

Analysis of Problem-Based Learning Model Assisted by Virtual Media and Study Styles on Student's HOT Literacy Ability

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Abstract. This research analyzes: the Problem-Based Learning (PBL) model that is assisted by Virtual media model HOT Literacy ability of students'; student Study Style on students' HOT Literacy ability and the interaction of the two learning models with Study Style types on HOT Literacy abilities of students'. This research is using Quasi-Experimental design. Fifth-grade students in School Elementary satate of Medan Deli is used as the population, while for the sampling techniques use total the entire population. Questionnaires and HOT literacy tests were used as instruments in this research. The Normalized gain data are Normal and Homogen. Two Way Anova using version 26th of IBM's SPSS were used to analyzed the data. The results showed that; 1) There is an effect of the PBL model assisted by Google Sites on students' science literacy skills ($p < 0.05$), 2) There is an effect on the type of student Study Style on students' HOT Literacy abilities ($p < 0.05$), and 3) There are the interactions between the two learning models and Type of Study Style on students' science literacy skills ($p < 0.05$).

Keywords: Problem-Based Learning, Study Style, HOT Literacy ability, Virtual media

1 Introduction

One of the efforts to prepare the younger generation to face future challenges is to empower the younger generation, mostly of school age, in the learning process [22]. Therefore, an education system must be built that is not only oriented toward students' ability to master learning material but must also be equipped with various 21st-century skills to solve problems encountered in everyday life.

The Indonesian government has issued policies to train 21st-century skills so that the quality of education in Indonesia improves, including the recovery of learning through the 2013 Curriculum. The presence of the 2013 Curriculum is an answer to the intense competition for human resources globally. There are three fundamental skills components in the 21st century: basic literacy, 4C competence, and character [8]. Basic literacy allows learners to apply literacy skills in everyday life. The World Economic Forum establishes HOT literacy as one of the six basic literacy that is very important for learners, parents, and all citizens of society. The other five basic literacy are numeracy, literacy, cultural, civic, financial and digital [7].

HOT literacy is a person's scientific ability to use their knowledge to acquire new knowledge, overcome problems, draw conclusions based on evidence related to scientific problems and also can explain scientific phenomena. HOT literacy is crucial in facing 21st century challenges because various activities are filled with scientific work products. Science is also inseparable from various problems in everyday life; therefore, it is very important to train HOT Literacy abilities [13]. Therefore, science education focuses on achieving HOT literacy before children graduate high school, including in Indonesia.

The importance of HOT literacy makes Indonesia participate in the international science assessment, namely PISA (the Programme for International Student Assessment) organized by The Organisation for Economic Co-operation and Development (OECD). The Programme for International Student Assessment results show that Indonesian students' HOT literacy ability is still low and below the international average score. Data details seen in Figure 1.

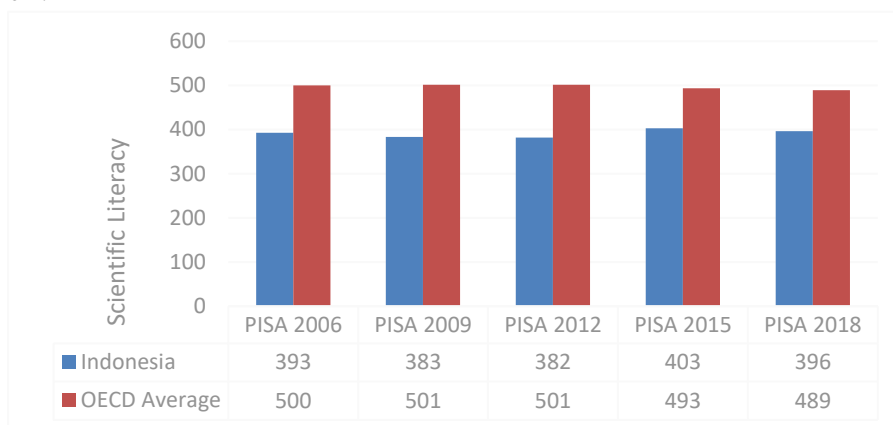


Fig. 1. The Results of Indonesian Students' HOT literacy during 2006-2018

Indonesia's low level of HOT literacy reflects that most students could not analyze also apply scientific concepts in problems solving. Based on several studies conducted previously shows that low HOT Literacy abilities are influenced by internal factors, which include health, intelligence, mentality, student motivation, participation, low reading skills, student relationships with teachers, and organizing the learning process, and external factors, including friends, family, teachers, media, facilities, and infrastructure, as well as the environment and climate that are not conducive [9]. Low HOT Literacy abilities can be overcome by applying science learning models/strategies/methods constructivist so that students can explore their knowledge, learning programs, learning resources, and classroom atmosphere that supports their HOT Literacy abilities [6].

