingko, black bunyu, their children are born black, their bodies are not big, their heads and stomach are large, there are also robusta diseases of children so skinny "(interview with Ms. Lina) Similar to the results of interviews conducted with a community leader in the Paluh Sibaji Pantai Labu Deli Serdang, which stated that, prohibition against food, fruits, and behavior still exists today, and even if they are not adhered to have adverse effects on the health of the mother and child will be born:

"The belief in the knowledge of dietary restrictions and prohibitions on food, fruits and behavior, still exists today in this village, indeed this village is a village that is almost entirely ethnic Malays, a small part of other ethnic groups have also obeyed or followed restrictions on health. This pregnant mother, but even then it depends also on each person. If I myself really
obey this kind of belief, because I feel it has a bad impact if it is not obeyed, I believe that if there are children who are born abnormally, it is because they do not obey abstinence and prohibition that has always been entrenched. when his wife is pregnant, her husband shoots a bird, then his child is born disabled. According to the knowledge and trustworthiness of the ancestors, that was why it was forbidden to kill animals when the wife was pregnant. So, boy, do I know about the culture of abstinence from pregnant women that I know of, so if you are obeyed better, because there is no harm, even if it is not obeyed then there are a lot of harm”.

3.1 Abstinence from food

Problems that have a significant effect on pregnancy are nutritional problems. Nutritional problems in pregnant women in Indonesia cannot be separated from local cultural factors. This is because there are beliefs and restrictions on some foods. This is done because it is believed to get health for the mother and child to be born. Pregnant women believe that they should not eat salted fish which they think can increase blood pressure, as well as abstinence from eating feared squid which can cause the placenta or sticky placenta. Based on the results of the interview with a mother: "Pregnant people are forbidden from eating fish that have been dried because of pressure pain, there are also restrictions on eating squid because they stick to later, sometimes we want to eat it, but we think of a child in this stomach, so the birth will be healthy, so I myself when I was pregnant, all I thought about was, sometimes I also thought that if everything was backed up, my fear was that my child and I would be malnourished too, but I was more afraid of the risk of violating restrictions - this is the deck "(interview with pregnant women).

3.2 Abstinence from behavior

In addition to abstinence in certain forms of food, there are also a number of restrictions in the form of behavior. Abstinence from these behaviors is mainly related to the belief that maternal behavior during pregnancy will affect the safety and perfection of the baby being conceived. A pregnant woman should not wrap a towel around her neck because it will cause the baby to be born with the placenta wrapped around it, as revealed by one mother, There are a lot of prohibitions - actually the deck is broken, but that's how it is taught, it suddenly hurts to be obeyed, because this is the teaching that was passed down from ancestors from the past, and until now it has been used, which I know for example which is not allowed wrapped around a towel on the neck, then the child can wrap around the umbilical cord "(in-depth interview with Miss Lina). Another abstinence is that pregnant women should not sleep using bolsters because it will cause the baby to be born with a big head, and should not sleep with a transverse position because it will cause the baby to be born breech. This was revealed through the statement of pregnant women supported by the opinions of community leaders.

"You can't use bolsters, your child will have the same head if you sleep, you can't breech with your husband and you are afraid that your child will be breech too" (in-depth interviews with community leaders). ) "there are restrictions, you can't sit near the door" (interview Miss Itet) . There is also a ban on afternoon baths above five o'clock in the afternoon because it will cause the baby to be born suffering from influenza, as one mother revealed, "You can't take a shower late past 5 o'clock, later you can runny children when born" (DKT with pregnant women).
3.3 Prohibition of pregnant women husband

Father also has prohibited abstinence that needs to be obeyed even though not as much as the ban on pregnant women. Father when returning home at night may not continue to enter the house, but need to pause outside the house. The goal is to confuse the ghost that follows. But in terms of rational thought, the aim is to defuse fathers who might be hot and to restore their original state as calm and patient. This is important if the wife is pregnant or has small children. Abdullah Yusof (2006: 131) also states that fathers to babies in the womb should not do "hard" work such as slaughtering chickens, killing animals, especially snakes, monkeys and dogs. This situation may result in the animal being exposed to his child and the child's dihuatiri who will be born with a split lips, numbness or disability. This abstinence does not educate the public so that they do not incite the animals because this act illustrates the cruel and cruel human attitude. Especially to a father who should be an example to children. According to Mbah Lina, one of the elders (the elder) in the study area, explained, that: "Babies who are still in their mother's womb can already hear what is said by their parents. Therefore women who are pregnant should not speak carelessly such as denouncing, or angry with others. The bad nature of a person who is denounced or scolded will decrease to the baby he is carrying. Likewise, someone who is a prospective father of a baby who will be born should also not denounce or scold other people, the event will be the same, the nature of the person being reproved or scolded will decrease in the baby. Maybe a husband whose wife is carrying an accident does something that violates these restrictions. For this reason, you should immediately say the baby's God forbid, if you do not immediately say the bad characteristics of the person who is reproached or scolded will decrease to the baby to be born.

Health problems are complex problems that are influenced by various environmental, social, cultural, behavioral, genetic problems. Healthy terms contain a lot of cultural, social and medical understanding. In the past, from a medical point of view, health was closely related to illness and illness. In reality it is not that simple, health must be seen from various aspects. WHO looks healthy from various aspects. WHO defines a healthy notion as a perfect state of physical, spiritual, and social welfare. health experts, health anthropology is viewed as a biobudic discipline that pays attention to biological and socio-cultural aspects of human behavior, especially about the way of interaction between the two throughout the history of human life that affects health and disease. Disease itself is determined by culture: this is because disease is a social recognition that a person cannot carry out his normal role naturally. "Human ways of life and lifestyle are phenomena that can be associated with the emergence of various diseases, besides the results of various cultures can also cause disease People and traditional healers adhere to two causes of illness, namely: Naturalistic and Personalistic Naturalistic causes, namely someone suffering from illness due to environmental influences, food (wrong eating), life habits, imbalances in the body, including the belief of cold heat such as colds and congenital diseases.

4 Conclusions

Paluh Sibaji Pantai Labu Deli Serdang still believe in customs that challenge food and certain behaviors for pregnant and postpartum women. The cultural conception of abstinence is aimed at safeguarding the safety of mothers and babies, but the reasons given for symbolic restrictions. only health service providers and health workers need to understand the
symbolic meaning contained in each abstinence so that they can make changes in the right way. It is better if it is supported by respect and openness with the traditional birth attendants to encourage the emergence of changes in childbirth assistance behavior in accordance with health principles.
References

Curriculum Design for Coaching and Training Center of Archery in the UNIMED

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Abstract. Unimed is a place for sports lovers; many people do sports activities in the Unimed environments. Archery is one sport that is much loved by the people; a sport that needs this concentration becomes a choice of people in the Unimed environment. Although this sport is not too easy to play, certainly there are many ways that can be done, especially making “Archery Curriculum”. Sports coaching cannot be separated from how the coaching is done, so that the goal can be achieved optimally. A reflection of how coaching can be done with a good curriculum, certainly it will produce a good generation. Training center of archery is a place to develop them so that they grow thoroughly. This curriculum design was designed to accommodate people's desire to become athletes, extracurricular for school-age children up to college, coach / teacher and match management in archery sports. In the curriculum, it has been determined how the rules are at the beginner level, advanced level, and expert level. The curriculum sets up how the conditions of the rising levels. This is a curriculum design for coaching and training center of archery in the Unimed environment.

Keywords: Curriculum, Coaching Center, Archery Training.

1 Introduction

The definition of curriculum, which is developed and adhered to by educational experts, is diverse and not just one type. In general, there are two streams that define the curriculum, namely:

a. The curriculum is seen as micro. This view represents those who think that what is meant by the curriculum is the material of a subject that must be conveyed to students. They look at the micro curriculum. Examples of curriculum definitions that belong to this group are: The curriculum comes from the Greek word "curere" which means a place of competition, direction of travel, or a teaching in college (Brotosuroyo, Sunardi & Furqon, 1992: The curriculum comes from the Latin "curriculum" which means a running course, or race course, especially a chariot race course. The curriculum also comes from the French "courier" meaning "to run" or run. The curriculum is then interpreted as subjects that must be taken to achieve a degree or diploma (Nasution, 1993: 9).

b. The curriculum is viewed in a macro or something that has a wide scope. The curriculum is defined as the entire experience set in school life, from subjects in the classroom to extracurricular activities. Some examples of definitions that represent groups are: Gallen & Alexander (in Soetopo & Soemanto, 1993: 13) states that the curriculum is sum is the
Suharsimi Arikunto (1994: 1) states that the curriculum is the entire learning experience developed and prepared for students to cope with life situations with the guidance of educators. The curriculum is a set of plans and arrangements regarding the purpose, content, and learning materials as well as the methods used as guidelines for implementation learning activities to achieve certain educational goals (Article 1 Item 19 of Law No. 20 of 2003 concerning the National Education System). Paying attention to the above definition of curriculum, what is meant by the curriculum is the experiences and activities planned by the school with the aim of modifying student behavior towards expected behavior.

Archery is a sport that uses bows and arrows, in this game each player must be able to shoot bows and arrows about the target that has been determined (Husni, Hakim and Gayo, 1990: 294)

From the definition above can be concluded in this study what is meant by archery curriculum is the experiences and activities designed by the Unimed Archery Coaching and Training Center with the aim of being able to produce reliable athletes, produce Trainers, Referees, and Archery Competition Administrators. from the exercises and programs that are applied to participants and develop archery sports.

In addition to producing athletes who are reliable, Unimed archery training and training centers also provide extracurricular activities for Unimed students, non-Unimed students, kindergarten, elementary, junior high, high school, general, and Sharia.

2 Curriculum components

According to Soetopo & Soemanto (1993: 26-36) if the curriculum is seen as a system, the components that become subsystems are (1) goals, (2) material, (3) organization & strategy, (4) means, and (5) evaluation. The component component of the curriculum is a whole and is reciprocally related. The details of each component are explained as follows:

2.1 Objective components

The object is the direction or target to be addressed by the education process. Therefore, each curriculum has a guideline target that will be achieved or addressed at the end of its implementation. The objective is a guide to evaluating work that has been completed.

The objectives of the Unimed Archery Training and Training Center curriculum are as follows:
(a) To produce reliable athletes who can compete at national and international levels
(b) Produce Trainers, Referees, Archery Race Administrators.

Become a place for students, students, and the general public who want to know and practice archery.

2.2 Material components

The next component that is part of the curriculum is material that consists of the content and structure of the program.
(a) Contents are materials / activities that must be given to participants within a certain period and at a certain level. Material content consists of:

1) Principal material contains program details submitted to participants so that the stated object can be achieved.
2) Teaching or training materials are sequences of subject matter delivery, from the first year to the following year. The sequences are usually based on the character of the material, the ability / interest of the participants.
3) Source of material is the resources used as a source of a number of learning experiences needed by participants. Sources of learning materials can come from people, places and printed and electronic items.
4) Annual Exercise Program.

(b) Program Structure

Based on the training level, curriculum material has the following structure.

1) Achievement Athlete Program
2) Program for Trainers, Referees, Archery Race Administrators
3) Unimed Student Extracurricular
4) Extracurricular Non-Unimed Students
5) Extracurricular kindergarten, elementary, middle school, high school
6) General
7) Sharia.

2.3 Components of organization and strategy

In general, experts say that in accordance with existing studies in a field, the curriculum must be organized based on the logical development of the material delivered. Each participant's learning experience must be developed based on the experience that has been completed by the participants, and must develop the skills needed for the next learning experience.

According to Soemanto and Soetopo (1993: 35) the vertical structure of a curriculum shows the preparation of a curriculum based on (1) a class system, the increase in class is held every year simultaneously, (2) a classless program, transfer to another program level every time without pay attention to others, (3) a combination of (1) and (2).

Strategy is a plan that will be used to run a job. The curriculum strategy included is a variety of activities starting with planning to evaluating the curriculum. Thus the curriculum strategy includes: (1) The design of the exercise or learning to be carried out, (2) The method of training or learning that will be implemented and carried out throughout the process, (3) the organization of the training group to be implemented, (4) the form of communication that will done, and (5) how to evaluate the set to find out how much the success level of a training process is.

2.4 Facility components

According to Soemanto and Soetopo (1993: 37) the components of the facilities in the curriculum consist of: (a) personal facilities consisting of: teachers, educators who are not teaching, such as counselors, administrative staff, and special staff or advisors, (b) material facilities which includes: instructional materials, physical facilities / buildings / fields, and
operational costs, and (c) leadership facilities that provide support and safeguards, guidance on program implementation.

In this research, the facility components that are in line with those presented by Soemanto and Soetopo are: (a) Personal facilities consisting of trainers, administration, (b) material facilities include: training program, Unimed archery field and UKM center as administrative buildings, and (c) means of leadership, namely the head of the Unimed archery coaching and training center.

2.5 Evaluation components

Evaluation is an important part of the curriculum. The results of the evaluation of the curriculum can be used as improvement material for the next planning period. Evaluation should be done continuously. Based on that, evaluation of the curriculum that is done will involve two important things, namely:

(a) Evaluation of curriculum results or products. Evaluation of results aims to assess the extent of the success of the curriculum in delivering students to achieve their intended goals.

(b) Evaluation of the curriculum process. Evaluation of the curriculum process intends to assess whether the curriculum implementation process takes place as stated. Thus, the objectives set will be monitored for their level of achievement.
References

Level of Ability to Use Weight Training Tools for Students of Department of Sports Sciences Universitas Negeri Medan

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Abstract. The purpose of this study was to determine the ability to use weight training tools in the form of shoulder presses, bench presses, leg presses, chest presses, and pull downs for students of sports study programs. This research is a qualitative descriptive study using survey methods. The population was fifth semester sports students who had graduated in taking courses in anatomy, physiology, kinesiology, and biomechanics. Based on this, a sample of nineteen people was obtained. The results showed that the ability of students in the use of weight training equipment with the type of shoulder press training, bench press, leg press training, chest press exercises, pull down exercises have an average score of two with category is “Good”.

Keywords: Ability, weight training tools.

1 Introduction

The Sport Science Study Program organizes academic education with the aim of producing graduates in the field of sports with qualifications nationalist, honest, tough, responsible and responsive education demands for sports development. The graduates of the Sport Science Study Program have competency as a skilled worker in the management of Sports Health and Fitness, Sports Recreation, Community Sports, Disabled Sports (adaptive sports), Sports Achievement, and Amateur Sports.

Sport is a necessity for everyone. The need for availability fitness center is increasingly mushrooming especially in urban areas. This is also comparable to the increasing need for personal trainers. Along with the level of personal need trainers who are increasing in higher education must also consider competencies support graduates so that they can have high competitiveness in the world of work. Strengthening this competence is carried out before students enter the world of internship in the company. So that students are ready when entering the sports industry.

One of the demands of being a Personal Trainer is having the good and right ability in using fitness equipment. Basically there are two types of equipment you will find in a fitness center, among others, is Lifting Charges and Machines. Weight lifting serves to train muscles while the machine functions to train cardio.

Before having the ability to use these fitness equipment then students must be provided with Sports Biomechanics. Biomechanics is science discuss the mechanical aspects of human body movements. Biomechanics is combination of mechanical science, anthropometry and the
basis of medical science. On Biomechanics approaches there are several definitions of
biomechanics that we can use. According to Hatze (1974), Biomechanics is the study of the
structure and function of biological systems with using knowledge and mechanical methods.

Meanwhile, according to James (1985), Biomechanics is the study of style forces that
occur in biological structures and effects produced by certain forces. So can be concluded,
Biomechanics is a science that uses the laws of physics and the concept of engineering to
study the movements experienced by several body segments and the forces that occur in this
part of the body during normal activity.

The purpose of studying biomechanics in the application of sports science is: 1) Knowing
the basic scientific concepts that are applied in the form of human motion; 2) Understand form
/ model of basic motion in sports so that it can develop it with good; 3) Able to understand the
development of basic movements; 4) Able to apply a form which is in accordance with a
person's physical characteristics in exercising, properly and correctly. As a student of the Sport
Science Study Program, must have knowledge regarding techniques, types of exercises, the
benefits of tools, and how to do fitness equipment properly.

The use of fitness equipment such as improper load tools can result injury to muscles,
bones, nerves, respiratory system is disrupted, and results of training that are not appropriate
with training objectives. In order for the exercise program to run according to purpose,
training must be programmed according to the rules of practice that are correct and in
accordance with the concept, measure, principle practice, and so on. Besides that the way to
do weight training is wrong to affect the results of training.

Based on the foregoing, it is necessary to examine how the motion technique of
sports science students in using weight training tools.

2 Methods

2.1 Subjects and procedures

Number of population in this study were students of sport science program study numbering
231people. The sampling technique in this study uses techniques purposive sampling is
sampling based on a particular consideration made by the researcher himself based on research
needs without eliminating the characteristics and the characteristics of the population that have
been known before (Arikunto, 2010). The sample criteria these are: 1) Students who have
graduated in the biomechanics of sports courses; 2) 5th semester students; 3) Willing to be a
sample when collecting data. Based on these criteria then obtained the number of samples in
the study amounted to 17 people. According to Nursalam (2013) the research design is very
important in research, it allows maximum control of several factors that can affect the
accuracy of a result

At this stage, the researcher must consider several decisions regarding with a method
that will be used to answer research questions and must be carefully plan data collection. The
researcher must be aware that each method is used has an impact on the quality, unity and
interpretation of an outcome. Therefore, researchers must be able to evaluate the decision to
determine how much the truth that will be presented in the results of the study (Nursalam,
2013). The research design used is descriptive research through this method researchers want
to compile a manual procedure for using fitness equipment that will be used by students of the
Sport Science Study Program through the course of Sports Biomechanics.
2.2 Statistical analysis

Data collection is done by distributing an observation sheet about how to do fitness equipment correctly. Data is obtained from primary data, namely data obtained directly from object of research by researchers, so that answers to questions are provided (Riwidikdo, 2009). During the data collection process, researchers focus on providing subject, pay attention to the principles of validity and reliability, and solve problems that occur so that the data is collected according to the plan that has been set. Data analysis techniques in this study used descriptive analysis techniques. On when observing the technical movements carried out by the sample, the researcher is assisted by experts in analyzing data. These experts participate directly with researchers at the time of data collection so that data becomes valid. Data were analyzed then added and percentage. In this study, to facilitate the description of research results

Four criteria were made which included Very Good (SB) with a value of 4, Good (B) with a value of 3, Not Good (TB) with a value of 2, and Very Bad (STB) with a value of 1. Basic determination this category is to maintain the level of consistency in this study, as well as make it easier in determining the interval, so that the analysis becomes easier. The data obtained is then analyzed and expressed in the form of percentages, searched with the following formula:

\[
P = \frac{\sum x}{N} \times 100\%
\]

Before being disseminated, the data obtained were analyzed using statistics Descriptions are then converted into qualitative data to help researchers in draw conclusions about the motion technique of using weight training equipment.

3 Result and discussion

Based on the results of the study, it was obtained data about the ability of students in using weight training tools can be seen in the table below:

<table>
<thead>
<tr>
<th>No</th>
<th>Category</th>
<th>Shoulder Press</th>
<th>Leg Press</th>
<th>Bench Press</th>
<th>Pull Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very Good</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Good</td>
<td>15</td>
<td>88</td>
<td>4</td>
<td>23</td>
</tr>
<tr>
<td>3</td>
<td>Bad</td>
<td>2</td>
<td>12</td>
<td>13</td>
<td>77 2</td>
</tr>
<tr>
<td>4</td>
<td>Very Bad</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sum</td>
<td></td>
<td>17</td>
<td>100</td>
<td>17</td>
<td>100 17</td>
</tr>
</tbody>
</table>

Tables 1. Distribution of Frequency of Student Ability in Using Weight Training Tools.
The data above shows that the ability of students using shoulder press tool by 88% is in good category, ability using Leg press tools by 77% is in the bad category, the ability of students using the bench press tools by 88% is in the good category and the ability of students using the pull down tools by 70% is in the good category.

Tables 2. Data Assessment of Motion of Techniques Judging from the Type of Exercise.

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Score</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder Press</td>
<td>2.88</td>
<td>Good</td>
</tr>
<tr>
<td>Leg Press</td>
<td>2.23</td>
<td>Bad</td>
</tr>
<tr>
<td>Bench Press</td>
<td>2.88</td>
<td>Good</td>
</tr>
<tr>
<td>Pull Down</td>
<td>2.76</td>
<td>Good</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>2.68</strong></td>
<td><strong>Good</strong></td>
</tr>
</tbody>
</table>

Table 2 above shows the average value of the motion assessment seen from the overall type of exercise is 2.68 with a good category.

