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THE EFFECT OF PBL MODEL WITH GOOGLE SITE WEB-ASSISTED ON STUDENTS' CRITICAL THINKING SKILLS ON TEMPERATURE, HEAT AND EXPANSION SUBJECT

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Abstract

The purpose of this research is to determine the influence of the Problem Based Learning model assisted by Google Site Web on students' critical thinking skills on temperature, heat and expansion materials. The type of research used is Quasi Experiment with a Non-equivalent Control Group Design. The sample was taken using the Purposive Sampling technique, so that 65 students of SMP N 2 Payakumbuh were selected for grades VII 9 and VII 10. Data collection is carried out by giving pretest and posttest questions. Based on the data obtained, the tests used are the t-test for pretest and posttest. The t-test in the pretest obtained a tcount value = 3.68 > a ttable of 2.00 which means that there is a significant difference so that Ha is accepted. Meanwhile, in the t-posttest test, the tcount value = 2.29 > ttable 2.00 which means that there is a significant difference in the average of the experimental and control classes. So, based on the results obtained from the mean difference test, it was found that there was a significant difference between the average of the experimental and control classes before and after being given treatment. When we get different research results, to see the effect can be seen from the improvement of the learning outcomes of the two sample classes. Therefore, the N-gain test is used. The results of the hypothesis calculation used are the U test or the Man Whitney test because the data obtained on the N-gain is abnormal but homogeneous. The result of the u test was obtained Zhitung = -1.54 < Ztabel = -0.73. Referring to the criteria of the u test which states that if the Zhitung < Ztabel then H0 is rejected. So in conclusion, there is an effect of significantly improving student learning outcomes between control and experimental classes.

Keywords: PBL, Google, Site, Critical, Thinking.

Introduction

The 21st century is marked by globalization and the rapid development of information technology. This led to a transition from traditional culture to modernity. This transition has an impact on various aspects of life, including education. In the world of education in the 21st century, humans are required to improve information technology literacy in order to improve the quality of life through education in accordance with the development of the times (Dedy et al., 2021). Therefore, in the 21st century, changes are needed in the education system by providing a set of skills needed by students in their lives. So that in the strictness of these technological challenges can be faced by students (Soh Arsyad & Osman, 2010).

The independent curriculum is an option planned by the Ministry of Education, Culture, Research, and Technology (Kemdikbudristek) as an effort to recover learning. Through the published Independent Curriculum development policy, it is hoped that students can improve their quality both in the academic and non-academic fields (Vhalery et al., 2022). In the academic field, students are not only required to think at a low level, but also to think at a high level, so that they have critical thinking skills, which must be developed by students (Suryaman, 2020).

Critical thinking is rational and reflective thinking in determining the right truth or action, so it becomes clear that thinking skills are a type of thinking that relies on cognitive processes. In this series of steps, information is obtained from regular testing of the hypothesis, followed by the making of accurate conclusions (Ennis, 1985). Students' critical thinking is the ability to evaluate opinions using the knowledge they have, as well as make decisions and find the most effective solutions to solve problems (Auliana et al., 2019). However, in reality, in the learning process, students tend to be less independent or lack the initiative to learn independently, as well as less use of critical thinking skills in solving the problems they face (Rinesti et al., 2019). To develop students' critical thinking skills, a learning model is needed that can effectively train and hone their critical thinking skills.

Problem Based Learning (PBL) is one of the learning models where applying a problem is used as a stimulus for students' self-regulation skills, materials, and problem-solving. Students will be faced with a problem from the students around them or a contextual problem from the environment around them, thereby increasing students' understanding of concepts and critical thinking (Ejin, 2016). In Problem Based Learning (PBL), students are directed to solve, analyze, and evaluate the given problems. They are directly involved in solving these problems by using critical thinking skills, experience, and relevant concepts. This process trains learners to think critically and develop their analytical skills, as well as to become independent learners (Qomariyah, 2016).

Problem-Based Learning (PBL) requires the help of learning media to create a more effective learning experience and be able to improve students' critical thinking skills. Web-based learning media is one of the strategic choices because it provides easy access to learning resources, allows for better interaction, and encourages students to solve problems collaboratively and independently. Research by Wahyuni (Wahyuni et al., 2024) states that the use of web-based media in PBL learning is able to significantly improve students' critical thinking skills because students can quickly access information, discuss, and present their solutions through digital platforms. In addition, the development of web-based materials such as Google Sites in PBL also provides a structured and interactive learning experience, supporting learners to be more actively involved in learning.