PBL is a recommended learning model for the 2013 curriculum. PBL is a model designed to develop students' problem-solving abilities [16]. Problem-solving uses higher-order thinking skills, namely the ability to analyze, synthesize, and evaluate a problem. PBL learning model also focuses on the selected problem so that learners not only learn concepts related to the problem but scientific methods are used to solve the problem to foster higher-

order thinking skills in learners. Research also proves that the PBL model can improve students' critical thinking skills. It is expected that critical thinking skills students can improve their HOT Literacy abilities.

In addition to the learning model, the factor influencing the low ability of HOT literacy is the use of learning media that has not been maximized. Learning media is an intermediary tool for facilitating communication of the teachers and the students. Media use is important because of the strategic position of media for learning success that can arouse interest in learning motivation, increase student understanding, and help the learning process achieve learning objectives. The media used has a position as a teaching tool in teaching, such as images, slides, photos, films, graphics, and learning using computers that are useful for stimulating visual and verbal information that has been obtained. As a learning aid, the media is also expected to help explain abstract concepts, increase absorption, and provide a direct learning experience to increase students' mastery of concepts and critical thinking. One of the learning media that can be used to improve students' mastery of concepts and critical thinking is Google Sites-based learning media.

Google Sites is a facility on Google with features as a visiting site. The visit site is managed in the form of a website display that contains text and learning videos. This Google Sites media can be used on the gadget-based web. In this era, Gadgets are very helpful for students in understanding the material because the information needed can be obtained easily and quickly. Learning in schools will be better when combined with Google Sites learning media. Google Sites-based learning media also has been conducted [15]. Google Sites learning media is very interesting to use because it is easily accessible, attracts students' learning interest, makes it easier to understand the material, and makes the use of language is easy to understand according to the level of thinking of students [23]. Google Sites-based learning media to improve the ability to master concepts and critical thinking of high school students is feasible, effective and efficient so that it can be applied in learning.

Based on the description above, the researcher wants to research the Influence of PBL Assisted by Google Sites on HOT Literacy abilities of the students at School Elementary satate Medan Deli.

2 Methods

The research using Quasi-Experimental Research. The study was conducted to determine the influence of the PBL model assisted by Google Sites on students' science literacy, comparing students' HOT Literacy abilities between experimental and control classes. Learning uses a PBL Model assisted by Google Sites in the experimental class, and the control class uses direct instruction. Features of control and experimental groups are used without changing the existing class structure.

Pretest-posttest nonequivalent control group design is used in this study. The independent variable of this study is problem-based learning, while the dependent variable is the student's HOT Literacy abilities. The research design as follows:

Table 1. Research Design

Class	Pretest	Treatment	Post-test
Experiment	O ₁	X	O ₂
Control	O ₃	-	O ₄

All fifth-grade students of School Elementary satate Medan Deli, 40 students in total became the population, all population members are sampled. The samples of this study were students of the VA class and VB class, with each class totalling 20 students. The VA class is an experimental class taught with the PBL model assisted by Google Sites, and the VB class is used as a control class taught with Direct Instruction. The syntax of the learning model is 1) orientate students about the problems, 2) organize the students, 3) focus to individual by guiding and arrange group investigations, 4) develop and present the works, and 5) process of the problem solving by analyze and evaluate the problem [3]. Although both classes receive different forms of learning, the number of meetings in both classes is the same: four. The subject matter is also the same, namely heat and displacement. Pretests and post-test are held at both classes' initial and final meetings.

Dependent variable of this study is the students' HOT literacy ability. Students' HOT literacy using a test instrument consisting of 15 multiple-choice questions, with cognitive levels C4, C5, and C6. Before using the research instrument, these questions are tested first. The test of the validity data were analyzed using Pearson's Product-Moment Correlation test and for reliability of the instruments using Cronbach's alpha test. The results of the question item analysis show that all question items are valid and reliable.

Data analysis in this study used prerequisite analysis tests and hypothesis tests using program IBM SPSS Verse 26, with a significance level of 5% or 0.05. The prerequisite analysis test in the form of a normality test is carried out to determine whether the data is normally distributed. In contrast, the homogeneity test is carried out to determine whether the research data is homogeneous [12]. The hypothesis test was used to determine the difference in the significance of the HOT literacy ability of students taught using a Problem-Based Learning Model assisted by Google Sites with a Direct Instruction Model. Hypothesis testing is performed using independent samples t-test. Test the hypothesis of science literacy ability in this study as follows.

