Development of Hybrid Mobile Phone Learning Media to Support the Implementation of Lesson Study on Mechanical and Machine Elements

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Abstract. The objectives of the research are (1) to develop mobile assisted learning media to support lesson study implementation on mechanical engineering and engineering element subjects; (2) evaluate the feasibility (3) measure the implementation effectiveness level of mobile assisted learning; and (4) measure implementation response level of lesson study implementation on mechanical engineering and mechanical elements lessons. The research was categorized as Research and Development (R&D) based on Richey & Klein (2010). This research was conducted in SMK N 2 Depok, Sleman to 32 students of class XI TP-B. The results of the research show that first, there are several menus as the results of the assisted mobile device learning media products, i.e. (1) home, (2) materials, (3) quiz, (4) review, (5) score, (6) competency, (7) downloadable materials, and (8) sign- in and sign out. Second, the feasibility of the mobile assisted learning media from the first validation of media was 3.51 (very good), the second validation of media was 3.18 (good), the third validation of media was 3.53 (very good), and the fourth validation of material was 3,093 (good). Third, both of the effectiveness levels of the implementation of mobile assisted learning media to support lesson study implementation at SMKN 2 Depok got 77.39% N-gain which means effective. Fourth, the responses level of lesson study implementation on mecahnical engineering and mechanical element got 3,27 which means very good.

Keywords: mobile phone, lesson study, mechanical, machine element

1 Introduction

In 2019 there are the Governing Board Members of TVET. One of which shows that the development of learning media is limited. The problem is important to be solved since the media are expected to improve students' understanding [1]. Moreover, the existence of learning media is significant to enrich oral and written traditions in the learning process into a variety of learning media with various shapes and nine issues and trends in vocational education in Southeast Asia region based on models so that it can describe things that are abstract or foreign to be more concrete and easily understood [2]. According to Imran, learning media are very important for the success of the teaching and learning process, especially in the process of delivering learning material. Also, the quality of students is also influenced by the quality of learning media[3]. This is also in accordance with the results of research conducted by Marfuatun in the development of learning media. The results of the study stated that the use of learning media can increase motivation and learning outcomes [4].

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In vocational schools, learning media become a significant tool to deliver the material not only the academic theory but also the practical things. It means that the vocational learning requires contextual media which support the students to achieve real world working skills and knowledge [5]. With this kind of learning media, students will be able to observe the model, practice and develop their knowledge and finally implement it in the real working environment [6]. Moreover, they also improve the students' retention [7].

Also, learning media in vocational school students need to fulfil the requirement in accordance with learning objectives, practical, flexible, durable, easy to use, and contextual [3]. It also needs to fulfill the students' need as the main consideration in developing the media [8].

Students' learning need can be seen from the students' score in each subject. In SMK 2 Depok, there was problems related to the low students' achievement. The 2013-2014 Engineer Technique ledger data from the curriculum of SMK 2 Depok Sleman shows that the Engineering Mechanics and Machine Element subjects are relatively low at 2.89% compared to the C2 Mechanical Technology group which is 2.88%, KMKE 3.1% and Engineering Drawings 2.9% and C3, but the lowest is the subject of Mechanical Mechanics and Machine Elements.

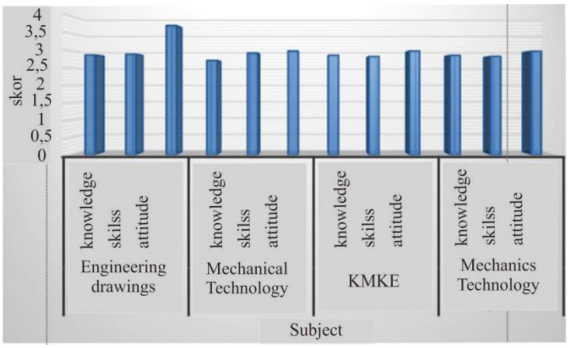

Fig 1. Subject score in C2 class X Machining Technique

This obstacle also appears in the learning of subjects in Mechanical Mechanics and Machine Elements. Based on learning, it appears that students had difficulty in acquiring learning attention. This can be seen from enthusiasm, awareness and strong willingness to ask questions, expressing ideas in an effort to improve material that is still low. Students' attention in following lessons is not completed. The activity of students in attending lessons is also almost invisible. Students who rarely ask questions or express their ideas ask the teacher repeatedly by asking questions. The activeness of students to work on practice questions is also very lacking. Many students seem lazy to work on practice questions that are released when work is not collected or supported.

Students' independence in learning is also relatively low. If given an assignment, it does not need to be collected, some students who do not work are found, and some students work at all or cheat on jobs. Another problem is that there are still some different understandings of the concepts of Mechanics and Machine Concepts and academic achievement is still low.