The average value obtained from the results of this study is the ability of students in using weight training tools is in good category. According to Notoatmodjo (2003) knowledge is the result of "knowing" and this happens after people do it sensing of a particular object. Knowledge is also obtained from education, self-experience and experience of others, mass media and the environment. The knowledge a person has will determine how action takes place that person. According to Sunaryo (2004) states that behavior is realized by knowledge will be more lasting than behavior that is not realized by knowledge. Students of the Sport Science Study Program who were sampled in this study have follow and pass courses in anatomy, physiology, kinesiology and biomechanics. Thus they can use weight training tools properly.

Based on the results obtained, shows the use of the Leg Press training tool is an average score. The average obtained is 2.23 with a bad category. This is caused by the results of observations made were students who were sampled pushing the pedals until both legs are straight, not straight forward, and do not regulate the breath push. The wrong pushing the pedals can be seen on picture below. The use of overloading loads will stimulate the adjustment of physiology in the body that encourages increased muscle work. According kravitz (2001: 20) to increase the training load by increasing the intensity of the duration or frequency of a level of training that is commonly done. If someone uses this leg press tool with excessive load it will cause injury. It was stated in more detail by Harsono (1988: 187-195) that the principles of weight training must be fulfilled, so that the training program guarantees added power step by step, and reduces the risk of injury to muscle fibers.
Leg press training is a weight training using a leg press machine, this exercise aims to increase the strength of the leg muscles (groves, 1997). By giving weight training using leg press machine, there is an increase in leg muscle strength with hypertrophy in the muscles, an increase in muscle tone and an increase in recruitment in the motor unit which will affect the contraction in the muscles.

In addition, mistakes made at the Bench Press training position, one of which is the position of the leg that is not bent when lying down. For more details can be seen on Figure 2.

In addition to the legs, the body part that is often prone to injury when doing bench press is the waist. This is due to when lifting the load up to the position of the waist in a swaying state. This will cause serious injury to the joint. According to Ade Rai (2008: 49) is a training movement similar to the bench press or incline press, only done on the decline bench which has a certain slope (around 20-30 degrees) down. This exercise concentrates the pressure on the lower chest muscles so that the chest muscles can become thicker and look full. According to Ade Rai (2008: 48) this exercise is the best exercise for chest muscles. Hold the handle slightly wider than the shoulder width. Don't be too wide because it will overload the joints too heavy. Lower the load slowly so that it touches the chest. When pushing the load up, make a slight angle, do not push it straight up, this causes the deltoid muscles to play a lot.

The importance of a person's ability to use weight training tools must be in line with his knowledge of basic principles in fitness training. According to Djoko Pekik (2000: 19) to achieve the goal of optimal exercise or fitness, it is necessary to know the basic principles in fitness training which have a very important role in physiological and psychological aspects.

To further enhance the ability of students in sports science study programs, it is then recommended to create a procedure manual on the instructions for using good and correct weight training tools. Italics can be used for emphasis and bold typeset should be avoided.
4 Conclusion

The average value of students' ability to use weight training tools is amounting to 2.68 and in good category.

Acknowledgements. The research was supported by DIPA of UNIMED.
References

Developments Of Self-Learning Module Basic Swimming College Students Of Sbmptn With Smnptn Pathway Pko Fik Unimed

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Abstract. Learning is an effort to teach students to develop new knowledge and improve the quality of learning by applying independent learning to achieve the expected goals. To be able to produce quality learning has been done various ways through increasing human resources as educators, improving learning facilities and infrastructure, creating a good learning climate. The study explains how the implementation of independent learning conducted by FIK UNIMED students refers to the implementation of the KKNI curriculum that is running by comparing the results between students of SNPTN and SBMPTN to the learning outcomes of basic swimming courses. This study aims to produce an independent learning module conducted on the basic swimming courses conducted by students of the SNMPTN with the students of PKO SBMPTN FIK UNIMED. This research used research and development approach by producing products in the form of teaching materials based on competency standards through analysis of user needs. The results of this analysis underlie curriculum design to become the basis for compiling learning concepts in the form of self learning modules between SNMPTN students and SBMPTN. The results of the study produced independent learning modules in basic swimming courses and assessed the results of their application between students of SNMPTN and SBMPTN PKO FIK UNIMED.

Keywords: Self Learning SNMPTN with SBMPTN.

1 Introduction

In the 2016/2017 school year, UNIMED as one of the state university in Indonesia has implemented the IQF curriculum (Indonesian National Qualification Curriculum) is a competency qualification framework that can pair, equalize, and integrate between education and job training as well as work experience in order granting recognition of work competencies in accordance with the structure of work in various sectors. The design of the lecture standard of this IQF curriculum will be a reference for all lecturers in designing, implementing and evaluating the lecture processes carried out in the class. Advanced campuses must have lecture standards, although given the authority of the lecturers to arrange according to the characteristics of their respective study. If there are already standards for planning, implementing, and evaluating, the lecturer can only develop it to be carried out in lectures.

Creation of graduates who can meet the needs of the community is determined by various factors, including educator competence, students' abilities, facilities, curriculum,
learning process, tools, college management, work environment and industrial cooperation, etc.. In this context prospective student admissions and curriculum play an important role.

In the implementation of the selection of new student admissions carried out by UNIMED as one of the state university conducted through the SNMPTN (Seleksi Nasional Masuk Perguruan Tinggi Negeri) and SBMPTN (Seleksi Bersama Masuk Perguruan Tinggi Nasional) began in 2008.

In the implementation of the Kurikulum Kualifikasi Nasional Indonesia (KKNI) conducted at FIK UNIMED, each department (study program) is required to take part in various sports practice courses, one of which is a basic and compulsory course that is swimming that requires success in mastering skills and knowledge in this matter cognitive abilities and sports motor skills.

The success of students in participating in the basic swimming course which is one of the branches of sports requires physical abilities that are influenced by past motion experience that is owned by each student of prospective students. In addition to the success of student learning is also determined by the interest in learning, intelligence, motivation and educational background that followed (S. Safarinah, 1986).

Self directed learning emphasizes more on students to be able to understand and understand what each student will do in the implementation of learning by referring to the modules that will be developed in this study. Here will be seen whether there are differences in the ability to carry out self-learning on the subject matter of swimming courses given to students. Based on the acceptance of new students of the Faculty of Sports Education UNIMED, for students who are accepted through with Seleksi Nasional Masuk Perguruan Tinggi Negeri (SNMPTN) will they have good basic swimming learning outcomes, and whether Seleksi Bersama Masuk Perguruan Tinggi Nasional (SBMPTN) path will have good swimming learning outcomes, to get answers, research was conducted on the development of independent learning modules for basic swimming courses between students of the SNMPTN and the SBMPTN PKO FIK UNIMED.

2 Related research

Self directed learning can be interpreted as a process on eye, where individuals take the initiative with or without the help of others. Activities carried out by these individuals include diagnosing learning needs, formulating learning objectives, identifying learning resources, selecting and implementing learning strategies and assessing learning outcomes.

According to Knowles (1975), self direct learning is more emphasized on adults with the assumption that the more mature students are:

1. The concept of themself is increasingly changing from an attitude of dependence on educators to self-directing and mutual learning among them.
2. Increasingly their learning experiences also can be used as learning resources, while learning orientation changes from mastery of the material towards problem solving.
3. Learning readiness is increasingly felt to master tasks related to their role in life.
4. The time perspective is increasingly oriented towards the use of learning outcomes that can be immediately utilized in life.
5. More involvement is needed in planning, need diagnosis, determining learning objectives, and evaluating learning processes and outcomes.

Self directed learning is very important for one's development because:
1. People who take the initiative in learning more and better than people who depend on the educators.
2. This way of learning is in line with the natural process of soul development.
3. The emergence of new concepts or theories in education that emphasize the learning responsibilities of students.

The concept of self-directed learning basically emphasizes the creativity and initiative of students. However, in certain conditions, students can systematically ask for assistance / guidance to educators, where the role of educators is more pressing as a facilitator.

The factors that influence self-study readiness are:

1. Open to every learning opportunity, learning is basically not limited by time, place, or age. It can be said that learning is unlimited (no limit to learn), every time someone feels that the knowledge and experience they have is no longer able to solve the problem so that it encourages them to continue learning.
2. Having a self-concept as an effective learning citizen, someone who has self-concept means always perceives positively about learning and always strives for good learning outcomes.
3. Initiate and feel free in learning, initiative is an urge that arises from a person without being influenced by others, someone who has the initiative to learn does not need to be stimulated to learn.
4. Having a love for learning, making learning as part of human life starts from the emergence of awareness, intimacy, and love of learning.
5. Creativity. Creativity can be seen in terms of results, processes, characteristics, and attitudes.

According to Supardi (1994), creativity is the ability of a person to give birth to something new, whether in the form of ideas or real work that is relatively different from what was before. Ability to use fundamental learning skills and solve problems. Have a future orientation. Someone who has an orientation in the future will see that the future is not something that contains uncertainty.

3 Method

Place and time of research

This research was carried out at the Faculty of Sports Education of UNIMED precisely to students of the Sport Coaching Education (PKO) study program. Research time is planned for the odd semester of the 2018 - 2019 learning year.

3.1 Research subject

To conduct a needs analysis, observations were made of 3 basic swimming lecturers in the UNIMED Faculty of Sport Education, plus 1 swimming expert and 2 physical and sports education teachers. PKO students 35 people.

3.2 Research methods

This study uses a research and development approach or development research. This study begins with an analysis of the needs of users as material for re-designing the curriculum.
Continued by gathering materials to compile teaching materials in the form of self learning modules.

3.3 Research procedure

This research was conducted to produce teaching material products in the form of independent learning modules for basic swimming courses. Activities carried out include the activities of preparing learning modules to establish needs analysis by collecting data from stakeholders, physical and sports education teachers, lecturers of basic swimming courses related to the curriculum (syllabus and RPS) used so far. Data was also collected from stakeholders, physical and sports education teachers, caregivers of basic swimming courses. The preparation of independent learning modules still takes into account the sequence and depth of the subject matter. The data that has been compiled is then presented in the seminar to produce teaching materials in the form of independent learning modules that are good and in accordance with the demands of competence. Furthermore, this material is carried out in the learning process in the odd semester of 2018-2019 learning year for students of SNMPTN and SNMPTN1.
References

Development Of A Variation Model Of Long-Jump Learning In Sport Coach Students In 2018

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Abstract. This study aims to develop a model of 2018 long jump training. Contributing knowledge and thoughts that can be used as a guiding guidance for lectures. Improve techniques in playing with different learning methods so that learning is not boring for students. The population in this study were 30 students of Sports Coaching Education. The model that has been made in advance is validated by 4 experts in the field of sports, namely 2 people are Long Jump trainers and 2 people are sports academics. The small group test involved 15 students and a large group test involving 30 FIK UNIMED PKO students. With the various models of learning development, it is also expected to provide good preparation for students as future educators. By giving a lot of models of learning model development in learning, it is expected that students can be applied when they become teaching staff, so that graduates from Sports Coaching Education can provide different colors when they are in the work environment, by mastering many learning models, PKO alumni teaching staff will be able to increase the learning interest of their future students.

Keywords: Development of Learning Models Long jump training, athletics.

1 Introduction

Athletics is the parent of all sports. However, along with the rapid growth of sports numbers in athletic games even very minimal demand by the general public and Unimed FIK students, especially PKO study programs. Athletic courses are learning that must be followed by all PKO students, but on the way, students who study this sport tend to be less than the other dominant game sports.

Long jump numbers are one of the lessons in athletics. The treatment that is often carried out by PKO students in following this learning is relatively mediocre. Simplicity in doing this long jump sometimes causes boredom and without challenges. This lack of variation in learning makes the level of saturation even higher in its implementation. In following student learning tends to be ordinary and only tries to make a leap in accordance with the techniques he mastered and pursue the results of leaps to the furthest in accordance with his abilities. Looking at this phenomenon, the researcher who is an athletic subject lecturer tries to increase the enthusiasm of student learning by giving six variations of training in increasing the willingness and ability of students in performing long jumps, so that the authors decide to conduct research on Long Jump Training Variations in PKO FIK Students UNIMED Year 2018.

AISTSSE 2018, October 18-19, Medan, Indonesia
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DOI 10.4108/eai.18-10-2018.2287440
2 Literature review

2.1 The nature of long jump sports

The history of the long jump has taken place since about 13 centuries ago. This long jump sport has been around since 708 AD when there was an Ancient Olympic race in Greece. The long jump was the only jump event that was contested at the Ancient Olympics. According to historical records, long jump sports were held by Sparta participants with a jump of 7.05 meters. In the beginning, all competitions held at the Ancient Olympics were intended as a form of war military training. The emergence of long jump sports is believed to train a warrior's dexterity in breaking through different obstacles, such as ravines or ditches. In ancient Greece, the method and technique of jumping in long jump sports was very different from the way and the current jumping technique. Leap in ancient times was made in the plural. In this event, the jumpers are only allowed to use a short run. In addition, jumpers are required to run while carrying a load in both hands, known as halteres with a weight ranging from 1 to 4.5 kg. Physical health, spirituality also has a high personality, discipline, and sportsmanship, which in turn will form a quality human being. In the long jump style jump is one of the most popular jumping numbers in the athletic sport and is most often contested in world class competitions, including the Olympics. The long jump is a movement that jumps upwards in an effort to bring the point of weight as long as possible in the air (floating in the air) which is carried out quickly and by means of a one-foot repulsion to reach the greatest distance. The goal and goal of the long jump is to reach as far as possible as far as a landing or jumping point.

Sports has an important role in human life. Through sports can be formed a distant human there is a variety of styles or posture when flying in the air. Soegito et al (1994: 143) argues that there are three ways in a floating attitude, namely, squat style (when floating in a squatting position), lenting style (when the body is floated), the way of walking in the air (when flying the legs are swung as if walking) in the air). The simplest long jump style to be taught to beginners such as elementary school students is the long jump using squat style. Squat style long jump techniques are also the simplest compared to other styles. According Engkos Kosasih (1985: 67) argues that the goal of a long jump is to reach a distance of leap as far as possible which has four elements in the movement, namely: prefix - repulsion - the attitude of the body in the air - the attitude of the body when falling or landing. Meanwhile, according to Yusuf Adisasmita (1992: 65) argues that these four elements explained by Engkos Kosasih (1985: 65) above are a unity, namely the unbroken long jump movement sequence. Aip Syarifuddin (1992: 93) In long jumps, there are several types of styles commonly used by jumping athletes, namely: squat style, hanging style or can be called lenting style and air way style. The difference in jumping force with one another, is marked by the state of the jumping body posture while floating in the air.

2.1.1 The nature of learning outcomes

According to Husdarta (2013: 2) Learning outcomes are interpreted as the results of the behavior change process as a result of the interaction between individuals and their environment. Behavior as a result of the interaction between individuals and their environment. Nana Sudjana (2009: 22) Suggests that learning outcomes are abilities that students have after they receive their learning experience. Someone is said to have succeeded
in learning if the person experiences behavioral changes in three aspects, namely aspects of knowledge, attitude and skills.

2.1.2 The nature of learning variations

One of the basic teaching abilities that must also be mastered truly by the trainer is the skill of making variations in learning activities. These skills play a role that is no less important than other teaching skills, for the coach's efforts in teaching athletes so that the learning objectives that have been set can be achieved well. Simaremare (2007: 23) the meaning of variation is defined as the difference in variation means changing the form so that it is different from the existing or ordinary. For example "A mother varies the food menu served for the family every day" imagine we would feel bored if we eat the same food every day. In everyday life if we see, feel the same or repetitive or repeated things and we will eliminate the boredom, we try to make changes in managing our own lives.

2.1.3 Variations in learning

One component of teaching and learning is variation in teaching including the skills to make variations that are useful to overcome the boredom or boredom experienced by students in the learning activities and processes and also to overcome the uncomfortable condition of the room, teacher performance is not enough to cool the hearts of students and material what is taught is less attractive. Variation in teaching is an activity of the teacher in the context of the process of interaction in teaching and learning which is shown to overcome students’ boredom so that, in teaching and learning situations, students always show perseverance, enthusiasm, and full participation.

3 Method

Research and development is a research that aims to produce products in the form of developing variations of long jump training. Sugiyono (2008: 407) development research method is a method of research to produce certain products, and test the effectiveness of the products mentioned.

3.1 Adhesives and research methods

The method used in this research is development research which includes: product development, testing the effectiveness of products that reach the desired goals. The end result of this research and development activity is to develop a variety of long jump exercises.

3.2 Data analysis techniques

In this development research data analysis techniques used are quantitative descriptive analysis techniques with percentages. Each validation instrument variable calculated by the number of percent is then averaged by another variable. Each validator will have a different value. The four validator values which consist of several variables on one model are averaged
and that is the reference whether the model is used or not. The formula for processing responses or evaluations from experts is calculated using a percentage formula, namely:

\[ P = \frac{\text{Amount of Value Obtained}}{\text{Total number}} \times 100\% \]  \hspace{1cm} (1)

**4. Result and discussion**

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**4.1 Needs analysis**

Based on observations made by researchers, it was found that 90% of the samples agreed with new variations in long jump learning.

**4.2 Product design**

The products of this study have been contained in videos and manuals for implementing long jump variations.

**4.3 Results of design validation**

After being revised by the long jump trainer and sports academics, the five variations offered are appropriate and feasible to be carried out the next stage.

**4.4 Result and small group testing phase**

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### Tables. 1. Percentage Analysis of Validation Results on the Model

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Information</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>80% - 100%</td>
<td>Valid</td>
<td>Used</td>
</tr>
<tr>
<td>60% - 79%</td>
<td>Valid enough</td>
<td>Used</td>
</tr>
<tr>
<td>50% - 59%</td>
<td>less valid</td>
<td>Replaced</td>
</tr>
<tr>
<td>&lt; 50%</td>
<td>Invalid</td>
<td>Replaced</td>
</tr>
</tbody>
</table>
4.5 Result and small group testing phase

Table 2. Result

<table>
<thead>
<tr>
<th>No</th>
<th>Question</th>
<th>Results (%)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Are variations on long jump training developed according to your expectations?</td>
<td>14 1 93,33 6,66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Will the development of variations in jumping exercises increase the interest in training / learning?</td>
<td>13 2 86,7 13,3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Are variations on long jump exercises easy to do?</td>
<td>13 2 86,7 13,3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Is the development of a variety of exciting long jump exercises that can be made in practice or learning?</td>
<td>15 0 100 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Whether developing a variety of long jump exercises can make it easier for you to master the long jump technique?</td>
<td>14 1 93,3 6,66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Can the development of long jump training improve the results of jumps?</td>
<td>12 3 80 20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5 Conclusion

This lack of variation in learning makes the level of saturation even higher in the implementation, so that a new variation of training is needed. With a variety of exercises, students / athletes are increasingly excited, motivated in a competitive atmosphere, and variations of the developed exercises are expected to change the culture of students / athletes from those who rely on physical abilities alone, with variations of the developed training can change the training culture that can balance the ability physical with the ability of the mind or reason.
References

Development of Volleyball Learning Media Based on E-Learning

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Abstract. This study aims at developing a Moodle-based e-learning system for teaching volleyball that will ease students and lecturers in Sport Science Faculty of UNIMED. The method employed in this study is research and development model. The population of this study is students of the Department of Sport Training & Education. From the population, sample is drawn purposively with an inclusion criteria for students who take the Development of Technique and Tactics of Volley Ball class in the 5th semester. The results showed that the development of e-learning applications in volleyball courses had reached the stage of media development, where in the development of this media a course description, lecture material, assessment and information column had been formed, so that from this development would be continued with product evaluation for see the effectiveness of the e-learning.

Keywords: Volleyball, E-Learning.

