Application of google sites assisted problem based learning model to junior high school students' mathematical problem solving ability

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ABSTRACT

Students have the ability to solve difficulties that are perceived as inadequate; efforts are required to continue to enhance them. There is an idea that the main goal of learning mathematics is to produce students who can solve problems competently. Thus, the purpose of this study is to see if there is an effect of employing a problem-based learning paradigm aided by Google Sites on the mathematical problem-solving abilities of junior high school students. A quantitative experiment with a quasi-experimental design was employed as the research method. The sample approach used is non-probability sampling of the purposive sampling variety. The instruments used have been tested for validity and reliability. The data analysis technique uses prerequisite analysis tests, namely normality and homogeneity tests. Initial hypothesis testing was carried out using the Mann-Whitney U Test. The results of the study show that problem-based learning with Google Sites has an impact on the mathematical problem-solving abilities of junior high school students.

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INTRODUCTION

A student's ability to solve a problem encompasses the problems that students face as they progress through the stages of studying mathematics. This occurs because some students find it difficult to find problem-solving strategies. Problem-solving ability is vital in mathematics education since the bulk of learning comes as a result of the problem-solving process (Ersoy, 2016). Being capable of answering mathematical problems is a fundamental skill in learning mathematics that will help pupils build analytical and critical thinking skills as well as improve other mathematical talents (Hidayat & Sariningsih, 2018; Jones, Swan, & Pollitt, 2015).

According to Yuhani, Zanthy, & Hendriana (2018), to accomplish instructional objectives, problem-solving education or learning involves methods to teach students how to find solutions for problems ranging from the easiest to the

most difficult. In the research of Mulyati (2016), to solve problems in real life, students will need to develop their problem-solving skills, which will also help them understand more.

In their research, Nursyifaa & Senjayawati (2018) said that many students believed mathematics to be difficult, and because it was uncommon in non-routine subjects, students' mathematical problem-solving abilities were still relatively poor. According to Meika & Sujana (2017), in his research that explains students' problem-solving abilities, things require improvement because they have not performed well. Several reasons make it difficult for students to have problem-solving skills. As explained by Surya, Putri, & Mukhtar, (2017), understanding what is known, asking questions, and constructing mathematical problems are three markers that show students struggle with problem-solving skills.

Failure of mathematical problem-solving skills is frequently caused by a lack of information about the issue-solving process (Montague, Krawec, Enders, & Dietz, 2014). According to Polya, Like learning to swim, solving mathematical problems takes a lot of practice and doing experiments. The indicators of conflict management through Polya are: 1) understanding conflict; 2) forming programs; 3) carrying out procedures; and 4) distributing alternatives (Aljaberi, 2015).

By paying attention to the learning process, including the process that must be taken into consideration, namely the selection of learning models, problem-solving abilities may be increased. Using the appropriate learning paradigm, students might be directed to apply their mathematical problem-solving abilities to solve difficulties. Several learning models can help achieve learning goals, and Problem Based Learning (PBL) is one of them (Juwanti, Salsabila, Putri, Nurany, & Cholifah, 2020). Problem-based learning (PBL) triggers students to understand the context of the material in the problem (Simbolon, Hakim, Aziz, & Aurelia, 2023).

PBL is a constructive learning paradigm in which different problems are developed with an emphasis on the process of learning activities (Husna & Kurniasih, 2023). According to Annizar, Maulyda, Khairunnisa, & Hijriani (2020), PBL is a learning strategy that uses actual-life circumstances to teach students critical logic skills and conflict handling and also gains priority facts and ideas from learning resources to make learning more active for students. The PBL model is a learning strategy in which students use problems as context and stimulation (Davidson & Major, 2014).

PBL stages according to Ariyana, Pudjiastuti, Bestary, & Zamroni (2018) are: 1) student references to conflict; 2) classifying students for learning; 3) educating students and associations; 4) developing and showing work; and 5) reviewing and analyzing stages of conflict handling. PBL can function as an educational model to help students improve their handling of mathematical conflicts. Active, creative, and creative mindsets are useful for learning the PBL model. As a result, various kinds of media are needed to help students develop practical skills.