Learning methods applied by lectures, assignments, resumes and tests turned out to be less able to motivate students to actively understand and successfully master the learning material. Students hope that in the learning process requires material that makes it easy to

understand mathematical and imaginative models in the lessons of Mechanics and Machine Elements. Suspending learning achievement is still low.

To respond the problems, a pre-survey was also conducted. It was found that every student in class X of Mechanical Engineering at Depok State Vocational High School had a mobile device media in the form of a smartphone, but not many were used for learning media. Students' smartphones are used commonly for communication, games, and a small portion for searching on the web. Applications that are specific to Engineering and Elemental Mechanics lessons have not yet been developed, this requires the development of learning media using mobile devices for learning in the classroom or outside the classroom that can be accessed anywhere. The development of media assisted by mobile devices is expected to have the effect of making it easier for students to access material, be active, and nuance of learning in the classroom more enjoyable.

The learning process in SMK Negeri 2 Depok Sleman, especially the subjects of Mechanical Mechanics and Machine Elements is encouraged to record the teacher in delivering the material on the board therefore the flexibility of discussion between friends is very limited. Student saturation has an ineffective impact on the class, there are some students who sleep, and lack focus. The role of the teacher in the class has also not been able to control each student in the learning process, both for attitude assessment, observation in terms of improving teaching methods. The application of lesson study (fun learning) at SMK Negeri 2 Depok Sleman, especially the subject of Engineering Mechanics and Machine Elements does not yet exist. Even though the lesson study approach is how to make the nuances of learning class happy and effective. The lesson study procedure was first applied in Japan. The lesson study learning process involves teachers, students and observers with the steps of plan, do, and see.

The activity of developing this mobile device assisted learning media is to facilitate students in learning to understand the subjects of Mechanics and Machine Elements. The process of applying the lesson study learning method that aims to form learning pleasure for students.It is an impact of the activities carried out by the teacher with mutual learning.

Students have the opportunity to explore what they are learning from a variety of different perspectives [16]. It has also been shown that the adoption of mobile learning in the classroom promotes knowledge sharing among students. Mobile learning has proven to be useful in helping students to share knowledge and create social interactions [17]. The use of mobile learning has proven to be beneficial in improving the knowledge structure of students as well as their learning achievements [18].Mobile technology encourages students to control of their own learning, allowing students establish from their own learning goals until the final assessment of their own learning [19]. Furthermore, it has been proven that mobile technology helps students to manage their self directed learning [20]

The results of Yang, J. C., & Lin, Y. L's research published in the 2010 International Forum of Educational Technology & Society (IFETS), [9] entitled Development and Evaluation of Interactive Mobile Learning Environment with Shared Display Groupware that results in the development of mobile devices can support students in classroom learning but can be an obstacle if media usage is two or more with a small screen size. The mobile device media was evaluated by field trials with 34 students using the pretest and posttest method. Results of the research of Vera I., Toktarova, Anastasiia D. Blagova. , Anna V. Filatova& Nikolai V. Kuzmin published in the Canadian Center of Science and Education 2015, Vol. 7 p 318 entitled Design and Implementation of the Mobile Learning Tools and Resources in the Modern Educational Environmental of Education which results in the use of mobile learning in universities for android. Application for students in the mathematics and information

technology department [10]. And the results of research by Xueping Li, Yu Huang published in the P. 473 Industrial and Systems Engineering Research Conference 2013 entitled Mobile Learning in Engineering Education: An Emperical Analysis. Based on the evaluation results the application of mobile learing media shows most students respond positively with a score of 50% [8]. The results of using the mobile device development show a high score.Therefore the study examines the development of the hybrid mobile device to support the activity of lesson study in the learning process.

2 Method

This research uses quasi experimental research. The experimental design used was a single group design or the one-shot case study by only doing a post test. The posttest results consisted of aspects of knowledge and skills, while the attitude aspect was used as an assessment to measure the level of learner learning behavior on the subject matter of theory and practice of turning thread using an observation rating scale and anecdotal notes. This research uses quantitative and qualitative approaches. This type of research is Research and Development (R&D) with adaptation steps from Richey and Klein [11].

The study was conducted within 4 months, starting from October 2015 to January 2016. The research location was SMK Neheri 2 DepokSleman Yogyakarta.The research subjects consisted of 4 test subjects. The initial trial subjects were one media expert supported by 3 programmer experts and three material experts. The subjects of the field trial were 32 students and 2 teachers of Class X Machining B Engineering at SMK Negeri 2 Depok.

Mobile device-assisted learning media products are validated by media experts and material experts. The learning process in class uses a lesson study approach, with steps in the plan, do, and see. The product is tested by first giving a pretest question and then continuing with the posttest after the product usage is complete. Questionnaire responses to products are given to teachers and students for evaluation and improvement of learning media assisted by mobile devices after using.Data collection instruments include interview guidelines, product validation sheets, test questions, and questionnaire responses. Data collection techniques such as interviews, product validation, tests, and questionnaires. Data were analyzed qualitatively and quantitatively.