1 Introduction

Information and Communication Technology in the Learning Process is now a necessity, because with ICT it makes it easier for students to learn and obtain information from lecturers. Of course ICT can be one of the media in the learning process, in applying the media in this case e-learning must pay attention to the readiness of not only lecturers but also students. In order for students to learn smoothly and effectively, creativity is needed for a lecturer to design e-learning so as to motivate students to be active and creative in following the learning. The importance of ICT in strategic education in general and in particular, the great potential, to change the way in which teaching is carried out in class (Japhet E. Lawrence, Usman A Tar: 2018)

The e-learning based media that is used is using the moodle version application .... which is an application with operational language that is easy to use, the Sports coaching education department is one of the departments that apply the KKNI curriculum and obtain an A accreditation, therefore the output from PKO needs to be improved, in order to achieve a satisfactory graduates' competency standards, so we need a learning tools, in this case e-learning based volleyball learning media. This study aims to design a volleyball-based learning media based on e-learning to facilitate students and lecturers in the learning process using the Moodle application in the FIK-Unimed PKO Department in volleyball courses.
2 Methods

The research method that will be used in this research is research and development methods, namely research that is oriented to develop and validate media products. Research development or known as R & D (Research and Development) according to Borg and Gall (1983: 772), states that research and development is a process / method used to develop and validate products. In this case the product developed is learning media in Volleyball lectures through E-Learning in Unimed FIK Sports Coaching Education Department students.

This research was conducted in Unimed FIK Sports Coaching Education Department, especially in students who take the Volleyball Technical & Tactic Development Course in 5th semester.

The data analysis technique in this study is in the form of testing conducted by media experts (IT), material experts and students on the feasibility of products that have been developed in terms of aspects of appearance, programming. Learning and content or material data in the form of comments, suggestions for revisions and observations of researchers during the trial process were analyzed in qualitative descriptive, and concluded as input to improve or revise products that have been developed. Meanwhile, data in the form of response scores of media experts (IT), material experts and students obtained through questionnaires, were analyzed by quantitative descriptive with percentage techniques and categorization.

![Diagram](image)

**Figure 1**: Steps for Research Development.

3 Results and discussion

This e-learning-based volleyball learning media has first analyzed the needs in the course, namely (1) the standard of graduate competence from the volleyball courses, (2) material based on basic competencies developed from the core competencies of each core competency, (3) assignments submitted by students in the form of soft files and videos, (4) assessments are designed in the form of written assessment (knowledge), portfolio (skills) and observations (attitudes) with a predetermined time limit.
After the needs analysis was obtained, then the learning design was designed, in making the e-learning learning design researchers used the help of media experts (ICT) in the application design, both from the home display section (course description and SKL), material content display, and assignment display and assessment display.

Furthermore, researchers with lecturers on volleyball courses conducted Forum Group Discussions to produce material that was in accordance with SKL, then validated by two sports experts. And the next is that after this application is finished, two media experts (TIK) are validated again to see the use of this e-learning application, so that there are some shortcomings which will be further refined so that it can be used.
Figure 2. Shortcomings Examples
References

The Development Of Android Based Learning Media In Basketball Subject To Establish The Ability Of Fik Unimed Students

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Abstract. In general, this research aimed to build a new powerful resource for college students which can be accessed by them whenever they want and wherever are using their android based smartphone. Furthermore, this research was also made to encourage and sharpen lecturer’s creativity in order to make a learning media like downloadable application where can be easily found on play store and install that program on their android based smartphone, so there would be no more excuses for lecturers to be out of date from the latest technologies and information. This application contains tutorials of whole basic technique related to basketball, and complete guidance of basketball regulations along with signs and codes of the referee. The making of this application, which can be found and downloaded on “Playstore” by everybody, involved a number of lecturers in Faculty of Sport, Medan State University, to be instructors in the videos for delivering lessons of basketball technique. Based on the first test results of 30 students who have downloaded the application and learned from it there were 28 students (≥80%) who categorized as excellent both in motoric skills and referee regulations comprehension and merely 2 students with good category. On the other hand, another class of 30 students who have not been introduced with the application gained lower score from those who have been by as many as 19 students in excellent category and 11 students in good category both in basketball basic techniques and arbitration.

Keywords: Learning Media, Smartphone Application, Android, Basketball, PJKR.

1 Introduction

Learning is essentially a process of interaction between students and their environment, resulting in a change in behavior towards a better direction. Many factors influence the process of interaction, such as both internal factors that come from within the individual and external factors that come from the environment. The most important task for the educators is to condition the environment to support changes in students’ behavior (Mulyasa, 2008, p. 100).

Basketball learning emphasizes the provision of direct learning experiences through the development of process skills and scientific attitudes. Learning of basic technique skills in basketball and theories about refereeing in basketball can be done effectively with excellent interaction of interesting learning between educators and students. Successfulness result in achieving learning goals is strongly influenced by several factors, such as learning strategies,
learning methods and approaches, and learning resources which can be taken from books, modules, worksheets, and medias.

Learning media can be created and designed in accordance with current technological developments. The use of instructional media assisted with technology, information and communication can also be used to facilitate the implementation of learning as desired by PP No. 32 of 2013 article 19 paragraph (1) that says Learning activities in education units are held for students as maximum as possible. Learning is essentially a process of interaction between students and their environment, resulting in a change in behavior towards a better direction. One of the ICT-assisted learning media that can be used as learning media is an android based software application which can be easily operated on students’ smartphone wherever and whenever they wish.

The use of Android-based learning media is one of the applications of 21st century learning styles (Calimag et al., 2014, p. 90). The use of this type of learning media has many potentials to help improve students' academic performance in the form of learning outcomes in the cognitive domain (Chuang & Chen, 2007, p. 27; Jabbour, 2014, p. 2).

Smartphones and tablets and other electronic devices have some sort of power to transform the learning experience in a maximum level for students. This type of learning media allows learners to gain immense number of knowledge without being bound by time and place with interesting applications (Squire, 2009, p.70; Meister, 2011, p. 28).

Students in Medan State University, particularly who are majoring in Physical Education, Health and Recreation Unimed who have to attend practical courses, especially basketball, are required to be able to master basic skills or movements in basketball such as dribbling, passing, catching and shooting, so the number of meetings offered by the faculty is insufficient. In addition, regarding to the lack of learning hours, many other factors have resulted in the implementation of lectures not being effective and efficient.

This research aimed to develop Android-based basketball learning program in order to establish students’ basic technique skills and arbitration materials, tested the feasibility of developed learning media, and examined the effect of the use of instructional media developed on improving academic performance in the form of learning motivation and learning outcomes of students in Faculty of Sport Science, Medan State University.

2 Research methodology

This study is a Research and Development kind that conducted to produce a product and tested the effectiveness of the product (Sugiyono, 2010, p. 407). The development model used in this study is an adaptation of the Borg & Gall model (1983, pp. 589-594). The model adaptation results was listed in five stages of development, namely (1) information gathering, (2) product planning, (3) product development, (4) product validation, and (5) product evaluation.
According to Barab and squaire, (2004) Design-based research or design experiments are a series of research approach development aimed at studying learning theory and learning theory with the aim of generating a new paradigm in the field of theory and practice that has a direct impact both in teaching and learning.

This research used survey methods, such as observation, interview, expert review and documentation to collect data. This survey method was used as the first foundation for the design of an Android-based application which used Siberian software as an application to build the Android program that will be given to students in Faculty of Sport Science, Medan State University.

This research was carried out with 5 steps from the adaptation of Borg & Gall’s development model (1983, pp. 589-594). There were five Steps taken in this study, (1) information gathering (literature study, field survey, needs analysis, curriculum analysis), (2) product planning (making flowcharts, storyboards, material texts, evaluation questions, and collecting images, sounds, and music), (3) product development, (4) product validation (material experts, media experts, peer reviewers, and chemical educators), and (5) product evaluation (individual trials, limited trials, field trials). Academic performance of students that were discussed in this study was limited to learning motivation and cognitive learning outcomes of students. Moreover, to see the final result, a comparison was made between two classes in which one was given an android learning application while one class was not.

3 Research result and discussion

The first stage carried out in this research was to take all basic technical movement videos in basketball which had been designed as clearly as possible by paying a close attention to every detail that will be seen by the students later. Furthermore, not only did the tutorial video of basic technique, this android-based application also contained refereeing videos in it so that the students could learn about basketball regulation and how to lead a basketball match as a referee. After the video has been recorded, the next step was to design an Android-based learning application using Siberian Application. Videos that had been recorded were then
entered into the application as contents that can be accessed through android-based smartphone.

The results of small group trials conducted on applications and learning videos of basic engineering exercises in basketball, which were evaluated by experts, based on the results of the analysis were obtained by experts, as shown below:

The next step after the application design and learning video content was successfully revised in second phase by the experts then the program was proceeded by testing the product to the large group of try-out field involved 30 subjects of Regular Class A PJKR students, while 30 students from the Regular PJKR class B was not introduced to this program.

### Table 1. Revision by experts.

<table>
<thead>
<tr>
<th>No</th>
<th>Revised Items</th>
<th>Suggestions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Angle</td>
<td>The angle of video must have been recorded widely so that the details will appear clearly on the screen.</td>
</tr>
<tr>
<td>2</td>
<td>Frame</td>
<td>The result of edited videos must have at least three different angles, in order to give a better perspective of picture</td>
</tr>
<tr>
<td>3</td>
<td>Model</td>
<td>Model, who played the role on the video, should have been worn a proper jersey to make it more professional.</td>
</tr>
</tbody>
</table>

Assessment data from 30 respondents / students who were given this android-based applications in order to maximize basketball learning outcomes on the effectiveness of basketball learning models both in basic techniques and refereeing science obtained results from students, wherethose who obtained grade score ≥ 80 (Excellent) were 28 people and grades 60-79 (good) were 2 people, and all of them were declared PASS, as shown in the table below:

### Table 2. Large Try-Out Field of Class A

<table>
<thead>
<tr>
<th>Score</th>
<th>Category</th>
<th>Meaning</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 80</td>
<td>Excellent</td>
<td>Pass</td>
<td>28</td>
</tr>
<tr>
<td>60-79</td>
<td>Good</td>
<td>Pass</td>
<td>2</td>
</tr>
<tr>
<td>30-59</td>
<td>Enough</td>
<td>Not Pass</td>
<td>0</td>
</tr>
<tr>
<td>30-39</td>
<td>Bad</td>
<td>Not Pass</td>
<td>0</td>
</tr>
<tr>
<td>&lt; 29</td>
<td>Worse</td>
<td>Not Pass</td>
<td>0</td>
</tr>
</tbody>
</table>

Assessment data from the other class with the same amount of 30 respondents / students who were not given an android-based application to maximize their basketball learning outcomes...
on the effectiveness of basketball learning models both in basic techniques and refereeing science obtained results from students where those who obtained grades $\geq 80$ (excellent) were 19 people and grade 60-79 (good) were 11 people, as shown in the table below:

<table>
<thead>
<tr>
<th>Score</th>
<th>Category</th>
<th>Meaning</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\geq 80$</td>
<td>Excellent</td>
<td>Pass</td>
<td>14</td>
</tr>
<tr>
<td>60-79</td>
<td>Good</td>
<td>Pass</td>
<td>11</td>
</tr>
<tr>
<td>30-59</td>
<td>Enough</td>
<td>Not Pass</td>
<td>5</td>
</tr>
<tr>
<td>30-39</td>
<td>Bad</td>
<td>Not Pass</td>
<td>0</td>
</tr>
<tr>
<td>$&lt; 29$</td>
<td>Worse</td>
<td>Not Pass</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 3. Large Try-Out Field of Class B.

therefore, the difference between Class A and B was merely 4% even though both classes both show good results, but the percentage of class success introduced with android-based applications about basketball learning both in basic techniques and refereeing techniques was higher compared to class that was not introduced with the application.

4 Conclusions

Based on the results of research that has been done on students' skills in conducting basic techniques in basketball such as dribbling, passing, catching and shooting as well as refereeing in basketball both about the rules and codes of a referee the results obtained that by providing learning media in the form of android-based applications with video content to students, the results of technical skills and knowledge of the rules in the game of basketball can be increased more maximally and better than just giving conventional learning in class and field.

This difference can be proven by comparing two classes with the same level and character, namely the Regular A and B PJKR classes where class A is superior to class B as a whole. Therefore, it can be concluded that by applying learning media in the form of android-based applications with content in the form of learning videos can improve students' abilities because they will more easily capture and digest the information contained in the video and they can easily access the content with smartphones. they go through the application and imitate and practice it in the field rather than just listening to the lecture or explanation from the lecturer concerned.
References

The Applying of the VAK Method in Improving Learning Outcomes in Basketball Dribbling on Physical Education, Health and Recreation Students Faculty of Sport Science, State University of Medan

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Abstract. This study was aims to know increasing the results of learning basketball dribbling through the application of the V.A.K (visual, auditory, kinesthetic) method. It was conducted by using Classroom Action Research (CAR). It was conducted in two cycles. Subject of the study were the students of III semester B Class, it were 30 students of Physical Health and Recreation Education, Faculty Of Sport Science, State University Of Medan. The study was conducted on the basketball court of Faculty Of Sport Science, State University Of Medan in the 2018/2019. Techniques of collecting the data were by using observation sheets and test assessment portfolios. Based on the first test results of 30 students there were 12 students (40%) who have reached the level of learning completeness with an average score of 74.07 student learning outcomes while there were 18 students who had not finished yet (60%). The results of the first cycle have 21 students (70%) who have reached the level of mastery learning with an average value of student learning outcomes 83.47 while there were 9 students (30%) who did not complete it. In cycle II there were 27 students from 30 students (90%) who have reached the level of learning completeness with an average score of 85.60 while there were 3 students (10%) who did not complete it. Based on the data analysis we can concluded that the using use of the V.A.K (visual, auditory, kinesthetic) method can make a very large contribution and significant in improving the results of learning basketball dribbling on the student of Physical Education, Health and Recreation Department, Faculty Of Sport Science State University Of Medan of 2018/2019.

Keywords: Visual, Auditory, Kinesthetic method (V.A.K), Dribbling Basketball, Classroom Action Research (CAR).

1 Introduction

One of the most important things to improve the quality of education is the creation of learning effectiveness in carrying out every teaching and learning activity. The role of lecturers is expected to be able to create effectiveness in learning. One of the supporting factors in creating effective learning is using the right learning method. But based on the results of the first observations from basketball lecturers of Physical Education, Health and Recreation Department, Faculty Of Sport Science, State University Of Medan shows that in general the learning process in lectures only applies command styles and training methods,
because basketball course is a course which practice in the field. Still lack of knowledge and the skills to apply various learning methods in the lecture resulted in low student interest and participation thus hampering the acquisition of skills and improving student learning outcomes.

To overcome these problems, efforts need to be made to improve, new changes or innovations in the teaching and learning process by implementing learning strategies that are more effective and efficient in improving student learning outcomes, especially the results of learning Dribbling in basketball games. There needs to be a renewal in learning to enable students to learn basketball dribbling material easier, faster, more meaningful, effective and fun, one of which is through visual auditory kinesthetic (V.A.K) methods.

Visual, Auditory, Kinesthetic (V.A.K) method is a learning method that can optimize all three learning modalities to make students feel comfortable. Through the V.A.K Method, students are taught to understand "how to learn" and "How to think", do activities based learning use the senses as much as possible. V.A.K Method which stands for the word Visual (learning by seeing, observing and describing something), Auditory (learning to talk and hear something), and kinesthetic (Learning through physical activity or moving and acting or direct involvement).

Rational reasons for using Kinesthetic Visual Auditory methods are that students will see hear and practice directly how the actual dribbling process is. Dribbling learning will be more interesting if actively involved in learning. However, the use of the VAK method is very rarely implemented in learning. This method is an alternative that can be chosen in learning, remembering in learning requires a form of activity which can direct students to be able to train and develop abilities through combining three styles namely visual style, auditory style and kinesthetic style. Thus the application of VAK learning methods to basketball dribbling material can improve student learning outcomes in basketball dribbling material.

2 Research methodology

This research was conducted by using Classroom Action Research (CAR). Where the study consists of four stages, there are planning, action, observation and reflection. It was conducted on the basketball court of Faculty Of Sport Science, State University Of Medan on August 2018. Subject of the research were the students of III semester B Class, it were 30 students of Physical Education, Health and Recreation, Faculty Of Sport Science, State University Of Medan. The following is a Class Action Research cycle.
The instrument used in this research was ability test to dribble with techniques / movements (Dribbling), lecturer observation sheet, and student observation sheet. Tools used: Basketball, Whistle, Basketball / Basket, Cone, research sheet and stationery.

3 Research results and discussion

Students are said to have completed their learning outcomes if the classical percentage reaches 85%. When viewed, the initial test results are still far from the classical completeness threshold. This is shown from the results of the tests given to students at the beginning of the meeting. Because of that it was given an effort to improve student learning outcomes by giving action in cycle I and cycle II.

First cycle there were still many students who have not yet achieved the completeness of learning both individually and in completeness of classical learning. This is because there are difficulties experienced by students during the learning process. The successes and failures that occur in the implementation of the learning process in the first cycle action were students are very enthusiastic and eager in learning due to variations in learning so that every student in the group wants to be better than other groups, lecturers play an active role in giving motivation to students in the implementation of the basketball dribbling learning process, short time in cycle I so that in the mastery of basketball dribbling material, there are still many students who have not reached KKM ≥ 70, the average student's difficulty in the attitude of implementation and continued movement, student learning outcomes in this cycle I have not yet achieved classical completeness, that is, only 70% of students who have fulfilled the KKM score while 30% of students have not yet completed.

Based on the results of the reflection of the first cycle, then it is used as a reference in providing action in cycle II to overcome student difficulties in basketball dribbling learning. To correct the weaknesses and increase the success of cycle I, it is necessary to do cycle II, namely lecturers are expected to motivate students to be more active in basketball dribbling learning, lecturers are expected to be able to maintain and enhance the learning activities that have been achieved previously, supervise students to focus on learning material, encouraging students to be more careful and increase repetition of the implementation attitude and the follow-up movement, encouraging students to increase information about basketball, especially dribbling techniques which consist of a beginning, continued implementation and movement attitudes.

Next is planning and taking action in cycle II. In cycle II, the researcher added time to do variations of learning so that in cycle II learning can increase. The following is presented in the table of efforts to overcome problems that occur in cycle II.

<table>
<thead>
<tr>
<th>No.</th>
<th>Problem</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>For asking questions, expressing opinions, and answering questions during the learning process, there are still many students who are afraid and shy to ask questions or answer</td>
<td>Tell students that if their friends ask questions, express their opinions, or answer questions from the lecturer, they will get a prize in the form of additional value.</td>
</tr>
</tbody>
</table>
questions from lecturers. They feel embarrassed if their answers are wrong, they will be laughed at by their other friends.

2 When doing basketball dribbling or start the lesson, there are still students who play and are not active in the lesson.

Motivate students, which if they do not concentrate on learning, students will not understand the material they are studying, and students will not know about basketball dribbling lessons later.

The lecturer immediately corrected the wrong movement right away.

3 When students do the basketball dribbling movement, students make wrong moves.

After carrying out the pre-planned actions, the result is an increase in all aspects, from the aspect of student activity and lecturers and student learning outcomes. From the learning outcomes obtained in cycle II, there was an increase from the first cycle and from the implementation of activities the students understood more and practice basic basketball dribbling techniques well through the application of learning variations. The results can be described as follows lecturers have been able to motivate students so that students can understand learning objectives, students want to ask lecturers and correct mistakes made, the activeness of students in participating in learning increases, knowledge and movement skills of students on the movement of the beginning attitude, the attitude of implementation, and the movement of basketball dribbling continued to improve both in each stage of the movement.

The increase in the implementation of this cycle II action can be described as follows students have looked more active and understand basketball dribbling movements, students seemed enthusiastic about basketball dribbling and enthusiasm in the learning process. Overall, students have started better than before and on average students already know the basketball dribbling movement.

<table>
<thead>
<tr>
<th>Table 2. Average value, beginning value, Cycle I, and Cycle II</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No.</strong></td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>1.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>2.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>3.</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Based on the results of the study in the form of first data, cycle I and cycle II in the V.A.K method with a variety of basketball dribbling learning, it turned out that there had been a significant increase in learning outcomes. The average student score in the initial data was 62.50, in cycle I it increased to 74.81, and in cycle II it has reached 82.31. With a percentage of initial data completeness of 40% (Not Completed), in the first cycle to 70% (Not Completed), and in cycle II it has reached 10% (Completed)

From the results of research conducted, seen that the classical completeness in the first cycle was 30% then increased to 90% in cycle II. From data analysis can also be known that student learning outcomes from the learning outcomes test before using the V.A.K method with low learning variation. Then the V.A.K method was used with variations in learning in
the learning process. It can be seen that student learning outcomes from the learning cycle test results using the V.A.K method with low learning variations; it was because students do not understand the truth of the movement of basketball and there were still some students while doing the movement process was not yet appropriate. The obstacles faced by students in the teaching and learning process was still a lack of lecturers using learning methods and variations so that students are not interested in participating in lectures on dribbling material and make students become less active in learning processes. This is the basis for the low value of students in basketball dribbling material. In dribbling material the lecture should be able to use the method or make learning variations. In order for students to be active in the learning process and will have a turn to make a move. Because in motion science, the more often you make a movement or the more you practice, will increasingly understand the process of the movement. Likewise with the movement of basketball dribbling, the more often students do it, the more understanding the movement will be.