Based on the results of observations that have been made, information has been obtained that the school has been using the independent curriculum since 2022. The learning process of the independent curriculum has been implemented in grade VII and grade VIII. This school has a digital class program, where there is one digital class per level. Digital classroom is a policy from schools that are able to manage technology and IT in learning based on directions from

the government. Digital classes are classes that specifically use technology and applications in the learning process. Some teachers have used learning media, both offline such as books, PowerPoint modules and presentations, as well as technology-based online such as Google Classroom, WhatsApp groups, Zoom, Google Meet, and Quiziz. However, teachers have not optimized the use of web-based learning media other than Google Classroom.

Science teachers stated that there are still students who feel disinterested and bored during the learning process. They do not pay attention to the material given by the teacher, but rather chat, listen to music, or play games. This causes students to lack understanding of the material so that they are careless in answering the questions given. This situation encourages researchers to improve critical thinking skills in grade VII students at SMPN 2 Payakumbuh. This research utilizes the PBL learning model to help students gain a stronger understanding and hone their critical thinking skills related to temperature, heat and expansion materials, by combining Google Sites and PBL, it is hoped that the learning process will be more meaningful and interesting for students.

Based on the description above, the researcher will conduct a study with the title "The Influence of the Google Site Web-Assisted PBL Model on Students' Critical Thinking Skills on Temperature, Heat and Inflation Materials".

Research Method

This type of research is a Quasi Experiment with a Non-Equivalent Control Group Design research design. The sample was taken by the Purposive Sampling technique, consisting of an experimental class that was given treatment, namely a PBL learning model assisted by Google Site Web on temperature, heat and expansion materials, while the control class was not treated using a scientific approach.

The population in this study is all students of grade VII of SMPN 2 Payakumbuh. The samples taken are class VII 9 is the control class and class VII 10 is the experimental class. The instruments used by the researcher are in the form of teaching modules, LKPD and essay tests to measure students' critical thinking skills in the form of pretest and posttest questions in the experimental class and control classes on temperature, heat and expansion materials using the Problem Based Learning model assisted by the Google Site Web.

Data analysis techniques consist of

1. Prasayat Test
   a. Normality test with liliefors test
   b. Homogeneity test with F
2. Uji Hipotesis
   a. The t-test is used if the data is normally distributed and homogeneous
   b. The t' test is used if the data is normally distributed but the data is not homogeneous
   c. The Mann Whitney U test is used if the distributed data is abnormal but homogeneous
   d. The Chi-square test is used for abnormal and non-homogeneous distributed data.
   e. N-Gain Calculation

Table 1. Criteria N-Gain

N-Gain Value	Criterion
$-1.00 \leq g < 0.00$	There is a decline
$g = 0.00$	Remain
$0.00 < g < 0.30$	Low
$0.30 \leq g < 0.70$	Keep
$0.70 \leq g \leq 1.00$	Tall

(Sundayana, 2020)

Result and Discussion

Validation is carried out by expert validator validators. The validated questions were continued by conducting a test of critical thinking skills for temperature, heat and expansion material on grade VIII 5 students with a total of 26 students. There are 20 questions that will be tested. After the test of the questions is carried out, the question item instruments are analyzed to determine

the quality of the questions to be tested. The analysis of question items is in the form of validity tests, reliability tests, difficulty indexes, and differentiation. After the analysis, 10 questions were obtained that were used as pretest and posttest questions.

This research was conducted as many as 8 meetings. The implementation of the learning process of the Google Site Web-assisted PBL model can be seen through an observation sheet given to observers which aims to see the suitability of the learning process with the steps of the Google Site Web-assisted PBL model. After conducting research, data on the learning outcomes of critical thinking skills of grade VII students were obtained in the form of temperature, heat and expansion materials, tests in the form of pretest and posttest.

The average results of pretest and posttest can be seen in the following table:

Table 2. Pretest and posttest results

Competence	Sample Class	Number of Students	Average	
			Pre-test	*Post-test*
Critical Thinking Skills (Knowledge)	Experimental classes	34	59,5	59.03
	Control class	31	18,00	45,56

Table 3. Maximum and Minimum Values

Value Type	Category	Class	
		Eksperimen	Control
Pre-test	Minimum Values	5	5
	Maximum Value	50	45
Post- test	Minimum Values	10	10
	Maximum Value	98	98

After that, the prerequisite tests are carried out, namely the normality test with the liliefors test and the Homogeneity test with the F test.

Table 4. Normality test results

Competence	Sample Class	Number of Students	Average	
			Pre-test	*Post-test*
Critical Thinking Skills (Knowledge)	Experimental classes	34	23,71	59,03
	Control class	31	18,00	45,56

Then continued with the homogeneity test which is the F test.