Data analysis conducted in this study was carried out qualitatively and quantitatively. This analysis aims to obtain learning media assisted by mobile devices that are truly feasible and effective. Feasibility and effectiveness are the focus of this analysis. Product feasibility data is obtained from the results of the validation of learning media assisted by mobile devices. The steps of data analysis on the feasibility of mobile device-assisted learning media are carried out by tabulating all data obtained from the validator for each component and assessment items available in the assessment instrument. Then categorized using the categorization formula. Data categorizing formulas adopted from [12]can be explained as follows.

This test aims to determine the distribution of data used in this study. Normality test is performed on the pretest and posttest results data. The normality test is done using the SPSS (Statistical Product and Services Solutions) program 22.0 for Windows with Kolmogorov-Smirnov. Meanwhile, homogeneity test is carried out to find out whether the research subjects are from a homogeneous population or not. Homogeneity test was carried out on the pretest in the control group and the experimental group.

3 Results and Discussion

3.1 Design

Use-Case diagrams are used to describe the interaction between the user and the system to be created, by giving a narrative about how the system. With use-case diagrams can explain what functions are contained in the system and who has the right to use these functions.

Use case diagrams depict all actors with their respective scenarios. Seen in the use case diagram, this learning media has two actors namely students and teachers. Students can view the material, give a review, view the timeline of the review and take the quiz via the use case login. The teacher can see the material, give a review, and see a list of values through the use case login. The use case diagram of the system as a whole can be described as follows:

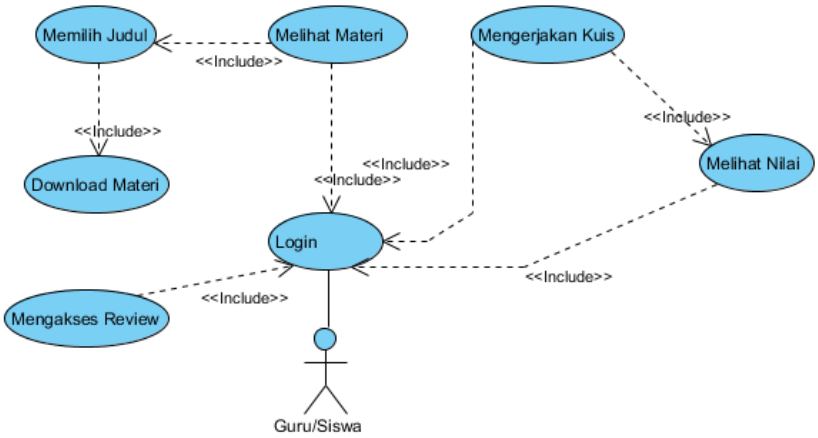

Fig. 1. Case diagram system

3.2 Development

The results of the needs analysis, design, and reference sources are references in developing learning media products aided by mobile device subjects in Theory of Mechanical Mechanics and Machine Elements. Following are the results of the development of mobile device-assisted learning media to support lesson study implementation.

Fig. 2. Display the application menu of media assisted by mobile devices

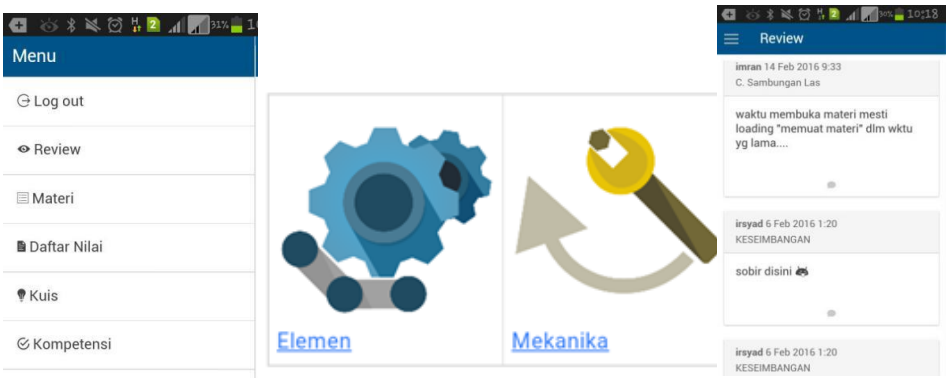

Fig. 2. Display material menu.