4 Conclusion

Based on the results of the study, it can be concluded that “the applying of the V.A.K (Visual Auditory Kinesthetic) method through variations on dribbling learning going forward, dribbling while running, zig zag dribbling. In Improving Learning Outcomes Dribbling In Basketball Games of the students of Physical Education, Health and Recreation Faculty of Sport Science, State University of Medan 2018/2019.” Based on the result of the research, it is suggested to the lecturers to consider the use of teaching style of inclusion and variation of learning to improve the results of learning dribbling in basketball games with customized material because its can inspire students to learn, It is recommended to the teacher / lecturer to motivate students to be more enthusiastic in learning, give special attention to the learning process for students that have not been completed and to the readers who might conduct research by using V.A.K (Visual Auditory Kinesthetic) method through learning variations it can be tried.
References

Design of Teaching Materials in Sports Statistics
Course Based on a Contextual Approach in the Faculty
of Sport Science

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Abstract. This study aims to produce teaching materials for statistical subjects in sports based on a contextual approach in the Faculty of Sports Science. With this product, it is expected to help in improving students' understanding according to the learning outcomes that have been set. This design will generate, learning outcomes, study materials, teaching materials, syllabus. Designing device as a basis for making further teaching materials. This study uses a 4D development model which is in the stages of defining, designing, developing and distributing. The implications of the design of this teaching material facilitate the development of teaching materials for statistical subjects based on contextual approaches.

Keywords: Design, Statistics, Contextual.

1 Introduction

Statistical courses at the Faculty of Sport Sciences are subjects that determine their competence is logical and creative thinking. The aim of this course is that students are able to apply and use data for the completion of the final project which starts from the introduction of data, making graphs, analyzing data. This course is a support for the completion of the thesis.

As a compulsory subject, statistical courses become frightening for students, so that the determined competence cannot be achieved. Many of the factors that caused it were a number of low levels of intelligence, less effective ways of learning, lack of motivation and a low level of discipline and the background of the department was IPS when in high school. The next factor is the lecture method delivered by the lecturer is still monotonous. As well as the lack of teaching materials used. The source books used are still general books on statistics. In the book all provide examples in general. No one uses an example of sports. As a result students are increasingly difficult to understand the contents of the book let alone be able to be applied to help complete their final assignment. Lecturers who teach are still not using books that are accompanied by applications in sports fields.

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the book all provide examples in general. No one uses an example of sports. As a result students are increasingly difficult to understand the contents of the book let alone be able to be applied to help complete their final assignment. Lecturers who teach are still not using books that are accompanied by applications in sports fields.

Competency to develop contextual teaching materials needs to be done for statistical course lecturers. We recommend that teaching materials designed can accommodate the needs of the three study programs in the Faculty of Sports Science. Teaching materials for statistical subjects are carried out with preliminary research, namely the design of teaching materials for statistical subjects. To need to do the design of teaching materials for statistical subjects based on a contextual approach through the KDBK research at the Unimed Faculty of Sports Science.

2 Research methods

This research was carried out at the Faculty of Sports Science, Medan State University Jl. Willem Iskandar Psr V. Medan Estate This research uses this research using research and development approach or development research. Borg and Gall (1983) suggested that the purpose of this research and development was to produce product designs. At this stage of research the development is still at the design stage. This study begins with an analysis of the needs of users as material for redesigning the curriculum (GBPP / syllabus). Followed by collecting materials for the design of teaching materials consisting of: a) learning outcomes, b) study materials (attitude aspects, knowledge aspects and skill aspects), c) teaching materials, d) syllabus, e) learning tools.

3 Results and discussion

3.1 Result

In detail the efforts to develop teaching materials for the subjects of growth and development of learning the motion can be stated as follows: In detail the efforts to develop teaching materials for the subjects of growth and development of learning the motion can be stated as follows:

3.1.1 Needs analysis

In this first phase, various information related to statistical courses is needed. This information can be in the form of: collect data from stakeholders, statistical experts, lecturers of statistics courses, analysis of RPP and Syllabus used so far. This information gathering step can be done by reading the syllabus, RPP, field observations, interviews with lecturers, and statistical experts.

3.1.2 Planning

Field data findings are the basis for planning development activities, so that the development of learning is carried out in accordance with the needs of the field. Based on the results of
interviews with lecturers, statistical experts and students, the development objectives can be
determined in the form of teaching materials for statistical subjects based on contextual
approach. Because of the limitations of research time, this research activity is still in the
design of teaching materials consisting of: 1) learning outcomes, 2) study materials (attitude
aspects, knowledge aspects and skills aspects), 3) teaching materials, 4) syllabus, 5) learning
tools.

3.1.3 Product development

Product development is emphasized in the preparation of preparing a syllabus, lesson plans
and lecture contracts that are adapted to the syllabus. In the example above, product
development is in the form of teaching materials for statistical subjects in sports, seminars for
revision of the syllabus and college contracts. At this stage a syllabus design is made which is
a miniature of the conditions needed in the statistical courses in sports. That product will be
used in compiling lecture contacts. Product preparation is carried out by researchers based on
input from experts and stakeholders and accompanied by experts in their fields

4. Trial of small group teaching materials
After the development draft for syllabus, lecture contracts, as well as the material for growth
and development of learning child movement was completed, a model was tested with a focus
group discussion to revise the draft materials that were almost completed. The pilot activity l
aims to obtain data, information, and input regarding the feasibility of the syllabus, lecture
contracts in terms of material feasibility, completeness of presentation and completeness of
presentation.

3.1.4 First product revision

The results of the focus of the discussion group draft teaching materials were analyzed to be
refined, in accordance with the input provided by experts. With the revision of the three
indicators, it is expected that the syllabus products and lecture contracts will be more easily
digested by students, so as to be able to achieve the achievement of competence in statistical
lectures in sports.

Trial design of large group teaching materials
The revised product was discussed by inviting 12 people consisting of statistical experts,
sports lecturers. Test and evaluate readability, accuracy of content and exploration. This trial
phase is a process to find out the effectiveness of the design of teaching materials for
statistical lecture courses in sports that have been developed through various reactions from
various parties to the syllabus and lecture contracts for the growth and development of
learning the motion.

3.1.5 Second product revision

The results of the seminar which involved 12 people from various fields of sports, the draft
teaching materials were analyzed to be refined, in accordance with the input given by experts
in the seminar.
4 Discussion

Development of teaching material design consisting of teaching material design consisting of: 1) learning achievement, 2) study material (attitude aspect, knowledge aspect and skill aspect), 3) teaching material, 4) syllabus, 5) learning tools. Syllabus and lecture contracts are components that need attention in lectures. a. Where is the formulation of learning outcomes that are arranged in 4 elements consisting of attitudes and values, work ability, mastery of knowledge, and authority and responsibility. Then determine structured study materials. The study material is related to the general and simple to the more complex. The material of the study of statistical subjects is designed covering aspects of attitude, aspects of knowledge and aspects of skills.

After the study material is determined, then determine the teaching material for statistical subjects in sports. The material determined is in accordance with the needs in research in sports and physical education.

The syllabus is a learning plan in a particular subject / subject / group that includes competency standards, basic competencies, subject matter / learning, learning activities, indicators, assessment, time allocation, and learning resources / materials / tools (PP 19 Year 2005 Article 20). The syllabus is a translation of competency standards and basic competencies into the subject matter / learning, learning activities, and indicators of achievement of competencies for assessment.

After determining the learning outcomes, study materials, teaching materials for the design of the next instructional material is to make teaching / lecturing devices consisting of RPS, Student worksheets and Assessment Instruments.

5 Conclusion

The development of teaching materials for statistical subjects must be based on the needs of the field, so that it will be more functional in accordance with the needs of users. These development steps can be carried out as follows: 1) conducting needs analysis, 2) planning, 2) developing products 3) focus group discussions with small groups, 4) revise product development, 5) conduct seminars with large groups, 6) revise the final product. Based on the results of the seminar in the large group, the draft was revised again to produce 1) learning achievement, 2) study material (attitude aspect, knowledge aspect and skill aspect), 3) teaching material, 4) syllabus, 5) learning tools used as guidelines in compile RPP and teaching materials.

A. Suggestions

In order for the course lectures on Statistics in sports to achieve the competencies that have been set then: 1. Lecturers of statistical courses should always develop instructional materials based on the contextual approach to teaching learning begins with the development of syllabus and lecture contracts continuously so that it increasingly increases the relevance of material related to the subject.

2. Update teaching materials with the latest book / reference sources.

3. Always involve experts, stakeholders in determining competency standards for each statistical material related to sports and physical education.

4. Reviewing old materials by adding new materials tailored to the research needs in the field of sports.
References

The Development of Basic Gymnastic Teaching Materials with Hybrid Learning Model Based on KKNI

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Abstract. Innovation in education is currently growing, where the use of communication and information technology in education is a challenge for educators in the teaching and learning process. This study aims to produce teaching materials for the basic gymnastic model of hybrid learning namely combining teaching materials in print out and e-learning. It is expected that the use of communication and information technology in the learning process through this product can ultimately solve the problem of the lack of learning resources for basic gymnastic courses, and the improvement for the quality of teaching and learning process for PKO students in the Faculty of Sport Science. The implications of this product help the lecturers to carry out learning in accordance with the demands of the KKNI curriculum. This study uses a research and development (R & D) approach that begins with a needs analysis. The results of this analysis became the basis for the preparation of teaching materials for basic gymnastics with hybrid learning models based on KKNI.

Keywords: Teaching Materials, Hybrid Learning, Gymnastic, KKNI.

1 Introduction

The use of communication and information technology in the field of education is an effort to improve the quality of the learning process through various studies on the process of interaction of students with educators and learning resources in a learning environment. In the current learning process, there is a tendency for: a) to shift education from teacher-centered learning systems to student centered, b) to grow and to become more open or distance education (Steep, 2002: 165), c) the more choices of learning resources available (Riyana, 2010: 42). Rosenberg (2001: 8) added that there were three shifts in the learning process due to the development of communication technology, namely: a) shifting from classrooms to anywhere and anytime, b) shifting from paper to online, and c) shifting physical facilities to network facilities. With the development of information technology, educators can provide services or facilitate without having to deal directly with students, as well as students can obtain information in a wide scope from various sources through virtual space using the internet.

The enactment of the IQF curriculum has provided guidelines for universities to prepare their graduates to have competencies recognized by the labor market. With the existence of the IQF will change the perspective of one’s competence, no longer just a diploma but also refers
to the nationally agreed qualification framework as a basis for recognition of the results of a broadly accountable and transparent education of a person. Therefore, it needs to be anticipated by reviewing the learning strategies in preparing a learning activity, especially relevant teaching materials according to the needs of stakeholders in the labor market while keeping in mind that the material developed must be adapted to the development of students, abilities, interests and needs; the whole supports the achievement of graduate competencies.

Conditions in the field based on the results of observations and interviews with the lecturers of Basic Gymnastics courses found several things, namely: 1) there are limitations to supporting books for courses, 2) students find it difficult to visualize movement techniques in gymnastics because they have to wait for the face to face process first, 3) The lecturer does not have a Semester Learning Plan for basic KKNI based gymnastics courses. This means that the lecturer teaches not yet fully based on the KKNI curriculum demands with material that is not sequential and combined with the lecturer experience about the material in accordance with the lecturer's memory so that the opportunity for giving material coverage becomes too broad, and students are less active because they are only waiting for material from face-to-face lectures. Whereas this basic gymnastics course has links with other training courses such as coaching methodology, physical training methods, techniques & tactics training methods, measurement tests and coaching clinic. It is also complicated by the inequality of perception among lecturers, so that the material coverage that students should get in the learning process can vary and certainly makes it difficult for students to take advanced gymnastics courses in Sports Coaching Education.

This condition is of concern, and must be corrected immediately so that the graduates' achievements in the course are clear and achievable, thereby contributing to the achievement of the competence of study program graduates. Students will be greatly helped by the existence of course teaching materials from the lecturer so that he can prepare himself before, when the meeting or after the lecture takes place as a material for self-evaluation. As for lecturers, this teaching material can be a guide for teaching and motivating lecturers to develop their abilities related to the presentation of learning.

2 Manuscript preparation

2.1 Concept of development research

Development research or known as research and development (R & D) is a research that produces an effective product to solve problems, starting with needs analysis, product development, and product testing. this research is not used to test theory but to produce a product or perfect an existing product so that it becomes part of problem solving. According Sugiyono (2008: 297) Development research is research used to produce certain products and test the effectiveness of these products. The ideas obtained from the needs analysis were poured into the concept script to the design of prototypes and through testing stages before the prototype was deemed feasible to be produced into a product that was used in bulk. Development research gave birth to something new according to the demands of the field of study carried out and obtained from the research process carried out and supported by research data that was systematically collected in accordance with the phasing of the research models
used such as ADDIE model, Four D model or Plomp model, Borg and Gall Model (Gusril, 2016: 12).

Development research using models from Borg and Gall (in munawwaroh, 2012: 2-3) includes ten activities, namely 1) preliminary study, 2) research planning, 3) initial product development, 4) initial (limited) field trials, 5) revision of limited field test results, 6) wider field tests, 7) revision of field test results, 8) feasibility tests, 9) revision of feasibility test results, 10) dissemination and dissemination of final products.

The existence of a problem can be a way for the emergence of new ideas which if packaged using a scientific approach will generate a solution as a solution to an existing problem. Problems can arise because there is a cause and this certainly encourages the emergence of an effect, it can be a series of repeated repetitions if a solution is not immediately found to overcome it. A variety of products can be produced from development research, depending on the topic studied to be developed into something new and the target of the user of the product. The form of the products produced does not have to be in the form of hardware but can also be in the form of software. In the world of education products from the development research that are often found include learning devices and learning models.

Learning tools and models are produced according to the level of need for problem solving encountered by researchers in learning. For example a learning device that contains the needs of the learning process will be related to planning, implementing, and evaluating learning, can play a role as a guide for lecturers in carrying out their duties in teaching.

2.2 Hybrid learning

Hybrid Learning or often called Blended learning has several definitions, but in general hybrid learning is known as learning that combines online learning with face-to-face learning (face to face = f2f) (Akkoyunlu & Soylu, 2008: 183; Garrison & Kanuka, 2004 : 96-97; Baum, 2013 and Garrison & Vaughan, 2008: 6). Today the term hybrid has become popular, so more and more combinations are referred to as hybrid learning. In the research methodology, the term mixing is used to show a combination of quantitative and qualitative research. There is also a mention in learning is an eclectic approach, which is combining various approaches to learning. However, the notion of blended learning based learning is learning that combines learning delivery strategies using face-to-face activities, computer-based learning (offline), and online computers (internet and mobile learning).

Hybrid learning based learning developed around 2000 and is now widely used in North America, England, Australia, universities and the world of training. Through hybrid learning all learning resources that can facilitate learning for people who learn are developed. Hybrid learning can combine face-to-face learning with computer-based learning. That is, learning with a learning technology approach with a combination of face-to-face learning resources with instructors and those contained in computer media, cellular phones, satellite television channels, video conferencing, and other electronic media. Students and instructors / facilitators work together to improve the quality of learning. The main objective of hybrid learning is to provide opportunities for various student characteristics to enable independent, sustainable and lifelong learning to occur, so that learning will be more effective, more efficient, and more interesting.

Hybrid learning based learning is the best choice to increase effectiveness, efficiency, and greater attraction in interacting between humans in diverse learning environments. Blended
2.3 Gymnastic

Hidayat (2004: 1) said: "gymnastics is a body exercise that is chosen and constructed intentionally, done consciously and planned, systematically arranged with the aim of increasing physical fitness, developing skills and instilling mental spiritual values". DISPORA (2004: 3) divides gymnastics sports organized by FIG (Federation International de Gymnastique) into 6 groups, namely; 1. Artistic Gymnastics, 2. Rhythmic Sportif Gymnastics, 3. Acrobatic Gymnastics, 4. Aerobic Gymnastics, 5. Trampoline Gymnastics, 6. General Gymnastics. DISPORA (2004: 3) proposes "artistic gymnastics, which is a gymnastics that combines tumbling and acrobatic aspects to get artistic effects from movements performed on the following tools: 1. Floors, 2. Vault, 3. Pommel Horse, 4. Parallel Bars, 5. Horizontal Bar, 6. Still Rings. Based on the description above it can be concluded that gymnastics is a body exercise that is carried out consciously and planned that is carried out on the division of gymnastic groups such as; 1. Artistic Gymnastics, 2. Rhythmic Sportif Gymnastics, 3. Acrobatic Gymnastics, 4. Aerobic Gymnastics, 5. Trampoline Gymnastics, 6. General Gymnastics.

According to the Ministry of National Education (2013: 173) floor gymnastics is one of the clumps of gymnastics. In accordance with the term floor, the movements / forms of learning are carried out on the floor. So, the floor or mattress is the tool used. Floor gymnastics is also called free learning. Because it does not use objects or other tools when running it. The purpose of doing floor gymnastics in addition to improving the ability to do the forms of floor gymnastics movement itself is also a learning of the ability to do gymnastic movements with tools. Floor gymnastics has mental and social benefits, students are required to think for themselves about developing their skills. For this reason, students must be able to use their thinking skills creatively through solving motion problems. Thus students will develop their mental abilities. Fitness or physical fitness is very important for human survival, where physical fitness includes and affects all aspects of the body. A person's physical fitness is the most important element in life even more so for someone who is elderly. Because all physical activities carried out by each individual will not be separated from the physical fitness conditions. So in this case physical fitness is something that is absolutely owned by every human being who wishes to live a healthy and fresh life.

Gymnastics theory and movement have relationships with other sciences, such as anatomy, physiology, biomechanics of nutrition, psychology, measurement tests and history. The purpose of studying basic gymnastics courses is that students as prospective educators and trainers need to have knowledge related to theoretical studies and implementation in various basic knowledge of gymnastics.

2.4 Development of teaching materials

Learning is interpreted as a process of behavior change as a result of the interaction between individuals and their environment. That behavior includes aspects of knowledge, skills and attitudes (Husdarta, 2013: 4). Therefore learning can be said to add, expand, and deepen
knowledge, values, attitudes, and skills. The implementation of learning in universities is an implementation of what has been planned in the learning program prepared by the lecturer. Teaching materials are all forms of materials used to assist teachers / instructors in carrying out teaching and learning activities (Majid, 2016: 173). More detailed about the definition of instructional materials proposed by Yaumi that learning materials or teaching materials are a set of materials that are systematically arranged for learning needs sourced from printed materials, visual aids, audio, video, multimedia, animation, computer and networking (2013: 272).

Lecturers compile teaching materials that contain information and knowledge that can be used by students to carry out the learning process in an effort to achieve specific competencies. Majid (2016: 174) suggests that a teaching material includes at least: 1) learning instructions, 2) competencies to be achieved, 3) supporting information, 4) exercises, 5) work instructions, can be in the form of worksheets, 6) evaluation.

Teaching materials are used as a tool to achieve learning competencies, therefore in its preparation must be guided by the learning outcomes of graduates of courses that contribute to the profile of study program graduates. as well as in the selection of teaching materials, the characteristics of the students are adjusted so that all teaching materials can be conveyed to students.

The instructional material according to Dick & Carey (2009: 230) is containing content that is written, mediated, or facilitated by instructors used by students to achieve goals and include information about students who will be used to guide progress. Furthermore Dick and Carrey (1996: 228) suggested that the development of teaching materials needed to pay attention to the following matters, namely: 1) paying attention to the desired learning motivation, 2) the suitability of the material given, 3) following a correct sequence, 4) contains the information needed, 5) the existence of practical training, 6) can provide feedback, 7) available tests in accordance with the material provided, 8) available instructions for follow-up or general progress of learning, 9) instructions available to students for the stage the activity stage, 10) can be remembered and transferred.

Suhartati (in yaumi, 2013: 274) stated that the position of teaching materials is 1) can help in individual learning, 2) provide flexibility in the presentation of short-term and long-term learning, 3) systematic design of teaching materials that have a great influence on the development of human resources individuals, 4) facilitate the teaching and learning process with a system approach, 5) facilitate learning because it is designed on the basis of knowledge about how humans are.