Table 5. Homogeneity Test Results

Treatment	Fcal	FTabel	Information
Pretest	1,07	1,80	Homogeneous
Posttest	1,43	1,80	Homogeneous

Furthermore, a hypothesis test was carried out to test the average difference hypothesis with the pretest using the t' test and the posttest using the t-test. The following results of hypotests are available in the following table:

Table 6. Hypothesis Test Results

Treatment	Tcount	Table	Information
Pretest	3,68	2.00	There are significant differences
Test t	**Tcount**	**Table**	**Information**
Posttest	2,29	2,00	There are significant differences

The results of the hypothesis test showed that there was a significant difference between the average of the experimental and control classes before and after the treatment. When obtaining different research results, it is to see the effect that can be seen from the improvement of the learning outcomes of the two sample classes.

Therefore, the N-Gain test is used by fulfilling the prerequisite tests for N-Gain and Hypothesis Tests. The results can be seen in the following table:

Table 7. Sample Class N-Gain Test Results

N-Gain *Normality Test*		
	Eksperimen	**Control**
Count	0,785	0,819
Ltabel	0,159	0,151
Conclusion	Abnormal	Abnormal

N-Gain *Homogeneity Test*	
Fcal	0,64
Ftabel	1,81
Conclusion	Homogeneous
Aji Yun - *Gayen*	
Zhitung	-1,54
Ztabel	-0,73
Conclusion	Different

Discussion

Data collection in this study was carried out 8 meetings in November 2024 at SMPN 2 Payakumbuh. In this study, class VII 10 is an experimental class with a total of 34 students and class VII 9 is a control class with a total of 31 students. The control class is one of the characteristics of experimental research, but the control class cannot fully control the external variables that affect the implementation of the experiment (Sugiyono, 2013). To find out how the influence of the PBL model assisted by Google Site Web on students' critical thinking skills on Temperature, Heat and Expansion material can be seen from the results of the pretest and posttest given.

Based on the data obtained, the results of the study in the pretest showed that the data was distributed normally and homogeneously, so that a parametric differential test was carried out, namely the t-test. The results of the t-test in the pretest obtained a tcount value = 3.68 > ttable 2.00 which means that there is a significant difference so that Ha is accepted. Meanwhile, the posttest showed that the data was distributed normally and homogeneously, so a parametric differential test was carried out, namely t. The results of the t-test in the posttest obtained a tcount value = 2.29 > a ttable of 2.00 which means that there was a significant difference in the average of the experimental and control classes.

So, based on the results obtained from the mean difference test, it was found that there was a significant difference between the average of the experimental and control classes before and after being treated. When obtaining different research results, it is to see the effect that can be seen from the improvement of the learning outcomes of the two sample classes. Therefore, the N-gain test is used (Sundayana, 2020). By measuring the normality test against N-gain, the homogeneity test against N-gain and the hypothesis test against N-gain.

The results of the hypothesis calculation used are the U test or the Man Whitney test because the data obtained on the N-gain is abnormal but homogeneous. The result of the u test was obtained Zhitung = -1.54 < Ztabel = - 0.73. Referring to the criteria of the u test which states that if the Zhitung < Ztabel then H0 is rejected.

So in conclusion, there is an effect of a significant improvement on student learning outcomes between control classes and experiments after the application of the Problem Based Learning learning model assisted by Google Site Web on students' critical thinking skills on temperature, heat and expansion materials.

The integration of the Problem-Based Learning (PBL) learning model with the Google Sites platform creates a deep, interactive, and collaboration-based learning experience. PBL encourages learners to solve real problems, develop critical thinking skills, and enhance their creativity, while Google Sites serves as a platform that supports the process. In practice, learners can use Google Sites to document the results of their discussions, present, and share ideas with group members in real-time (Wahyuni et al., 2024).

The Web-assisted PBL model of Google Site that was applied was able to make the students of the experimental class interested in the learning process so that it showed a better improvement in students' critical thinking skills than the improvement of critical thinking skills in the control class. Based on the description above, the results of the research conducted are appropriate

because of the influence of differences in the improvement of critical thinking skills in the experimental class after the treatment with the PBL learning model assisted by the Google Site Web.

Conclusion

The PBL learning model assisted by Google Site Web has an effect on improving students' critical thinking skills, based on the results of the u test, Zhitung = -1.54 < Ztable = - 0.73. Referring to the criteria of the u test which states that if the Zhitung < Ztabel then H0 is rejected. So in conclusion, there is an effect of significantly improving students' critical thinking skills between control classes and experiments after the application of the Problem Based Learning learning model assisted by Google Site Web on students' critical thinking skills on temperature, heat and expansion materials.

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