H₀: There was no difference in the student's HOT Literacy abilities taught with the PBL Model assisted by Google Sites with the Direct Instruction Model.

H_a: There was a difference in the student's HOT Literacy abilities taught with the PBL Model assisted by Google Sites with the Direct Instruction Model. There was difference Students scientific literacy between Variation Study Style. There interaction between both of learning model and Study Style toward Student's HOT Literacy ability.

The criteria are:

If the p (2-tailed) ≥ 0.05 , H₀ is accepted

If the p (2-tailed) < 0.05 , H₀ is rejected

3 Results and Discussion

3.1 Pretest and Posttest Data

The research data obtained in this study are the results of HOT Literacy abilities during learning. Before learning is carried out, pretests are given to the control and experimental classes to determine the HOT Literacy abilities of students from both classes. Based on the results of the study, students' HOT literacy scores were obtained in Table 2:

Table 2. Result of Pretest Data on HOT Literacy abilities

Class	Value		Mean
	Min	Max	
Experiment	13.33	66.67	32.67
Control	6.67	66.67	32.00

Based on Table 2, it seen that the average value of the control class is 32.00, while the experimental class is 32.67. The average difference between the two classes is 0.67. Based on these data, it can be concluded that students' HOT Literacy abilities in both classes are relatively the same.

Table 3. The Result of Post-Test Data on HOT Literacy abilities

Class	Value		Mean
	Min	Max	
Experiment	60.00	100.00	79.00
Control	40.00	93.33	59.33

Table 3 shows that average post-test score of HOT Literacy ability on the experimental class was 79.00, while the control class obtained an average score of 59.33. This data shows that students' HOT Literacy abilities in the experimental class using the PBL Model assisted by Google Sites are higher than in the control class using the Direct Instruction Model. For more details, see the following Table:

Table 4. The result data using GLM Univariate

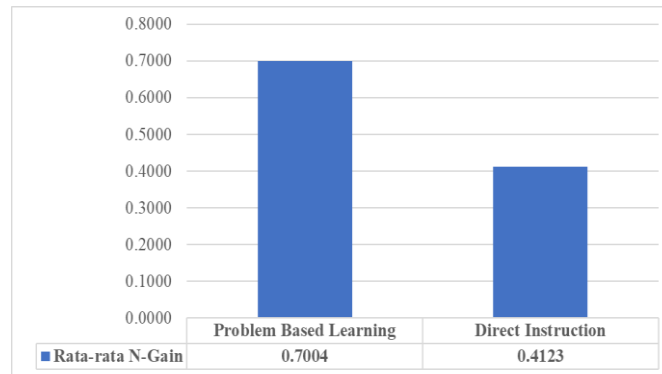


Fig. 2. Comparison N-gain

Before further analysis, normality and homogeneity tests being performed by prerequisite tests. Based on Figure 2, it seen that the average score of the experimental class science literacy pretest is 32.67, and the control class is 32.00. In the pretest data, the science literacy ability of students in both classes is relatively the same. Meanwhile, the post-test data showed that the average science literacy score of the experimental class obtained a value of

Factors	Sum of total Square	DF	Mean of square	F _{Count}	p
Learning Model	.500	1	.500	22.907	.000
Studying style	.211	2	.105	4.832	.014
Learning model*	.151	2	.076	3.469	.043
Studying style					

79.00, and the control class was 59.33. The experimental class obtained the highest score from the post-test data.

3.2 Normality Test and Homogeneity Test

The prerequisite tests used are the normality test and the homogeneity test. Normality test use Kolmogorov-Smirnov test using program IBM SPSS verse 26 with a significance level of 0.05. Data is normal if the significance value exceeds 0.05 (sig > 0.05). Results of the normality test showed in the following table.

Table 5. Results of The Experimental Class HOT literacy Normality Test

Data	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	p	Statistic	df	p
Pretest	.182	20	.081	.921	20	.104
Posttest	.142	20	.200*	.944	20	.289

Table 6. Results of The Control Class HOT literacy Normality Test

Data	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	p	Statistic	df	p
Pretest	.129	20	.200*	.959	20	.519
Posttest	.182	20	.082	.928	20	.142

Based on Table 5 and Table 6, it showed that the significance value is greater than 0.05 (sig > 0.05), so it can be concluded that the data on students' HOT Literacy abilities in the experimental class and control class are normally distributed. In contrast, the homogeneity test determines whether data comes from a homogeneous population by conducting a homogeneity test with the Levene Statistics test on the IBM SPSS version 26 program. The homogeneity test results can be seen in the following Table 7.