Related to basic gymnastic teaching materials, Bompa (2009: 3) identifies the main elements in gymnastics, namely at the center of training theory that a structured training system is built on the scope of exercise activities that target the physiological, psychological, and specification characteristics of sports and athlete performance.

2.5 KKNI curriculum

Mandate Law number 12 of 2012 Article 29 paragraph 1 states that the Indonesian National Qualification Framework (KKNI) is a level of learning achievement that equates the outcomes of formal, non-formal, informal, or work experience in the framework of recognition of work competencies in accordance with the structure of work in various sectors. The derivative of the law is stated in the Republic of Indonesia Presidential Regulation number 8 of 2012 so that currently the IQF is used as a basic reference in determining the competence of graduates of academic education, vocational education and professional education.
Determination of the qualification level must be based on Learning Outcomes (CP) because through learning outcomes can be described one's skills and career. Learning outcomes are what is known, understood and can be done by someone after completing the learning process (Kemendikbud, 2014: 3).

Giving recognition to work competencies based on one's learning achievement obtained from various paths (formal, non-formal education, work experience, or increased professionalism) is structured into a gap framework in accordance with the structure of work in various sectors so that the world of work recognizes a person's competence. In the KKNI there are nine levels that have descriptions of learning outcomes in accordance with their respective qualifications. Learning outcomes obtained from various channels, in this IQF will be equalized with the level of job expertise (operator, technician / analyst, expert) so that someone who has taken competency improvement paths will be known at what level according to the IQF.

Qualification descriptions at each level of the IQF are expressed as CP covering aspects of national identity building, mastery of science and technology, ability to do quality work, as well as one's authority and obligations according to the level of qualifications (Kemendikbud, 2014: 5). Through this description a formulation of learning outcomes is formulated, known as the four elements of the IQF description, namely 1) attitudes and values, 2) work ability, 3) knowledge mastery, 4) authority and responsibility.

Description of CP KKNI is a reference to formulate the formulation of CP for university graduates. The formulation is stated in 3 elements (Kemendikbud, 2014: 6) as follows:

a) The attitude element in CP is the attitude possessed by college graduates

b) The element of knowledge has the same meaning as the element of mastery of knowledge from CP KKNI, which must be mastered by graduates of certain study programs

c) Elements of skills are a combination of elements of work ability and elements of authority and responsibility of the description of the IQ KKNI

d) Elements of special skills characterize the ability of study program graduates according to certain fields of science / expertise, while general skills characterize the ability of graduates according to the level and type of education program not dependent on the field of study

The PKO department aims to produce competent graduates as trainers, teachers and sports managers with character. Competence must certainly include 3 elements of learning achievement of college graduates, so that graduates who are graduates of higher education if adjusted to the level of work ability in the description of the IQF are at level 6, namely at least having the ability to apply, study, design, utilize science and technology and solve problems.

Medan State University applies the IQF curriculum in lectures as a step to answer the demands of the times for the needs of competent graduates who are recognized for their level of expertise in the job market. Therefore, the PKO department must be able to prepare its graduates to have competencies recognized by the labor market so that the implementation of the IQF curriculum is carried out through the learning of courses, which is carried out since the planning, implementation and evaluation process.
3 Methods

This research was conducted for 4 months at the Unimed FIK Sports Coaching Education Department. This research uses research & development (R & D) method. The steps that have been modified include: needs analysis, formulation of objectives, drafting of scripts, evaluation and revision I, test I, revision II, trial II, evaluation, manuscripts ready for production, final production.

3.1 Sample and population

The population and sample of this study came from the first semester students majoring in sports coaching education who took basic gymnastics courses, while sampling used random sampling techniques.

3.2 Data collection and analysis technique

Research data was collected through observation, interviews, and document studies. Document study is carried out to collect data contained in the relevant documents as material for the preparation of teaching materials. The data analysis technique used is quantitative descriptive analysis with percentages.

4 Results and discussion

The results of the needs analysis are carried out through questionnaires, structured interviews and document studies for students, lecturers, trainers and stakeholders. The results of the questionnaire on the level of teaching material needs distributed to 25 student respondents, if it was concluded that students needed help to overcome difficulties in obtaining subject learning textbooks (80%), knowing the limitations of subject learning materials (72%), knowing the learning achievement of the eye college (92%), and students need clarity of instructional instructions and assignment of courses (92%).

The researcher also conducts structured interviews to the lecturers of basic gymnastic courses in the PKO department to obtain information input related to the learning process of the basic subjects of sports coaching science. The results of a small group trial involving a sample of 15 people provided input information for the implementation of stage II revision before proceeding to the large group trial stage.

From the assessment questionnaire, it was found that at this stage the draft teaching materials were able to meet several criteria for teaching material needs for students, although there were still some inputs that needed attention by researchers to improve the draft teaching materials before testing on large groups, among others: assignment obscurity (20%), non-compliance with font size (25%), unattractive content layout (20%), unattractive teaching material design (14%).

The results of student assessment of the draft teaching materials used in large group trials showed that the draft teaching materials had met the criteria of a teaching material that was ready for use in the learning process. Large group trials involved a sample of 50 people. The implementation of large group trials resulted in several notes on product excellence, including: (a) facilitating lecturers in
providing material understanding to students, (b) students know the learning achievement of courses, (c) teach students about the concept of basic gymnastics, (d) learning materials are arranged with the concept of interconnectedness between materials, (e) learning Basic gymnastics becomes more attractive with the increasing active participation of students, (f) helping to grow the character of students through the assignments given.

The results of large group trials found that teaching material products were able to increase student participation in learning because they already had organized learning resources. But in this study found some limitations including: (1) Field trials in this study only involved limited and random samples, (2) The amount of product contribution to learning was still influenced by the readiness of lecturers and the learning model used, (3) Material description instructional materials related to advanced course material from a series of coaching subjects in sports coaching education.

5 Conclusion

Based on the results of the field trials and the results of the researchers' discussion, it can be concluded that: (1) The developed teaching materials increase the students' participation in learning in the basic gymnastics courses, (2) the research carried out produces basic gymnastic teaching materials for use in gymnastics lectures. basic.
References

Improving Skills Smash Ball With R & D in Faculty of Sport Science Medan State University

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Abstract. This research is focused on Development of Circuit Based Learning Model To Increase the ability of volleyball smash technique at Faculty of Sport Science, Medan State University. Research and development (R & D) is a strategy or research method that is quite powerful. The research and development model is a process used develop and validate educational product. The research and development (R & D) approach in education includes ten steps. The chart of the steps of this study can be shown in the following figure: 1) Research and Information Collection. 2) Planing. 3) DevelopPreliminary form of product. 4) Preliminary field testing. 5) Operational field testing. 6) Operation product revision. 7) Main field testing. 8) Main product revision. 9) Product Revision. 10) DisseminationAndimplementation. Research method used is research and development method. Based on the data obtained from the results of field trials drawn the following conclusions: (a) Development of learning models of circuitbased volleyball smash has met the operational criteria of a learning model that is: syntax contained in the social system, princip reaction, support system and accompanist. b). Result of Development of learning model of circuit based volleyball smash has fulfilled the requirement of validity, homogeneity, normality, effectiveness and model of circuit based development has been able to improve student learning outcomes of regular PJKR Faculty of Sport Science Medan State University. (3) From the experiment, volley based on the learning factor that the experiment group of postest (new model) and the pre-experiment group (old model) smash volleyball of the experimental postest group is the lowest score of 12 and the highest 16, whereas in the pretest experiment group, and the highest score 15.

Keywords: Improving Skill, Volleyball, Smash Ball.

1 Introduction

The use of strategies in teaching and learning activities is necessary to facilitate the learning process. Without a clear strategy, the learning process will not be directed so that the learning objectives that have been set cannot take place effectively and efficiently. Learning strategy is not only required for teachers / lecturers, students can also benefit from the strategy. For teachers / lecturers, the strategy can be used as a guide and a systematic reference in implementing teaching and learning. For students as users of learning strategies, can facilitate the learning process and accelerate the understanding of learning content. Challenges and demands in the world of education never pause, increasing and sometimes even threatening. This happens because humans never stop wanting the latest innovations in education. Innovation in education has introduced a technology-based education, where
Based on the background of the above problem then this research is focused on Development of Circuit-Based Learning Model to increase the ability of volleyball smash technique at the Faculty of Sport Sciences Medan State University. Based on the background and focus of the research, it can be formulated in this research as follows: How to Develop a Circuit-Based Learning Model To Improve The Technique of Smash Ball Technique at Faculty of Sport Science, Medan State University, especially the physical and health education department 2015 A-B class?

2 Theoretical study

2.1 The concept of developing learning models

Experts in education provide different views on defining the meaning of the model. This is due to the point of view of various experts who continue to take care of peeling from different angles of judgment but have the same goal. The model is interpreted as an object or concept used to represent something real and converted to a more comprehensive form. For example, the model plane, made of wood, plastic, and glue is the real model of the airplane. Another example is the idea of politics; public opinion is like a pendulum because it varies every period from left to right so continuously.

2.2 The nature of motion learning

The term learning is something that has been commonly heard in everyday conversation. In everyday conversation the term learning is always associated with an activity to read or work on problems such as math and mathematics and so forth. Learning is considered as a function when viewed is the aspects that determine or enable changes in one's behavior in the educative process. While learning is considered as a result when he sees is the final form of various experiences in educational interaction.

2.3 Learning model concept

Research and development (R & D) is a strategy or research method is quite powerful. The research and development model is a processes used develop and validate educational product.

2.4 Model concepts developed

2.4.1 Purpose and function learning

Learning according to theoretical view is a process to provide a real experience for students. There are three potentials that must be changed through learning, namely intellectual potential (cognitive), the potential of moral personality (affective) and mechanical / muscular (psychomotor) skills. Bloom's Taxonomy classifies learning outcomes into three domains: cognitive, affective and psychomotor.
2.4.2 Circuit exercises

Circuit is a learning model consisting of several in a circle in order for the muscle groups to work sequentially from stat on to station. Imran Akhmad in Bompa (2013) states that Circuit training is a name of the exercise with stations conducted in circles or sequentially back to the original place consisting of 6-9 stations. Fox (1992) states that circuit training contains a number of stations where an athlete perform sex exercises within a certain time. A circuit consists of short circuits (6 to 9 exercises), medium (9 to 12 exercises), or length (12 to 15 exercises) over time and can be repeated several times depending on the number of exercises involved.

3 Research methodology

3.1 Research objectives

This research is a development research which is a process or steps to develop a new product or perfected an existing product.

3.2 Place and time of research

This research was conducted at Faculty of Sport Science Medan State University. The time this study was conducted during one semester that is in the range between January up to June 2017. This study only take advanced volleyball courses with smash material.

3.3 Research approach and method

a) Because this research focuses on developing a model of learning, the approach and method used in this research is mixed methods research that combines qualitative and quantitative methods,

b) Research methods used in this dissertation are research and development (R & D) method.

3.4 Client goals (Clientele target)

Target of clients or users who are targeted in this study are students majoring in physical education health recreation semester 2 majoring in physical education recreational fitness regular class FIK Unimed.

3.5 Model development steps

Research development of Learning Model Volleyball Smash Training Circuit Based on the mastery of smash techniques volleyball students The physical and recreational education semester 2 class A and B regular consists of three stages, namely,

1. Phase identification and needs analysis by conducting a preliminary study
2. The planning and development stage of this model is carried out before the test runs.
3. Model test aims to determine whether the model developed feasible to use or not. The model test also looks at the extent to which the product is made to achieve goals and objectives. Based on the explanation, the research at this stage using qualitative and quantitative approach. The qualitative approach is used to complement the first objective, while the quantitative approach is used to reveal the second objective, with a before-after (one-group pre-test and post-design) design experiment.

4 Research and development result

4.1 Implementation of the trial first stage testing results

The first stage of testing was conducted on 15 students. Testing stage is divided into two parts. The first part of the students was tested on the old (conventional) model learning and the second part was tested on new model learning.

4.1.1 Smash ball volleyball performance based on learning factor

a) Data Description

Here's a description of data from both trials:

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>95% Confidence Interval for Mean</th>
<th>Mn</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Model</td>
<td>15</td>
<td>13.20</td>
<td>1.207</td>
<td>12.53</td>
<td>13.87</td>
<td>12</td>
</tr>
<tr>
<td>Last Model</td>
<td>15</td>
<td>11.73</td>
<td>1.223</td>
<td>11.06</td>
<td>12.41</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>12.47</td>
<td>1.408</td>
<td>11.94</td>
<td>12.99</td>
<td>10</td>
</tr>
</tbody>
</table>

Based on the data obtained from the volleyball smash based on the learning group that is the experiment group postest (new model) and the pretest experimental group (old model), it was found that the result of volleyball smash skills in the experimental group postest is the lowest score 12 and the highest score 16. While in the pretest experimental group, the result of volleyball smash ability obtained the lowest score of 10 and the highest score of 15. The mean score and standard deviation in the postest experimental group were 13.20 and 1.207 respectively, while in the pretest experiment group was 11.73 and 1.223.

a) Test Prerequisite Analysis

Homogeneity test based on study group that is group of postest experiment and experiment group of pretest done by Levene test, The result of calculation can be seen in following table:
Tables 2. Wilcoxon Signed Ranking Test Based on Learning Factors.

<table>
<thead>
<tr>
<th>Last Model, New Model</th>
<th>( Z )</th>
<th>Asymp. Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-2.971(a)</td>
<td>.003</td>
</tr>
</tbody>
</table>

a Based on positive ranks.

Based on table 2 above the following will be described about the hypothesis test:

**Hypothesis:** The students’ smash volleyball performance in the postest experiment group is better than the pretest experimental group students.

4.1.2 Smash ball volleyball performance based on indicator factor

a. Data Description

Based on the data obtained from the student's volleyball smash performance based on indicators such as SS, SW, PB and SA

The results of the volunteer smash volumes of the postest experimental group on the SS, SW, PB and SA indicators have the same lowest scores: 3. The highest score on all indicators is 4. The result of volleyball smash skills in the pretest experimental group on the SS indicator has the lowest score of 3 and on the SW, PB and SA indicators the lowest score of 2 and the highest score for all indicators of 4 except the SA indicator has the highest score of 3.

b) Test Prerequisite Analysis

To prove the significance of the application of learning media development in terms of each SS, SW, PB and SA indicator on volleyball smash performance, it is necessary to test statistically with related t-tests. But before the requirements to be able to perform these calculations, it must be done prerequisite analysis test that is homogeneity test and normality test.

Homogeneity test based on learning group that is group of postest experiment and pretest done by Levene test, The result of calculation can be seen in following table:

Tables 3. Homogeneity Test of Variance by Indicator.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Levene Statistic</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS</td>
<td>15,740</td>
<td>1</td>
<td>28</td>
<td>,000</td>
</tr>
<tr>
<td>SW</td>
<td>,370</td>
<td>1</td>
<td>28</td>
<td>,548</td>
</tr>
<tr>
<td>PB</td>
<td>1,799</td>
<td>1</td>
<td>28</td>
<td>,191</td>
</tr>
<tr>
<td>SA</td>
<td>,924</td>
<td>1</td>
<td>28</td>
<td>,345</td>
</tr>
</tbody>
</table>

Ho: There is no difference in variance between groups

From table 9 above shows that the significance values for SW, PB and SA indicator are 0.548, 0.191 and 0.345, respectively, those values are greater than the significant 0.05 level. This indicates that the SW, PB and SA indicators are good at both the postest experimental group and the pretest experimental group had a homogeneous data variance, whereas the SS indicator had a significance value of 0.000 and the value was less than 0.05, so that the SS
indicators in both the postest and pretest experimental groups did not have homogeneous data variances.

c) Hypothesis Testing by Indicator
Based on the prerequisite analysis test indicates that the SS, SW, PB and SA indicators do not meet the prerequisites, the calculations for paired samples on those indicators use nonparametric statistical tests, precisely the Wilcoxon marked rank test. The results can be seen in the following table:

<table>
<thead>
<tr>
<th></th>
<th>SS_ML</th>
<th>SW_ML</th>
<th>PB_ML</th>
<th>SA_ML</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS_MB</td>
<td>2,236(a)</td>
<td>-1,633(a)</td>
<td>2,271(a)</td>
<td>-1,890(a)</td>
</tr>
<tr>
<td>Asymp. Sig. (2-tailed)</td>
<td>.025</td>
<td>.102</td>
<td>.023</td>
<td>.059</td>
</tr>
</tbody>
</table>

**Table 4**. Wilcoxon Signed Test Two Samples by Indicatora Based on positive ranks

**Hypothesis 1**: Student volleyball smash performance on SS indicators in the postest experimental group was better than in the pretest experimental group.

From table 11 it can be seen that for the SS indicator the significance value is 0.025. Since this hypothesis test is a one-tailed test, then the value must be subdivided 2 ie 0.025 / 2 = 0.0125 and the value of this significance is smaller than the significance level of 0.05, then reject Ho and accept Ha, which means Student volleyball smash performance on SS indicators in postest experiment group is better than students in the pretest experiment group can be accepted. Hence hypothesis 1 has been tested for its truth.

**Hypothesis 2**: Student volleyball smash performance on the SW indicator in the postest experimental group was better than the students in the pretest experimental group.

From table 11 it can be seen that SW indicator has a significance value of 0.102. Because this hypothesis test is a one-tailed test, then the value must be subdivided 2 ie 0.102 / 2 = 0.051 and the value of this significance is greater than the significance level of 0.05, then accept Ho, which means Performance smash volley students on the SW indicator in the postest experiment group did not differ from the students in the pretest experimental group were accepted. Thus hypothesis 2 has not been tested.

**Hypothesis 3**: Student volleyball smash performance on PB indicators in the postest experimental group was better than in the pretest experimental group.

From table 11 it shows that for the PB indicator the significance value is 0.023. Because this hypothesis test is a one-tailed test, then the value must be subdivided 2 that is 0.023 / 2 = 0.0115 and the value of this significance is less than the significance level of 0.05, then reject Ho and accept Ha, which mean student smash performance of student volleyball on PB
indicator in group of postest experiment better than student in group of pretest experiment acceptable. Hence, hypothesis 3 has been tested.

**Hypothesis 4:** Student volleyball smash performance on SA indicators in the postest experimental group was better than in the pretest experimental group.

From table 11 it can be seen that for SA indicator the significance value is 0.059. Because this hypothesis test is a one-tailed test, then the value must be subdivided 2 ie $0.059 / 2 = 0.0295$ and the value of this significance is smaller than the significance level of 0.05, then reject $H_0$ and accept $H_a$, which means Student volleyball smash performance on SA indicator in postest experiment group is better than student in the pretest experiment group is acceptable. Thus hypothesis 4 has been tested for its truth.

### 5 Conclusion

Based on data obtained from expert test result, small group test, field test and product trial, and discussion of research result can be drawn conclusion as follows:

1. Development of learning model of circuit-based volleyball smash has met the operational criteria of a learning model, namely: the syntax contained in it social system, prinsif reaction, support system and accompanist.

2. Results Development of learning model of circuit-based volleyball smash has qualified validity, homogeneity, normality, effectiveness and model of circuit-based development has been able to improve student learning outcomes of regular PJKR Faculty of Sport Sciences Universitas Negeri Medan.

3. From the experiment, the volleyball smash performance was based on the learning factor that the experiment group postest (new model) and the pretest experiment group (old model) smash volley ball of the experimental postest group is the lowest score of 12 and the highest 16, whereas in the pretest experimental group, the ability to smash the volleyball earned the lowest score of 10 and the highest score of 15.
References

Development of Football Learning with Tactical Approach

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Abstract. This study aims to produce football learning products with a tactical approach based on IQF based on basic soccer courses in the form of teaching materials. This study uses a research and development approach by developing learning instructional materials with a tactical approach based on competency standards through the analysis of the needs of lecturers and students. Based on the needs analysis of football lecturers at FIK Unimed, Medan Football Specialists and Soccer course lecturers from STOK Bina Guna Medan who need a football learning guide book that is in accordance with the existing lecture achievements. Based on the tests of small groups and large groups in the soccer course class at PKO FIK Unimed Semester I, the results of the Teaching Materials for Teaching Basic Football Materials with a Tactical Approach are very efficient to be used in the lecture process. This is because young people are understood and implemented a form of training that is designed according to the actual game so that students get a more challenging experience to solve it. In addition to improving the learning process, soccer learning textbook products with this tactical approach can improve the basic techniques of football skills for PKO students in the first semester of the 2018/2019 academic year.

Keywords: Learning, Tactical Approach, Football.