3.3 Product Trial Results

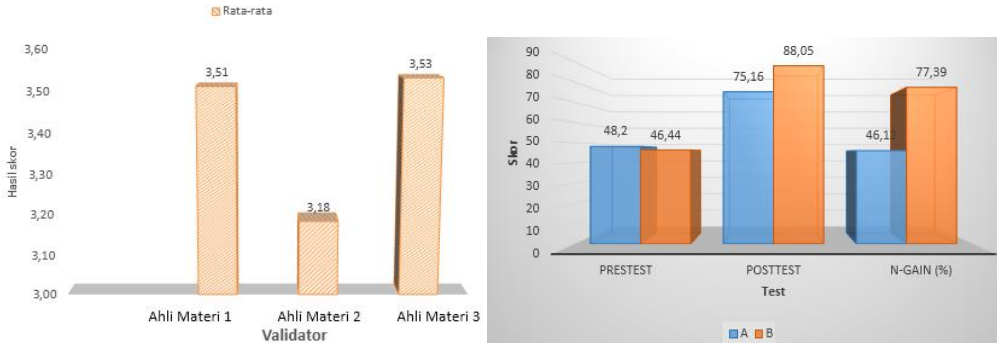

Fig. 3. Material Expertise Results and Effectiveness of Learning Outcomes

Based on the assessment data from the questionnaire given to the material experts, the feasibility of learning media products assisted by mobile devices to support the implementation of the lesson study of three validators consisting of one lecturer and two teachers: (1) Material expert 1 rated 3.51 or 87.76% (Very Good), (2) Material experts 2 rated 3.18 or 79.59 (Good), and (3) Material experts 3 rated 3.53 or 88.27 (Very Good). The suggestions and input from media experts related to learning media products assisted by mobile devices to support the implementation of lesson study, namely adjusting the speed of access, and adding value menus.

In the N-gain test results of the experimental and control groups there are differences in learning outcomes from the pretest and posttest. The experimental group calculated the average N-gain score of the experimental group showed a value of 77.39% (effective), while the control group showed a value of 46.1% (quite effective).

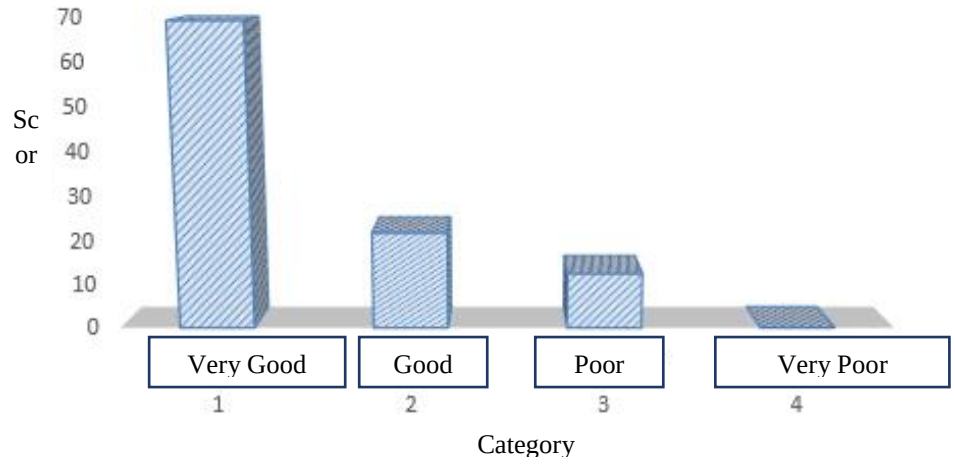

Fig. 4. Student Response Results To Media Development

Grade X students of class B (experimental) machining techniques of 32 SMKN 2 Depok, the results of the assessment of 22 students rated with very good responses, 7 students rated with good responses, and 4 students rated with poor responses. Average overall student response to media assisted by mobile devices scores 3.27 on a scale of 4 with a very good category.

4 Conclusion

Based on the results of research and development that has been done, it can be concluded that the learning media products assisted by mobile devices have several menus: (1) home, (2) material, (3) quizzes, (4) reviews, (5) grades, (6)) competence, (7) material download, (8) sig-in and sig-out. The feasibility of mobile device-assisted media products to support the implementation of lesson study by three material expert validators consisting of one lecturer and two teachers: (1) material expert 1 rate of 3.51 or 87.76% (very good), (2) material expert 2., rated 3.18 or 79.59 (good), (3) material experts 3., rated 3.53 or 88.27 (very good), and media expert Subagijo, S.Pd., got an average of 3,09 (good). The effectiveness of the application of the development of mobile device-assisted media to support the implementation of lesson study obtained an average N-gain score of the experimental group showing a value of 77.39%, so it can be said that the use of mobile device-assisted media to support the implementation of lesson study is effective to improve learning outcomes in Mechanical Mechanics and Mechanical Element subjects. The level of student response to the implementation of lesson study in implementing mobile device-assisted media in the subject of Mechanical Mechanics and Mechanical Element Class X Machining B Engineering at SMKN 2 Depok scored 3.27 or 81.25% (very good).

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