Table 7. The Result of the Homogeneity Test

	Levene Statistic	df1	df2	p
Mean	0.346	3	76	0.792
Median	0.376	3	76	0.770
Median and with adjusted df	0.376	3	72.803	0.770
Based on trimmed mean	0.335	3	76	0.800

Based on homogeneity test results, Table 6 shows the value of $p = 0.792 > 0.05$ indicates that from both classes have the same variance or homogeneity and after the prerequisite test, the data obtained are proven to be homogeneous and normal, hypothesis testing can be carried out.

3.3 Hypothesis Test

The hypothesis test using an independent sample t-test through the IBM SPSS version 26 program.

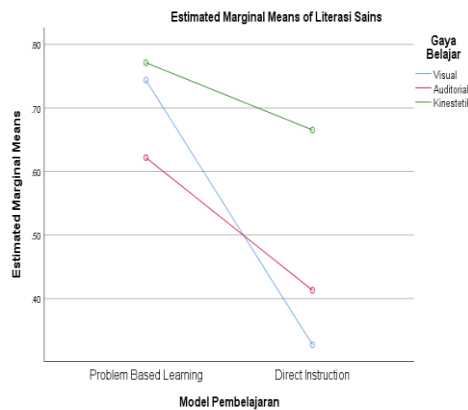


Fig. 3. Graphics interaction between model and motivatio

Based on Figure 3, the value of p (2-tailed) The independent sample t-test is 0.00. Thus the value of p (2-tailed) = 0.00 < 0.05, meaning that H_0 is rejected and H_a is accepted; there is a significant difference between the student's HOT Literacy abilities in the experimental class using the PBL Model assisted by Google Sites and the control class using the Direct Instruction Model. The average HOT literacy score of the experimental class was higher than the control class, with a difference of 19.67. This shows that The PBL Model assisted by Google Sites increases students' science literacy skills at School Elementary satate Medan Deli.

There are differences in students' science literacy abilities in experimental and control classes due to the application of different learning models. Learning methods and models are selected by the teachers, teaching materials and learning tools influences students' low HOT Literacy abilities in Indonesia. One of the recommended learning models for use in the 2013 curriculum is the problem-based learning model [11]. The PBL model is a learning model that can help students to understand the nature of Learning as a way of thinking instead of just understanding based on the textbooks [18].

The application of the PBL model can develop students' ability to think critically in solving problems and can learn, apply, and continue the learning process independently or in groups [10] and students are more confident and enthusiastic in Learning The effectiveness of the PBL model is also seen in learning activities that directly invite students to examine complex problems related to the material, independent and group investigations, and conduct practicums that can provide broader experience related to science literacy which in the context of science literacy emphasizes understanding the context of science applications, recognizing and understanding the context of science applications, and able to solve real problems that apply sciences. The PBL Model prepares students to be critical, creative, communicative, innovative, collaborative, and having analytical thinking also able to facing and solve real-world problems effectively.

HOT literacy is very important in everyday life; this HOT literacy emphasizes mastering concepts, analyzing, concluding, and appreciating the knowledge gained from reasoning. Given the increasingly sophisticated technological advances, HOT literacy learning can be applied to technology-based media. Media is a graphic tool to capture, process, and rearrange information visually or verbally [2]. Media has an important role in Learning [14]. Make learning more focused and interesting so that students have greater curiosity in learning.

Learning with web media is very helpful and motivates students in their Learning [4], [5]. In this study, the media used is Google Sites. Google Sites is one platform that can easily create learning websites without requiring skills such as web coding and web design [17]. Using Google Sites in PBL will increase curiosity, encourage creativity, increase curiosity, and train students to have critical and logical thinking. Thus, students' HOT Literacy abilities can increase.

This research shows that applying the PBL Model assist with Google Sites affects students' science literacy skills at SDN 067251 Medan Deli. Findings of this analysis are

similar to previous studies that already conducted by others researchers [1], . Their studies also prove that applying PBL Model can improve HOT Literacy abilities of the students.

4 Conclusions

1) There is an effect of the PBL model assisted by Sites of Google on students' science literacy skills ($p < 0.00 < 0.05$), 2) There is an effect on the type of student Study Style on students' HOT Literacy abilities ($p < 0.14 < 0.05$), and 3) There are the interactions between the two learning models and Type of Study Style on science literacy skills of the students ($p < 0.043 < 0.05$). (p (2-tailed) = $0.00 < 0.05$), meaning that H_0 is rejected and H_a is accepted.

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