1 Introduction

The soccer course is one of the subjects contained in the IQF-based curriculum in the number of Sports Coaching Education (PKO) in the Faculty of Sport Science, Medan State University. The existence of the football course itself is not only as a supporting course but is one of the core courses in the PKO Department. Football courses in the PKO Department are one of the conditional courses which consist of semester I to semester IV, namely: Basic Football, Development of Football Skills, Physical Physical Conditions, and Tactics and Football Strategy. Students who pass Basic Football in the first semester, the student can only take the Soccer Skills Development course in the second semester, while students who do not pass are not allowed to take the Soccer Skills Development course.

The learning process of basic football courses so far has been done in the field using the drill approach, where the learning process is only focused on mastering the basic technical skills of mere football, so that when entering the game level students experience difficulties. These difficulties are like fear when mastering the ball so that the ball is easily taken away by the opponent. In this case the researcher estimates that the cause is due to the experience of students when following the learning process is not faced with a situation similar to the actual
In the teaching and learning process a tactical approach can be used as one of the answers to the lack of interest and motivation of students in participating in learning, often we meet with lecturers of football courses or lecturers of other sports courses to let the students play alone. This is one of the reasons why students feel less motivated and enthusiastic in participating in soccer learning. Learning with a tactical approach is designed to encourage students to solve tactic problems in the game. The tactic problem is essentially the application of technical skills in game situations. By using a tactical approach, students are better able to understand the link between techniques and tactics in a game so that students will more easily apply it in a real game.

In football games, the skills of each player are inseparable from one team unit and are not used individually. In the ability to kick, control the ball and win the ball from the opponent must be able to be aligned with other goals. In other words, the skills possessed by a player,
will not be able to achieve the goal if it is alone. Because of that we meet a lot, a player who has good skills and talents is not played by his coach, this is because the player cannot cooperate with team mates in the match. With a tactical training approach there will be a training process that prioritizes teamwork, because in this tactical approach is a game aimed at training playing techniques that are tailored to the needs of the player or student, so that in the training / learning process the player or students play enthusiastically.

Sucipto (2001: 3) states that a tactical approach is an approach to learning technical skills and is also applied in game situations.

2.2 Development of teaching materials

Dwiyogo (2004) states that the steps of the product development process are needs analysis, product development, and product testing. These three steps show the sequence of time and development activities. This can be confirmed by the fact that development research is a research approach that is linked to the design and development work and has the aim to develop in the design of environmental needs, formulation of the curriculum, achievement of the success of observation and learning. Basically, soccer learning instructional materials with a tactical approach developed are aimed at improving the results of learning itself. Teaching materials are a set of metrics that are arranged systematically both written and unwritten so as to create an environment that allows students to learn.

The instructional materials that are prepared are very important to overcome the limitations of the learning books of football courses so far. This is because teaching materials have several advantages including; (1) increase motivation and interest in reading, (2) contain material according to the needs of the needs, (3) use flexible learning patterns; (4) can be re-studied at any time; (5) accommodate various difficulties; (6) provide a summary; (7) has a communicative writing style (Hunter, 1997)

3 Method

This research is planned to be carried out at the Faculty of Sports Science, Medan State University Jl. Willem Iskandar Pasar 5 Medan Estate. Need analysis is done by observing several basic football lecturers in the Sports Coaching Department and majoring in Physical Education and Recreation.

This study uses a research and development approach or development research. This study begins with an analysis of the needs of users as material for redesigning material. Followed by collecting materials to compile a log book on basic soccer material.

This research was conducted to produce log book products in the form of football learning teaching materials with a tactical approach. Activities carried out are detailed steps in the implementation of Research and Development research as follows;

1) Potential Identification, Problems and Needs Researchers made preliminary observations at the Faculty of Sports Science to find out potential and problems. Preliminary observations were made using the interview method to the lecturers of basic football courses, using guidelines for identifying potential, problems and needs.

2) Log Book Validation soccer learning materials with a tactical approach by material experts, media experts, and subject lecturers. Revision Look Book football learning instructional materials with a tactical approach Log Book design development teaching
4 Result

The results of this development research are the development of a log book teaching materials for soccer learning with a tactical approach to the Basic Football course. Where the tactical approach itself is a learning approach, the implementation is carried out by applying situations such as in the actual game. With the log book, the process of learning basic soccer courses so far that has been done in the field using the drill approach can work well, where the learning process is only focused on mastering basic technical skills of soccer, so that when entering the game level students experience difficulties. These difficulties are like fear when mastering the ball so that the ball is easily taken away by the opponent. In this case the researcher estimates that the cause is due to the experience of students when following the learning process is not faced with circumstances similar to the actual football game. So that students can only master basic technical skills, while the football playing technique cannot, this will also have an impact on the learning process of football in the next semester.

The results of the validation and responses regarding the importance of developing a log book for teaching materials for soccer learning with a tactical approach to the Basic Football course, testers and testers showed that 80% said that a much needed 15% was needed and only 5% stated that it was not needed. Based on the results of this survey it can be believed that the development of a log book teaching materials for soccer learning with a tactical approach to the Basic Football course is needed.

Figure 1. The Process of The Study
References

The Development of Badminton Smash Learning Model for Medan State University Students

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Abstract. This study aims to produce a Smash badminton punch learning model through video tutorials, as a learning media tool. Research and Development (R & D) model development research method, the subject of this study were 60 students. This development research was conducting with the following steps: (1) preliminary study phase, (2) expert validation, (3) testing product, and (4) creating the final product. Data were collected by using instruments: (1) initial product validation, (2) observation questionnaire for trainers and material experts, and (3) student response observation sheets. The result of this study in a video tutorial video of the badminton smash punch learning model, namely: (1) basic smash learning variations without really using and using, (2) learning variations of smash blows without jumping, (3) learning variations of smash jump punches, and (4) variations smash learning in pairs.

Keywords: Learning model, tutorial video, and badminton smash.

1 Introduction

The factors that affect student learning outcomes, student still lack of understanding on understand the material delivered by the lecturer. According to Anne there are three stages of learning motion in the stage of learning motor movement, cognitive stage, associative stage and autonomous stage. So at this cognitive stage the lecturer must be able to convey the material well supported by good learning media. The lack of students' willingness to repeat after the lecture. In other word students who take badminton courses after running face to face on the scheduled time they average until the next meeting do not do or repeat the material that has been received. This is due to several existing learning resources that are still in the conventional form, namely thick and heavy papers in the form of books so students feel less practical and only provide temporary information. It cannot be denied that the availability of physical education learning media is still inadequate for optimal implementation of the lecture / learning process.

Badminton is a sporting branch of Indonesian pride must be disseminated and upgraded either in the community, society or at schools. Badminton a racquet sport played by two people (for single) or two opposite (for double) pairs. Similar to tennis, Badminton aims to hit the game ball through the net in order to fall in the field of opposing games that have been determined and try to prevent opponents from doing the same thing (Sofyan, 2009). Basic techniques that are the most difficult to master well is smash punch, it is because to get an accurate smash, complicate and turn off quickly the opponent's game needed the ability to
master the very high motion skills. After students attend badminton lectures, expected to have results, namely changes in motion. Changes from makeshift abilities become the ability to play badminton with the mastery of the right punch technique.

Explanation of how to hit a smash is linked to the provision of the right learning model because in addition to functioning as a tool to convey material or interaction, also functions as a tool to achieve goals, so that the learning model is able to improve skills in a learning process. By providing the right learning model, both in ways of giving lessons, ability to do new techniques or in regulating the systematic process of presenting the ways of teaching and teaching methods. Based on the above problems, need to develop learning models in improving the results of learning smash punch skills in badminton games.

2 Manuscript preparation

2.1 Development of learning model

Joyce, weil, danCalhom (2011) stated that a learning model is an illustration of a learning environment, which also includes teacher behavior when the model is applied. These models have many uses that reach all fields of education, starting from planning and curriculum material until to instructional planning material, including multimedia programs. Joyce and weil argued that learning model is a plan or pattern that can be used to design the curriculum (long-term learning plan), designing learning materials, guiding class or other learning (Rusman, 2012). The learning model can be used as a pattern of choice; it means that teachers can choose an appropriate and efficient learning model to achieve educational goals.

2.2 Tutorial media video

Learning media includes a tool which is physically used to convey the contents of teaching material, which consists of books, tape recorders, cassettes, video cameras, video recorders, films, slides, photos, pictures, graphics, television, and computers (Gagne and Briggs in AzharArsyad).

Tutorial video is (1) Classroom guidance by a teacher (tutor) for a student or a small group of students, (2) Additional teaching through tutors. Meanwhile, according to Amir Fatah (2008), video is a presentation of images and sounds captured by a camera, which is then arranged into a sequence of frames to be read in seconds.

In this study includes basic technical training materials for badminton game smash blows. The material is packaged in the form of a video tutorial with the help of video editing software that is wondersharefilmora.

Smash Badminton skills in badminton there are various basic techniques, including service, smash, lob, drop and footwork techniques. As stated by GiriVerianti (2007: 27) that, Basic skills of badminton can be divided into five parts: (1) serve, (2) smash, (3) overhead, (4) drive, and (5) drop.” The five basic techniques of badminton games must be mastered by badminton players to support or achieve the goals of the game.

Poole (in Ahmad, et al), stated that Smash punch is the fastest and strongest blow, where the shuttlecock is hit hard and dropped down in empty areas or pointing to the opposing player's body. Whereas according to Syahri smash is smash is an overhead (top) trawl that is directed down and carried out with full power.
Paper will be part of the conference proceedings therefore we ask that authors follow the guidelines explained in this example and in the file «FormatContentsForAuthors.pdf» also on the zip file, in order to achieve the highest quality possible (Smith, 1998).

Be advised that papers in a technically unsuitable form will be returned for retyping. After returned the manuscript must be appropriately modified.

3 Method

To be able to produce certain products, research is used in the form of needs analysis to test the effectiveness of the product so that it can function in the wider community, then research was needed to test the effectiveness of the product. So research and development were longitudinal (gradually it can be muly years) (Sugiyono, 2013).

The draft development research steps are as follows:

![Figure 1: Steps for using the Research and Development (R & D) method (Source: Sugiyono, 2013, 409)](image)

This development study classifies trial subjects into two, namely Subjects of trial experts, material experts and media experts. The subjects tested in this study were small (20 students) and for a large scale (60 students) badminton courses odd semester 2017/2018.

Data obtained through trial activities were classified into two, namely quantitative data and qualitative data. To find out whether there is a significant influence from this learning model through statistical methods (t-test).

4 Discussion

The results of data collection studies or the results of data collection studies or field findings are then described and analyzed so this result is descriptive and analytical by referring to the product to be produced. The following will be explained about the results of the learning model design validation test that will be developed by the researcher.
Table 1. The Result of Validation

<table>
<thead>
<tr>
<th>No</th>
<th>Model Name</th>
<th>Receipt</th>
<th>Inf</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Model 1 The basic motion is gradual without cock</td>
<td>Yes</td>
<td>Valid / Worthy</td>
<td>97.50</td>
</tr>
<tr>
<td>2</td>
<td>Model 2 Basic movements of hand movements</td>
<td>Yes</td>
<td>Valid / Worthy</td>
<td>97.50</td>
</tr>
<tr>
<td>3</td>
<td>Model 3 Overall basic motion without cock</td>
<td>Yes</td>
<td>Valid / Worthy</td>
<td>97.50</td>
</tr>
<tr>
<td>4</td>
<td>Model 4 Basic motion of hand and foot combination</td>
<td>Yes</td>
<td>Valid / Worthy</td>
<td>97.92</td>
</tr>
<tr>
<td>5</td>
<td>Model 5 Basic movements of cock and hand movements</td>
<td>Yes</td>
<td>Valid / Worthy</td>
<td>98.33</td>
</tr>
<tr>
<td>6</td>
<td>Model 6 Hand foot combination motion with cock</td>
<td>Yes</td>
<td>Valid / Worthy</td>
<td>97.50</td>
</tr>
<tr>
<td>7</td>
<td>Model 7 Smash hull of cock</td>
<td>Yes</td>
<td>Valid / Worthy</td>
<td>97.08</td>
</tr>
<tr>
<td>8</td>
<td>Model 8 Smash line service hull of cock</td>
<td>Yes</td>
<td>Valid / Worthy</td>
<td>97.92</td>
</tr>
<tr>
<td>9</td>
<td>Model 9 Central smash hull field of cock</td>
<td>Yes</td>
<td>Valid / Worthy</td>
<td>98.33</td>
</tr>
<tr>
<td>10</td>
<td>Model 10 Smash base line hull of cock</td>
<td>Yes</td>
<td>Valid / Worthy</td>
<td>96.67</td>
</tr>
<tr>
<td>11</td>
<td>Model 11 Smash hull of Smash left field service line</td>
<td>Yes</td>
<td>Valid / Worthy</td>
<td>97.92</td>
</tr>
<tr>
<td></td>
<td>Model</td>
<td>Description</td>
<td>Instruction</td>
<td>Valid / Worthy</td>
</tr>
<tr>
<td>---</td>
<td>-------</td>
<td>-------------</td>
<td>-------------</td>
<td>----------------</td>
</tr>
<tr>
<td>12</td>
<td>Model 12</td>
<td>cock of smash hull left field base line</td>
<td>Yes</td>
<td>Valid / Worthy</td>
</tr>
<tr>
<td>13</td>
<td>Model 13</td>
<td>Smash the movement towards the right front</td>
<td>Yes</td>
<td>Valid / Worthy</td>
</tr>
<tr>
<td>14</td>
<td>Model 14</td>
<td>Smash the movement to the front left</td>
<td>Yes</td>
<td>Valid / Worthy</td>
</tr>
<tr>
<td>15</td>
<td>Model 15</td>
<td>Smash Movement to the right side</td>
<td>Yes</td>
<td>Valid / Worthy</td>
</tr>
<tr>
<td>16</td>
<td>Model 16</td>
<td>Smash the movement towards the left side</td>
<td>Yes</td>
<td>Valid / Worthy</td>
</tr>
<tr>
<td>17</td>
<td>Model 17</td>
<td>Smash the movement towards the right back</td>
<td>Yes</td>
<td>Valid / Worthy</td>
</tr>
<tr>
<td>18</td>
<td>Model 18</td>
<td>Smash the movement towards the left back</td>
<td>Yes</td>
<td>Valid / Worthy</td>
</tr>
<tr>
<td>19</td>
<td>Model 19</td>
<td>Smash the movement in the middle towards the back</td>
<td>Yes</td>
<td>Valid / Worthy</td>
</tr>
<tr>
<td>20</td>
<td>Model 20</td>
<td>Cross Smash</td>
<td>Yes</td>
<td>Valid / Worthy</td>
</tr>
</tbody>
</table>

Based on the large-scale test the development of the badminton smash punch learning model from 60 students obtained a percentage of 97.89%.

Test results of the implementation hypothesis and the effectiveness of the badminton smash learning model that is carried out by the t-test formula obtained t count = 9.76 from the distribution list by using 1-α = 0.95 with dk n-1 (60-1)= 59 obtained the price of t table 2.66. When compared, it is obtained thitung> t table, thus the badminton punch smash learning model of Faculty of Sports Science students, Medan State University effectiveness is used to improve the results of badminton smash punch learning skills.

The factor that makes the development of this model acceptable to students is from the aspect of media display in terms of ease of use of media, Material Demand, Color clarity of the picture, Material easily understood. Aspects of content and material in terms of Material
Clarity, Picture Illustration clarify material and video to clarify material, so that the development model can be used to improve the learning outcomes of smash skills in badminton games.

5 Conclusions

The development of learning models using a gradual basic motion model without cock, basic motion models of hand movements, basic foot and hand combination motion model, the whole basic motion model without cock, basic motion models of cock hand movements, hand motion combination model with cock, smash hullcock model, smash line service hull cock model, central smash hull of cock model field, smash base line hull of cock model, smash hull left field service line of cock model, smash hull left field base line of cock model, smash movement model towards the right front, smash movement model towards the left front, smash movement model to the right side, smash movement model to the left side, smash movement model towards the right back, smash movement model towards the left back, smash movement model in the middle towards the back, cross smash model as a product that has been produced by researchers can be used as a learning model in the process of learning badminton smash blows.

References

The Difference of Influence of Learning Methods and Coordination Eye-Hand Against The Results of The Study Lay-Up Shoot on Student PKO FIK UNIMED 2018

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Abstract. Lay-up shoot is one type of shot in a basketball game that is used to break through the opponent’s defense to shoot closer to the basketball hoop, but not infrequently this shot fails due to eye-hand coordination and leg muscle power that is lacking in players so Mastery of the ball when ending the dribbling and when lifting the ball and repulsion that is not good at shooting causes the ball not to enter the ring. The purpose of this study was to find out (1). Differences in the effect of alternate leg bound and double leg bound learning methods on the learning outcomes of lay-up shoot. (2). Differences in influence between high-eye hand coordination and low eye-hand coordination on learning outcomes from lay-up shoot. (3) Knowing whether there are interactions between learning methods and eye-hand coordination of the learning outcomes of lay-up shoot. Research uses experimental methods. The design of the study was Factorial 2 x 2. The population of this study was all FIK Unimed PKO students who took the advanced basketball course. A sample of 70 people were taken with total sampling technique. Research instruments used eye-hand coordination tests and lay up shoot tests. Data analysis techniques used statistical analysis while the calculation used a difference test with Anova Factorial 2 x 2 experiments at a significant level of 5%. to fulfill the assumptions the results of the research were tested for reliability and prerequisite test analysis. The results showed (1). There are differences in effects between alternate leg bound and double leg bound learning methods on the learning outcomes of lay up shoot. (2). There is a difference in the effect of high-eye hand coordination and low eye-hand coordination on the learning outcomes of lay up shoot, and, (3). There is an interaction between learning methods with eye-hand coordination on the learning outcomes of lay up shoot.

Keywords: Learning Method, Eye-Hand Coordination, Lay-up Shoot.

1 Introduction

To be able to play well, a player is required to master the basic techniques of playing including; passing, dribbling, pivot and shooting. Shooting (shooting) is very important role, because only with shooting as if the player can enter the ball. Of the many shooting techniques, one of them is the lay up shoot technique. This type of shooting is often done by players to break through the guard and defend the opponent closer to the ring to enter the ball.
Mistakes during lay up shoots that often occur so that the ball does not enter is; lack of eye coordination with the hand to catch the ball while ending dribbling, unfavorable footsteps cause loss of balance when you want to lift the ball, and lack of foot repulsion, and lack of hand eye coordination when you want to put the ball into the ring.

There are many ways that can be done to improve the ability of learning results of lay up shoot, among others; ability to jump with alternate leg bound and double leg bound training methods, eye hand coordination exercises by throwing the ball into the wall.

To be able to improve the ability to jump can be trained with alternate leg bound and double leg bound learning methods. Both forms of exercise are included in the form of plyometric exercises that aim to increase the explosive power of the leg muscles, because the mechanism of the movement mostly involves muscles in the lower extremities (Car, 2003 in Cahyo et al, 2012). In this exercise the developed are leg and hip power. By altering both limbs especially the work of flexor and extensor on the thighs and hips. The functional anatomy of alternate leg bound movements includes bounding categories including (1) flexi thighs, which involve the muscles of sartorius, illacus and gracillius, (2) knee extension involving muscles rectus femoris, vastus lateralis, medial and intermedius (quadriseip group), (3) thigh extension, involving the muscles of the femoris biceps, semitendinosus, and seminembranosus (hamstring group) and also involving the maximax gluteus muscles and minimus (gluteus group), (4) flexing the knee and feet, involving the gastrocnemius muscle, (5) adduction and abduction of the thighs, involving the gluteals and adductor longus, brevis, magnus, manimus and hallucus muscles (Hidayat, 2015). Next Double Leg Bound. In this exercise developed the power of the leg and hip muscles, especially gluteals, hamstring, quadriceps, and gastrocnemius. The muscles of the arms and shoulders are also indirectly involved. This exercise has broad applications for various sports that involve jumping / jumping like basketball. The location of the alternate leg bound and double leg bound plyometric training methods is the plyometric training technique in the alternate leg bound using one of the right or left legs, which rejects from behind and the other leg is lifted as far as possible forward and swings both arms from front to back. Whereas in the plyometric training method, double leg bound training techniques jumped upwards and landed as far as possible in front of them using two legs and swung both arms from top to bottom.

In addition to the repulsion capabilities needed in lay up shoots, eye-hand coordination is also needed. Coordination is the ability to combine several movements to achieve a harmonious movement in accordance with the objectives. (Suharno HP, 1981: 29). Another opinion expressed by Bompa (1983: 12), coordination is a complex motor skill necessary for high performance.

Coordination is a complex need for high performance. Furthermore Bompa (1990) added that coordination is a very complex biomotor ability, interconnected with speed, strength, endurance, and flexibility. According to Sanjoto (1999: 9), that coordination is a person's ability to integrate different movements into an effective single movement pattern. So that coordination is the body's ability to combine several elements of the movement into an effective and harmonious movement in accordance with its objectives.
In performing lay up shoots, it requires the development of maximum power coordination. Coordination must be developed with appropriate, easy and precise movements. To produce better lay up shoot, it is necessary to coordinate the movement of the foot with visuals. Eye-hand coordination when performing lay up shoot is an ability in combining visual perception with hand movements into a special motion pattern, which is directing the ball to the target object in the form of a board or ring. A player who does not have a good level of coordination will not produce good and profitable shoot quality in a game.

2 Research method

2.1 Research design

<table>
<thead>
<tr>
<th>Learning Method</th>
<th>Alternate Leg Bound (A1)</th>
<th>Double Leg Bound (A2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High (B1)</td>
<td>A1B1</td>
<td>A2B1</td>
</tr>
<tr>
<td>Low (B2)</td>
<td>A2B1</td>
<td>A2B2</td>
</tr>
</tbody>
</table>

2.2 Population and research sample

The population in this study is the entire student population is taking advanced basketball courses. While the sample in this study were 70 students (sample total)

2.3 Research instruments

a). Eye-Hand Coordination Test
b). Lay Up Shoot Test
Table 2. Summary of Descriptive Statistics of Learning Outcomes Data Lay Up Shoot according to the Research Group.

<table>
<thead>
<tr>
<th>Method</th>
<th>Eye-Hand Coordination</th>
<th>Statistics</th>
<th>Pre-Test</th>
<th>Post-Test</th>
<th>Enhancement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alternate Leg Bound (A1)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High (B1)</td>
<td>Total</td>
<td>908</td>
<td>935</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>50.46</td>
<td>51.94</td>
<td>1.48</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>1.85</td>
<td>2.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (B2)</td>
<td>Total</td>
<td>814</td>
<td>841</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>47.93</td>
<td>49.50</td>
<td>1.57</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>5.05</td>
<td>2.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Double Leg Bound (A2)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High (B1)</td>
<td>Total</td>
<td>889</td>
<td>906</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>49.42</td>
<td>50.36</td>
<td>0.94</td>
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</tr>
<tr>
<td></td>
<td>SD</td>
<td>3.46</td>
<td>1.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (B2)</td>
<td>Total</td>
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<td>860</td>
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<tr>
<td></td>
<td>Mean</td>
<td>49.61</td>
<td>50.61</td>
<td>1.00</td>
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</tr>
<tr>
<td></td>
<td>SD</td>
<td>3.20</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Based on the description of the alternate leg bound and double leg bound learning method data and high hand-eye coordination level and low eye-hand coordination, it shows:

1. When compared between groups of students who received treatment for lay-up shoot using the alternate leg bound method with an average increase of 1.54 and a double leg bound average increase of 0.94, an increase of 0.6. this means that the alternate leg bound method is better than the double leg bound method.  
2. When compared between groups of students who have a high increase in eye-hand coordination 44 and who have low-level eye-hand coordination 43.

### 3 Result and discussion

1. The results of the calculation of the hypothesis that there are differences in the effect of the alternate leg bound method with double leg bound on the learning outcomes of lay up shoot for PKO FIK-Unimed students in 2018. Based on the results obtained show that there are differences in the influence between the alternate leg bound method and double leg bound on learning outcomes of shoot lay-p 0.006 $<\alpha$ 0.05.

   Learning alternate leg bound and double leg bound is a form of pliometric training that aims to increase the power of leg muscles. Having the explosive power of the leg muscles
allows the athlete to jump as high as possible as in lay up shoots in a basketball game, with a high jump that makes it easy to insert the ball into the ring.

Plaiometric work is called "stretch reflex" (also called "stretch reflex"), also called "spindle reflex" or "myotatic reflex" (reflex or miotatic reflex spindle). Shaft reflex devices or devices and strain reflexes are components main of the overall nervous system control of body movements. Plyometric exercises are exercises to develop stretch reflex ability in the muscles to produce explosive movements.

The principle of this exercise movement is the change in the motion of both legs, namely the flexor and extensor thighs and hips (Hidayat, 2015). The plyometric alternate leg bound exercise has the same goal as double leg bound, but it is different in the way it is done, where in the alternate leg bound exercise it jumps with one foot swing forward like kicking. Whereas in the double leg bound exercise, jumping forward upwards using extensions on the hips and arm movements to push forward and both legs jump together (Primayanti, 2011).

Based on the purpose of the exercise to increase the leg muscle power to make high jumps, then this exercise is suitable to improve the results of lay up shoots because shoot shoots also require a high jump to approach the ball inserting ring.

When viewed from the specifications of the motion will allow the difference in the results of the lay up shoot. In the alternate leg boundary exercise emphasizes one foot leap forward, while the double leg boundary emphasizes the jump and two foot swing. But if it is associated with lay up shoot techniques that require high jumps and hand swings, the alternate leg bound exercise is better than double leg bound in increasing lay up shoot results because footwork in alternate leg bound exercises is similar to foot repulsion in lay up shoots. .

2. The results of the calculation of the hypothesis which states that there is a difference in influence between high-hand eye coordination and low-hand eye coordination on the learning outcomes of lay up shoot for PKO FIK-Unimed students in 2018. -p 0.000 <α 0.05.

The findings in this study explain that athletes who have high eye-hand coordination will be able to perform better lay-up shoots than those who have low-eye hand coordination. Students who have high eye-hand coordination allow coordinating the lay up shoot movement to be more effective and efficient and able to steer the target.

Thus it can be said that high-hand eye coordination is very necessary for every basketball player. Based on this, each athlete needs to have high eye-hand coordination to support the ability to shoot up.

3. Interaction Between the Eye Coordship - hands with Learning Outcomes lay up shoots.
The results of the research about the hypothesis that there is an interaction between Mata-hand coordination with the ability to lay up shoot -p 0,000 <0,05. Adjustd R Square value of 0.979 means that there is an interaction of 97.9%.

Overall it can be explained that after statistical testing of empirical data obtained from the field it can be said that the proposed eye-hand coordination variable provides an interaction with the ability to lay up shoot.

The level of coordination of a person’s motion is a reflection of its ability to carry out a movement smoothly, precisely and efficiently. A person with good coordination is not only able to do a skill perfectly, but also can easily and quickly do movement skills that are still new to him.

Thus, it can be explained the importance of having good eye-hand coordination so that it can improve lay-up shoot.
4 Conclusion and suggestions

4.1 Conclusion

1. There is a difference in the effect of alternate leg bound and double leg bound learning methods on learning outcomes of lay up shoot.
2. There is a difference in effect between high eye-hand coordination and low eye-hand coordination on the results of learning lay up shoots.
3. There is an interaction between the lay-up shoot learning method and eye-hand coordination.

4.2 Suggestions

1. In an effort to improve the learning outcomes of lay up shoots, in addition to the application of appropriate learning methods must pay attention to the level of eye-hand coordination of students.
2. Teachers and trainers are expected to apply alternate leg bound and double leg bound learning models to improve the learning outcomes of lay up shoots.

References

The Anthropometry and Physical Factors in Determining Drive Blowing Skills in Squash Game to the Students at Faculty of Sport Science UNIMED

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Abstract. This study used correlational methods, for the design the writer used confirmatory factor analysis. Data was processed through: (a) Analysis of multivariate statistical factors by using Statistical Product and Service Solutions (SPSS) version 20 software therefore it can be reduced to be some factors. (b) Calculating the average deviation value of each factor in the latent variable and the dependent variable. (c) Describing the value and the position of the average score of the dominant variable in the transformation of matrix importance-performance. To conclude, the factors of anthropometry and physical (latent variables ξ₁) determining the blowing drive skills in squash game can be measured by the indicator of variables such as weight (0.888 and 0.855), height (0.877 and 0.854), leg length (0.451 and 0.375), grip strength (0.719 and 0.670), flexibility (0.432 and 0.335), hand-eye coordination (0.546 and 0.539), leg muscle power (0.765 and 0.750), agility (0.789 and 0, 783), speed (0.8158 and 0.816) and cardiovascular endurance (0.754 and 0.715) that will benefit the students of the faculty of sport science UNM to increase their drive blowing skills in squash game.

Keywords: Anthropometry, Physical, Drive blowing skills and squash game

1 Introduction

1.1 Research background

To improve the students’ achievements in squash sports, students should master some basic technical skills in playing squash. Some of the basic techniques are punch drives, servicing, volleyball, boast, lob, drop-shot, etc. Those are supported by physical conditions. One of the indications in developing the students’ achievements of sports is physical formation and the aspect of athletes’ anthropometry. The formation of physical elements are to create suitable squash players with the demands of the squash match criteria. Exactly, it cannot be separated from the training process which is expected to excogitate the professional athlete. Mochamad Sajoto (1995: 11) said that "The aspect of achieving appreciation in sports is the biological aspect that includes the structure and posture of the body, namely the height and length of legs, size, width and weight, and somatotype (body shape)".

To develop squash sport skills, students have to master some basic technical skills in playing squash. Some of the basic techniques are punch drive, service, volleyball, boast, lob, drop-shot and so on. Mastering the some basic technical skills students must be trained in a continuous training program.
A *squash* player should know some ways in mastering basic technical of *drive* blowing skills in playing *squash*. One of them are to control the blow so that the player can direct ball to an empty corner of the field where the opponent has difficulty in reaching the ball. One of the tricks in getting score is to place and direct the ball from the front wall, then it will fall in the corner between the side wall and the floor, so that the ball does not bounce again and it cannot be struck by the opponent. There are many methods that have been applied in order to develop the technique of blowing *drive*. However, many players still haven’t realized the right way that can produce good blowing *drive*.

2 Literature review

2.1 History of the squash game

The *squash* sports actually had been existed in the 19th century, in the Fleet Prison area of London, taken form (http://ggo-blog.blogspot.com/2013/11/sejarah-dan-cara-bermain-squash.html). According to Hanlon (2009: 226) the popularity of squash has been spread to various countries and it had been played by 15 million people worldwide, and almost every country has the *squash* courts. Recently, the game has been extremely popular in South America, Eastern Europe, and the United States.

Although the *squash* game was invented and discovered in England, the United States was primarily established the the first *squash* association in 1907 under the name of the United States Squash Racquets Association. In fact, in its origin country England, *squash* was originally a branch of field tennis. Back then, *squash* was just established in England in 1928 under the name Squash Rackets Association. Since that year, England has always held *squash* tournaments under the name of the British Open. Britain had brought the sport to all over parts of the world too, especially during colonialism.

In Indonesia, *squash* sports have actually been known at the end of the World War II, precisely in 1948. The British Army first built a *squash* field in Indonesia located in Embong Sawo Surabaya. The red thread of the history of *squash* development began to be inscribed by an Indonesian named Bambang Gatot Subroto. At that time Bambang often watched *squash* matches because he worked in a star-rated hotel in Jakarta. He was offered to learn *squash* in Pakistan.

2.2 The factors of anthropometry and physical

2.2.1 The factor of anthropometry in playing *squash*

Anthropometry is the study of the measurement of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue. The word "anthropometry" comes from the Greek word "anthropo" which means human and "metron" which means size. Anthropometry includes various measurements of the human body. Body weight, height, body posture, length, skin fold thickness, circumference (head, chest, waist, legs, etc.), length of limbs (arms, legs).

In general, there are 3 human shapes and structures can be described: (1) endomorph, (2) mesomorph, and (3) ectomorph. Every human body is formed from various levels of them.

2.3 The factor of physical in playing *squash*
Djoko Pekik I, 2002: 65) suggests that a good physical condition has many advantages, it includes that the athletes are able and easy to learn skills that are relatively difficult, the athletes are not easily get tired during training or matches, training programs can be completed without having any obstacles and can complete heavy training.

Physical factors that are suitable for the characteristics of squash, as follows:

1. Flexibility
   Flexibility means yaitu broad motion of one joint or several joints. There are two kinds flexibility, such as (1) static flexibility, and (2) dynamic flexibility.

2. Endurability
   Endurance is the body's ability or parts of the body that work in a certain time which is influenced by the work ability of the cardiorespiratory work system. Endurance is often defined as the ability to build the muscles to be active for a long time.

3. Speed
   Speed is a component of the physical condition needed in every sport. Speed is a crucial physical component in any kinds of sports, because it is included in elements of basic physical conditions besides strength (strength) and endurance.

4. Power of Arm Muscles
   The formula used in explosive power is: power/muscle explosive power = work/ time = strength x mileage.
   Power is divided into 2 (two), namely:
   a) Explosive power; this power is used to overcome lower resistance, but it used with the maximum of explosive power acceleration.
   b) Fast motion strength; this movement is carried out to against the resistance with an acceleration below the maximum, it is used for repetitive movements, such as running, riding, etc.

2.4 Hand-eye coordination

Harsono (2001: 39) defined that coordination is the ability to integrate various kinds of movements into one or more specific motion patterns.

2.5 Research hypothesis

The research hypothesis can be formulated as follows; 1) The anthropometry factors of height, weight, and leg length determine blowing drive skills in squash game. 2) The Physical factors strength of grip, flexibility, endurance, speed, arm muscle power, leg muscle power, hand-eye coordination and cardiovascular endurance determine the blowing drive skills in squash game.

3 Research design

3.1 Research method

In this study, the writer used the correlational research with a confirmatory factor analysis design that ensures the relationship of indicator variables with latent variables that determine the blowing drive skills. The data was analyzed through: a) The analysis of multivariate statistical factor analysis using SPSS computerized software that can be reduced to be just
some factors; b) The calculation of the average deviation of each factor in the latent variable and the dependent variable.

The research design can be seen in the following figure. Statistical Analysis Factor

![Figure 1. Research Design](image)

### 3.2 Technique of data collection

Measurement of: 1) anthropometry a) measurement a) height, b) body weight and c) leg length, 2) physical components namely a) grip strength; b) balance; c) flexibility; d) hand-eye coordination, e) leg power (vertical jump); f) agility; g) speed; cardiovascular endurance; 3) blow drive includes; (a) initial position; (b) the implementation of the movement; and (c) final position.

### 3.3 Technique of data analysis

The data was analysed by using descriptive frequency test, simple correlation test, and multiple correlation test along with KMO-MSA (Kaiser-Meyer-Olkin and Measured of Sampling Adequacy); Anti-image correlation test; initial engine value; Communalities; Component matrix and Component score coefficient matrix. Furthermore, in statistical factor analysis the writer used the SPSS program 23.00 statistical assistance test.

### 4 Result and discussion

#### 4.1 Research result

The research result can be seen in the table 1, as follows:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Initial Extraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Weight (X1)</td>
<td>1.000</td>
</tr>
<tr>
<td>Body Height (X2)</td>
<td>1.000</td>
</tr>
<tr>
<td>Limb Length (X3)</td>
<td>1.000</td>
</tr>
<tr>
<td>Grip Strength (X4)</td>
<td>1.000</td>
</tr>
<tr>
<td>Balance (X5)</td>
<td>1.000</td>
</tr>
<tr>
<td>Flexibility (X6)</td>
<td>1.000</td>
</tr>
<tr>
<td>Hand Eye Coordination (X7)</td>
<td>1.000</td>
</tr>
<tr>
<td>Leg Muscle Power (X8)</td>
<td>1.000</td>
</tr>
<tr>
<td>Agility Running Back And Forth (X9)</td>
<td>1.000</td>
</tr>
<tr>
<td>Speed (X10)</td>
<td>1.000</td>
</tr>
<tr>
<td>Durability (X11)</td>
<td>1.000</td>
</tr>
</tbody>
</table>
From the table above, it can be seen the initial value and the extraction value. The initial value reflects the role or deviation, if the variable determines the individual factors in forming these factors, while the results of the communalities for each variable are found in the extraction column. Extraction values explain the percentage of roles or the deviation of each dimension or sub-variable making up the factors individually to factors. This also means that the numbers in the extraction column show the percentage of rotated component matrix. From the table above it is known that the role of the largest dimension is the sub-variable weight, with a value of 0.855 or 85.5% and the smallest is flexibility with a value of 0.335 or 33.5%. Then to find out the deviation of each variable in each component, it is necessary to do a rotation process that produces the Matrix component as above. The results of Rotated Component Matrix Analysis of anthropometry factors and physical drive skills in squash game in Table 2, shown as below;

<table>
<thead>
<tr>
<th>Component</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Weight (X1)</td>
<td>-.018</td>
<td>.918</td>
<td>.110</td>
</tr>
<tr>
<td>Body Height (X2)</td>
<td>-.116</td>
<td>.907</td>
<td>.130</td>
</tr>
<tr>
<td>Limb Length (X3)</td>
<td>.336</td>
<td>.447</td>
<td>-.250</td>
</tr>
<tr>
<td>Grip Strength (X4)</td>
<td>.813</td>
<td>-.085</td>
<td>.029</td>
</tr>
<tr>
<td>Balance (X5)</td>
<td>.183</td>
<td>-.126</td>
<td>-.225</td>
</tr>
<tr>
<td>Flexibility (X6)</td>
<td>.507</td>
<td>-.156</td>
<td>.230</td>
</tr>
<tr>
<td>Hand Eye Coordination (X7)</td>
<td>.549</td>
<td>.460</td>
<td>.159</td>
</tr>
<tr>
<td>Leg Muscle Power (X8)</td>
<td>.836</td>
<td>.135</td>
<td>.180</td>
</tr>
<tr>
<td>Agility Running (X9)</td>
<td>-.845</td>
<td>-.128</td>
<td>-.228</td>
</tr>
<tr>
<td>Speed (X10)</td>
<td>-.137</td>
<td>-.085</td>
<td>-.889</td>
</tr>
<tr>
<td>Durability (X11)</td>
<td>.397</td>
<td>.106</td>
<td>.739</td>
</tr>
</tbody>
</table>

Based on the results of Rotated Component Matrix Analysis of anthropometry factors and physical analysis factors of blowing drive skills in squash game, it showed that all the factors have a value of ≥ 0.5. In other words, it means that the dimensions of the anthropometry and physical factors which consist of strength grip, flexibility, hand-eye coordination, leg muscle power, speed, and cardiovascular endurance that determine the blowing drive in squash game.

4.2 Discussion

Based on the results of hypothesis test about the analysis of anthropometry factors (ζ1) and physical analysis factors (ζ2) in determining the blowing drive skills above in playing squash game. There was one anthropometric and physical variable that is eliminated from the dominant analysis factor or (H0 is rejected) because it has an MSA value below 0.5 is balance (0.397) while anthropometric and physical factors that determine the blowing drive skills in squash games (H0 is accepted) or it has a component value factor of ≥ 0.5.
1) Body weight with the value of the factor that determines the blowing drive skill is 0.855
2) Height with the value of the factor component that determines the blowing drive skill is 0.854
3) Leg length with the component value factor that determines the blowing drive skill is 0.375
4) Grip strength with the value of the factor component that determines the blowing drive skill is 0.670
5) Balance with the value of the factor component that determines the blowing drive skill in the squash game is 0.783
6) Flexibility with the value of the factor component that determines the blowing drive skill in squash games is 0.335
7) Hand eye coordination with the component value factor that determines the blowing drive skill in the squash game is 0.395
8) Power of leg muscles with the value of the factor component that determines the blowing drive skill in a squash game is 0.750
9) Speed with the value of the component factor that determines the blowing drive skill in squash games is 0.816.
10) Cardiovascular endurance with the value of the component factors that determines the blowing drive skill in squash games is 0.715

The results of this study illustrated that the anthropometric and physical factors that determine blowing drive skills in squash games were weight, height, leg length, grip strength, flexibility, hand-eye coordination, leg muscle power, cardiovascular speed and endurance.

From the results of data analysis and the explanation above, it is known that there is one variable that has a small or less dominant value contribution. So, it must be eliminated, namely balance. Balance is eliminated because the balance biomechanically does not have a close relationship with skills, or in this case specifically tennis the field of explanation that acceptable is a balance. The balance is the asset of the UNIMED student's blowing drive skills in the squash game so during the long-term training process the balance of students' blowing drive skills. As a result the UNIMED student will play squash games relatively constant or static, unlike grip flexibility or strength, which later on growth and improve both quality and function.

The results of factor analysis in this study were calculated using the KMO and Bartlett's Test method with SPSS computerized statistical software which is supported by a theoretical basis, from the explanation and analysis of the data that has been done then obtained the anthropometric and physical factor variables determining blowing drive skills in squash games consisting of 8 (eight) indicator variables. The results of the factor analysis statistical test of all variables are as follows:

a. The dominant anthropometric factor in determining blowing drive skills in squash games is body weight, height and leg length. While the physical factors that determine blowing drive skills in squash games are the strength of grip, flexibility, hand eye coordination, leg muscle power, speed, and cardiovascular endurance. After data collection and further analysis of the data in the sample, it can be stated that the blowing drive skills in the squash game of student blowing drive skills in UNIMED student squash games are formed or influenced by weight, height, leg length, grip strength, flexibility, hand-eye coordination, leg muscle power, agility, speed and cardiovascular endurance. The ten independent variables have a positive correlation value and are above ≥ 0.5 based on the value of rotated component matrixes. Then it can be concluded that the greater value of rotated component matrix than the
independent variables will be more beneficial for students to increase the skill of the drive-in squash game.

b. Anthropometry and physical factors that have a low or less dominant correlation value in determining blowing drive skills in squash games are balance. This can be seen in the Anti-Image matrices correlation table 5.5, in the table there is one variable with MSA values below 0.50 is equilibrium (0.397), thus these factors must be eliminated or excluded from further analysis tests because they do not have sufficient values for further testing.

5 Conclusion

The conclusion of the research presented was based on the results of tabulated data for descriptive frequency testing and simple correlation test and multiple correlation test using KMO-MSA (Kaiser-Meyer-Olkin and Measure of Sampling Adequacy); Anti-image correlation test; initial enginevalue; Communalities; Component matrix and Component score coefficient matrix.

5.1 Conclusion

Anthropometry and physical factors (latent variable ξ1) that determine the blowing drive skills in squash games can be measured by the indicator variables weight (0.888 and 0.855), height (0.877 and 0.854), leg length (0.451 and 0.375), grip strength (0.719 and 0.670), flexibility (0.432 and 0.335), hand eye coordination (0.546 and 0.539), leg muscle power (0.765 and 0.750), agility (0.789 and 0, 783), speed (0.8158 and 0.816) and cardiovascular endurance (0.754 and 0.715) will benefit students in increasing blowing drive skills.

5.2 Suggestion

Suggestions to the teachers / squash coaches to choose the professional athletes who will be athletes must always consider the elements of anthropometry and physical especially weight, height, leg length, grip strength, balance, flexibility, hand eye coordination, leg muscle power, speed, agility and

References

Innovation and Development of Evaluation Tools of
KKNI Based for Learning Subject of Process
Evaluation and Chemical Learning Results

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Abstract. The enactment of the KKNI (Indonesian National Curriculum Qualification) in learning activities in Unimed is a challenge for lecturers and students, one of which is that a lecturer must be able to develop his professional and pedagogical competencies such as compiling a learning evaluation tool in the course he teaches. One of the courses that we are able to do almost every year is the subject of Evaluation and Assessment of the learning outcomes of chemistry. The research group of lecturers in the field of expertise (KDBK) aims to: (1) develop innovative Evaluation Tool based on Indonesian National Curriculum Qualifications (KKNI) on subject of Evaluation Process and Chemistry learning outcomes, (2) validate and revise the results of the Development Evaluation Tool, (3) Do simple trial of Evaluation Tool on result development on learning the subject Evaluation process and chemistry learning outcomes. Preliminary research results indicate that. The research method used is Research and Development (R & D), namely research methods to produce certain products, and test the effectiveness of these products. Feasibility analysis of Learning evaluation tools are carried out with the aim to determine whether the KKNI Evaluation Tool developed is suitable for use in the course of Evaluation process and learning outcomes of chemistry. Feasibility analysis is calculated using a percentage formula. Preliminary research results indicate that of KKNI evaluation tools for routine assignments were declared to be very feasible to use with a percentage of 90%, while the CJR evaluation tool was feasible to be used with a percentage of 80%, meanwhile CBR is feasible with a percentage of 80%. Mini Research with a percentage of 90% declared very feasible. Manipulation of Idea with a percentage of 80% declared feasible and Project Assignments are declared to be feasible with percentage of 80%. Thus it was concluded that the Learning Tools on subject of Evaluation and PHB Chemistry that being developed could be used in next research.

Keywords: Innovation, Learning tools, KKNI, Evaluation

1 Introduction

The government regulation on 2012 no 8 concerning the Indonesian National Qualification Framework is a reference and guideline in developing the curriculum, especially at the university level. The curriculum standard that is arranged in a higher education institution is based on meeting the Learning Outcomes (CP) or Learning Outcome (LO) targets, which can be fulfilled through the content and learning process. (Unimed, 2013)
The implementation of IQF in learning activities is a challenge for lecturers, for instance a lecturer must be able to develop professional and pedagogical competencies such as compiling a learning evaluation tool in the course he teaches. One of the subjects used the IQF is the chemistry learning evaluation and assessment (PHB) course.

The IQF implementation includes an Assessment Concept that demands 6 concepts of measured tasks and abilities, namely Assessment of Critical Book Review, Assessment of Critical Research Review, Mini Research Assessment, Project Assessment, Engineering Ideas and Routine Tasks. The six concepts of appraisal must be made and controlled by a lecturer who will teach the subject.

At the Chemistry Education Study Program there is no six standard assessment concepts for the Chemistry Evaluation and PHB subjects. For this reason, the research team plans to make a concept for evaluating the Chemistry Evaluation and PHB courses to be used in future learning.

Based on a brief description of the Evaluation and PHB Chemistry courses, the discussion of this course covers the concept of planning and implementing the learning process and learning outcomes in the field of chemistry studies, concepts and implementation of measurement, assessment and evaluation, types of measuring instruments in the process and results of teaching and learning, tests and non-test, determine instrument validity and reliability, analyze test items, process measurement results data to determine evaluation results, and make reports. From this brief description, it can be seen that the courses of Evaluation and PHB Chemistry contain basic concepts of evaluation and measurement that can be used to solve problems related to daily life and its application in learning. (Sugiharti, 2014)

Evaluation Tools based on KKNI and Subject of Evaluation and PHB chemistry. The KKNI (Indonesian National Qualification Framework) is a reference and guideline in developing the curriculum, especially in university education. The curriculum can be interpreted as a document or written plan regarding the quality of education that students must possess through a learning experience. This understanding means that the curriculum must contain in one or several written documents or plans. Likewise, in determining the concept of valuation in a course, certain signs are needed to be able to achieve the expected goals. There are several concepts and abilities that are measured in an IQF-based curriculum, which can be achieved through assignments. Furthermore, Medan State University established 6 types of tasks to achieve the concepts and abilities that will be measured in a course, namely: Routine Tasks (TR); Critical Book Report (CBR); Critical Journal Report (CJR); Mini Research (MR); Project Tasks (TR); and Engineering Ideas (RI)

Process Evaluation and Chemistry Learning Outcomes courses are subjects at KDBK Education which discuss about; topics of the concept of planning and implementing the learning process and learning outcomes of chemistry, concepts and implementation of measurement, assessment and evaluation, types of measuring instruments in the process and results of teaching and learning; test and non-test, determine instrument validity and reliability, analysis of test and non-test items, process measurement results data to determine evaluation results, and make a report.

From the concepts listed in this course, it can be seen that the Chemistry Learning Evaluation course contains basic concepts of evaluation and measurement that can be used to solve problems related to everyday life. This course is a subject that is indispensable for a teacher or prospective teacher (education student) in preparing themselves as a teacher to be able to conduct assessments in the class as they should.
2 Research methodology

Research and Development (R & D) methods are research methods used to produce certain products, and test the effectiveness of these products. To be able to produce certain products, research is used in the form of needs analysis (used survey or qualitative methods) and to test the effectiveness of these products in order to function in the wider community, research is needed to test the effectiveness of these products. (Borg. W.R, 1983) 3)

This research was conducted in the Department of Chemistry Unimed which was held in 2018, for students who took the course as much as 2 classes taken purposively.

The approach used in this research is a qualitative approach, namely the approach used to examine the condition of natural objects (Arikunto, 2011)4). Meanwhile the variety of research being used is descriptive to systematically describe the facts and characteristics of the subject precisely.

Data collection techniques in this study were carried out with instrument and questionnaire feasibility sheets. Feasibility analysis of Learning Evaluation tools are conducted with the aim to find out whether the Evaluation Tool developed is suitable to be used as an Evaluation Tool in the Evaluation and PHB chemistry courses. Feasibility analysis (Sugiyono, 2015) is calculated using the following formula:

\[
\text{Percentage} = \frac{\text{Total score acquisition}}{\text{Total score maximum}} \times 100
\]

The percentage results obtained from the calculation are then seen as the assessment criteria as in Table 1.

<table>
<thead>
<tr>
<th>No</th>
<th>Value %</th>
<th>Assessment Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0-20</td>
<td>Very unworthy</td>
</tr>
<tr>
<td>2</td>
<td>21-40</td>
<td>Unworthy</td>
</tr>
<tr>
<td>3</td>
<td>41-60</td>
<td>Quite</td>
</tr>
<tr>
<td>4</td>
<td>61-80</td>
<td>Feasible</td>
</tr>
<tr>
<td>5</td>
<td>81-100</td>
<td>Very Feasible</td>
</tr>
</tbody>
</table>

(Source: Sugiyono, 2015)5)

The response results (student questionnaire) also calculated the percentage using the percentage formula above. To score the questionnaire on the average value of the frequency
distribution results calculated based on the alternative answers the sample can be seen in Table 2.

<table>
<thead>
<tr>
<th>No</th>
<th>Value %</th>
<th>Assessment category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80-100</td>
<td>Very good</td>
</tr>
<tr>
<td>2</td>
<td>66-79</td>
<td>Good</td>
</tr>
<tr>
<td>3</td>
<td>56-65</td>
<td>Quite</td>
</tr>
<tr>
<td>4</td>
<td>46-65</td>
<td>Bad</td>
</tr>
<tr>
<td>5</td>
<td>0-45</td>
<td>Fail</td>
</tr>
</tbody>
</table>

(Source: Silitonga, 2014)  

3 Result and discussion

The results obtained during the initial research are the making the instrument of KKNI assignments in the Chemistry Evaluation and PHB courses in the form of standardized tasks. Before the field trial was conducted, the KKNI-based evaluation tools were first reviewed by 2 validators who were experts in the Chemistry Evaluation and PHB subjects. Validation results show that the KKNI-based evaluation tools in the Chemistry Evaluation and PHB courses are as follows.

Based on the results of a review of the Student Routine Task Force (TR) in the Evaluation and Assessment of Chemistry Learning Outcomes subject, it can be concluded that the Routine Task Tool of students is very feasible, with a percentage of 90%. Validator suggest that the routine tasks given to students are made at a higher level of cognition, no longer in the form of C1 and C2. Thus the Routine Task Evaluation Tool based on the KKNI in the Chemistry Learning Outcomes Evaluation and Assessment course can be used in the learning of Chemistry Evaluation and PHB courses.

The results of the review of the CJR (Critical Journal Report) Evaluation Tool found that the CJR evaluation tool was feasible to be used in the learning of evaluation and PHB Chemistry courses, with a percentage of 80%. While the advice from reviewer /validator so that the criticized journals are scopus indexed journals.

The results of the review of the CBR (Critical Book Report) Evaluation Tool found that the CBR evaluation tool was feasible to be used in the learning of evaluation and PHB Chemistry courses, with a percentage of 80%. While the advice from reviewer / validator is that it is better that the book reviewed be supplemented with other books, namely textbooks that smell evaluation.
The results of a review of the Mini Research (MR) instrument found that the Mini Research evaluation tool was very feasible to use in the learning of Chemistry and PHB evaluation subjects, with a percentage of 90%. While reviewer / validator states that it is even better if the questions used in mini-research instruments are not only in the form of multiple choice questions, but also inserted with questions in the form of test essays.

The results of the review of the Idea Engineering (RI) instrument found that the Idea Engineering evaluation tool was feasible to be used in the learning of evaluation and PHB Chemistry courses, with a percentage of 80%. While the reviewer / validator suggested that the Idea Engineering format should be clarified with the addition of guidelines so that students would be easier to express their ideas.

The results of a review of the Project Task instrument found that the Project Task evaluation tool was very feasible to be used in the learning of evaluation and PHB Chemistry courses, with a percentage of 80%. From the results of the preliminary research above, it was concluded that the Learning Evaluation and PHB Chemistry Learning Tools that had been developed could be used in subsequent studies.

References

The Effectiveness of D2 Serve Learning Model to Improve Students Skill in Playing Table Tennis in Medan

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Abstract. The aim of this research is to test the effectiveness of D2 Serve learning model to improve students skill in playing table tennis. The subjects of this research were the beginner students which consists of 30 students as experimental group and 30 students as control group. Quantitative approach was used in this research as the six steps (main group trials) from Research and Development design (R&D). The type of this research is experimental research, table tennis D2Serve learning model as the treatment variable and using randomized control group pre test-post test design. Based on the data obtained from the Pre test and Post test which had given to experimental group and control group before, then the effectiveness test result of this research as follows: (1) for experimental group obtained sig (2-tailed) 0,00 smaller than 0,05, which means there are significant differences between pre test and post test result of D2Serve learning model. As well for the control group was obtained sig value between the pre test and post test result of conventional learning model. Based on sig (2-tailed) value obtained between the two groups, it had the same high significant value. Therefore, it can be concluded that D2Serve learning model (new model) and learning model with conventional method (conventional model) together can give positive contribution in improving table tennis basic skill for beginner students. Based on statistics analysis and findings above, it can be concluded that D2Serve learning model for beginner student is worth and effective to be used as learning model which can improve drive (forehand-backhand) and serve basic technique skills in Table Tennis Sport.

Keywords: Effectiveness, model D2 Serve, skill and table tennis

1 Introduction

Table tennis sport is one of the compulsory subjects followed by S-1 students in Sports and Health Physical Education Study Program. Through this course, students are guided, accompanied and trained to master the basic techniques, rules, and playing techniques, in order the students have the ability and skills to play table tennis. But now, a problem rises where students’ table tennis playing skill is still low. Observations had been held on the achievement of students’ Tennis Table learning outcomes in the odd semester of 2015/2016 academic year, and if it is related to student passing grade competencies, it is not in the level of satisfactory category.

Tennis Table learning with its methods, models, media and materials needed by beginner students is a learning model which involves students more actively in the learning process,
develops all the potential in students selves, and accommodates the conditions and characteristics of students based on their physical and psychologically abilities in order to create a fun and an interesting learning atmosphere in accelerates the improvement of students' comprehension and skills to the material that had being taught.

In this study, the researcher developed a tennis table learning based on playing, that is the D2Serve technique model. This learning model is developed based on the analysis of theories which one of the theories is services, learning, and models which had been used by lecturers so far, then integrated it with playing approach. This D2Serve learning model is part of learning model development needs to be tested for its effectiveness to see how much effectiveness level of the model is in improving the table tennis service technique skills of beginner students.

2 Research methods

This study deals with effectiveness of test research of D2Serve learning models in improving table tennis basic serves skills for beginner students. The type of the research is an experimental research with randomized control group pretest-posttest design which can be described as follows:

The data are using quantitative data from observations of motion. The aim of the study is to see the level of student skills in tennis table service pouncing. The instruments used are table tennis specific test battery. The results of this study obtained based on data analysis from the pre-test and post-test (experimental group and control group) using SPSS 17.0 for windows. The degree of significance is $\alpha = 0.05$.

![Figure 1. Research design to achieve research output](image_url)

3 Results and discussion

There were 60 students as the sample of the D2serve model, 30 students for the experimental group and 30 students for the control group. For the research results of the effectiveness of D2serve model in improving of serve basic skills of beginner students can be known from the obtained of test and data analysis of the two groups above. For the analysis results of paired sample average differentiation (service) can be seen in table 1 and for the analysis results of Independent Samples Test can be seen in table 2.
In this section, the analysis pattern test had been done in testing the effectiveness of the D2Serve model on service by using mean differentiation test (average) which analyzed by t-test (paired t-test). The calculation paired t-test is based on the data of the pre-test and post-tests values of each group, namely table tennis learning groups by playing and table tennis learning groups by old model. For the results of the t-test calculation analysis can be seen in the following table. Based on the table 1, it is known that the value of significance-test statistic processed by using SPSS for the new model group D2Serve is obtained sig 2-tailed 0.00 <0.05, which means there is a significant difference between the results of the pre-test and post-test for serve basic learning techniques based on playing. Also for the old group conventional, it was obtained the sig 2-tailed value is 0.00 <0.05, which means there is a significant difference between the results of the pre-test and post-test of table tennis basic learning techniques with old model conventional.

Based on the obtained of sig 2-tailed values between the two groups, both of them have a high significant value. Thus it can be concluded that service learning with D2Serve model based on playing new model and service learning with conventional learning models with conventional methods, both can contribute positively in improving the table tennis service basic techniques skill for beginner students.

### Table 1. Different analysis results of paired samples service

<table>
<thead>
<tr>
<th>Service</th>
<th>Mean</th>
<th>T</th>
<th>Df</th>
<th>Sig 2-tailed</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Model</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-tests</td>
<td>-5.233</td>
<td>-15.643</td>
<td>29</td>
<td>0.00</td>
</tr>
<tr>
<td>Pre-tests</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Old Model</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-tests</td>
<td>-4.567</td>
<td>-16.921</td>
<td>29</td>
<td>0.00</td>
</tr>
<tr>
<td>Pre-tests</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The simultaneously mean difference test between learning groups is to understand the differences of the effect of treatments in increasing treatment variables, namely service technique learning with the D2Serve model based on playing methods before and after treatment in each group. The analysis technique used is through the calculation of IBM SPSS 21.0 for Windows. For the results can be seen in the following table.

Based on table 2, it can be seen that the obtained of significance 2-tailed is 0.01, then 0.01 <0.05 which means that there was a difference influence of the D2Serve table tennis learning model based on playing method with old conventional model exercises in improving the basics skills of table tennis services for beginner students.

### Table 2. Results of independent samples test analysis

<table>
<thead>
<tr>
<th>Servis</th>
<th>Df</th>
<th>Mean Difference</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Equal variances</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>assumed</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>58</td>
<td>1.400</td>
<td>2.940</td>
<td>0.01</td>
</tr>
</tbody>
</table>
Research on the development of the D2Serve model of table tennis learning based on playing methods is conducted by researcher to help students with low basic skills especially the table tennis services basic techniques. After going through a variety of long analysis and testing processes started from needs analysis, modeling process, revision test from experts, field trials and model effectiveness test as the final revision phase, thus various revisions were made for the perfection of developed products. The revision was carried out with various indepth studies supported by various experts, scientific concepts and theories. Based on these various processes, it can be said that some of the interesting features of this D2Serve model are:

a) The D2Serve model can improve the service basic technical skills of beginner students.

b) Beside D2Serve model can improve skills, it also can also stimulate the cognitive aspects and attitudes of students.

c) Through the D2Serve model, the learning situation brings lecturers and students more motivated and comfortable in following the table tennis learning process. This is suitable to (Xiuli Chen1, Peter Holland 1 and Joseph M Galea, 2017) stated that "Physical education teachers or coaches need to create a stimulating, encouraging learning environment and to cultivate a positive approach to goal achievement in order to enable players, and in particular novice players, to learn easily, experience personal progress, and remain interested in playing tennis. Game-based teaching, adapting equipment and lessons, free expression of tactical skills rather than strict technical control, good communication, are all major factors effectively introducing the Play and Stay tennis program, which above all, stresses that the key to success with novice players is to get them playing tennis from the very first lesson ".

d) Through the D2Serve model, it can stimulate collaboration between students groups to be more synergistic in doing the task of motion which is given by the lecturer.

e) This model also can enrich the scientific repertoire of lecturers who are struggling with table tennis learning.

Furthermore, various learning in the D2Serve model as these research development products has a simpler procedure and the beginner students as direct users of this product will be easier to adapt on the various basic service skill motion tasks exist in each variation. Each variation also contains the principle of learning that is adapted to the principle concept of motion learning, namely the stages of motion in each variation starts from an easy phase to difficult phase which is more complex. Thus, with this concept it will be easier for users of this model to master service techniques correctly.

4 Conclusion

Based on the research result and discussion have been explained previously, conclusions can be drawn that is D2Serve learning model can improve the service skills of beginner students, thus the D2Serve learning model deserves to be used as a learning model by lecturers and teachers in the table tennis course learning process.

References

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