With technological developments, the science and technology-assisted learning model will be more effective because learning will be more varied. One of the sciences and technologies that can be used is Google Site-Assisted Learning. Google Sites is an easy-to-use E-learning platform. According to Taufiq (2021), Google Sites is a Learning Management System (LMS) offered by Google for e-learning-based learning media. Google sites can provide variety with self-study even when students are not in class, allowing students to manage their knowledge more extensively and develop

concepts in the content (Sevtia, Taufik, & Doyan, 2022). A laptop or smartphone is required in its application for Google Sites-based learning so that it may be accessed anywhere and at any time (Kumar & Nanda, 2019). Google Sites has several benefits, namely: (1) learning with Google Sites makes it more interesting; (2) learning materials can be downloaded for students to store and study; (3) Material that is on Google Sites will not disappear automatically, so students can repeat material that has been studied again; (4) Students easily enter the work that is distributed; (5) Google Sites can share reports and work (Rosiyana, 2021). Based on the multiple benefits of Google Sites outlined above, the employment of the PBL model with Google Sites tools can be improved to increase students' mathematical problem-solving abilities.

Relevant study results are associated by Karen Nulty with problem-based learning and Google sites; the results showed a positive impact on student participation and involvement and their ability to solve problems (Nulty, 2015). The research conducted by Kroeger & Chiang (2013) related to Google Sites and PBL. As a result, the utilization of Google Sites is highly efficient in presenting students with problem-based insights. As well as research conducted by J. Doe & Smith (2019) relating to problem-based learning and problem-solving abilities, when compared to traditional learning approaches, the outcomes greatly boost students' problem-solving abilities. As a result, the focus of this study was on the impact of problem-based learning helped by Google sites on students' mathematical problem-solving abilities.

METHOD

The quantitative quasi-experimental approach was applied in this research. This study has a nonequivalent control group design, in which control classes and trials are not an option at random. The approach used is a post-test. This study's population is class VIII in Junior High School. The sample for this study consisted of 48 students from classes VIII C and VIII D. The experimental class had 25 students, whereas the control class had 23. In the learning progress, the experiment group was using the PBL model based on Google Sites, and the control group was using only the PBL Model. So the research design can be described as follows:
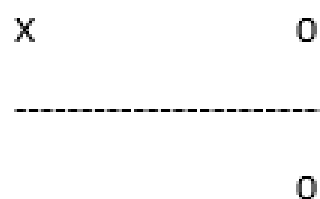
$$X \qquad\qquad O$$
$$\text{-----------------------}$$
$$O$$

Figure 1. Research Design

Details :
X : Problem Based Learning Model based on LMS Google Sites
0 : Posttest Students' Mathematical Problem-Solving Ability

The instrument that will be applied to the sample in the form of available conflict-handling expertise instruments will be thoroughly evaluated. The tests performed include checking the instrument's validity and determining its reliability. The SPSS program was used to perform instrument validation and hypothesis testing calculations. The acquisition of reliability and validity tests is shown below.

From the SPSS Program calculation with a probability of 0.05 and a degree of freedom value of 32, the obtained r_{table} is 0.349. Then, from the calculation results that can be determined from 8 questions, only 1 question is invalid because $r_{count} < r_{table}$ or 0.154 < 0.349.

If an instrument can measure something consistently from time to time, it is considered reliable (trustworthy) (Zarkasyi, 2015). The Cronbach's Alpha

value from the SPSS calculation is 0.674 > 0.05, so the data is reliable (consistent).

After evaluating the instrument and students, the next step is assessing the data, which includes checking the analytical requirements, such as normality and homogeneity, before testing the hypothesis with the Mann-Whitney U assessment. The study's concept is that employing the Google Sites-based PBL model influences students' mathematical problem-solving abilities.

RESULTS AND DISCUSSION

The population of this study was class VIII Junior High School. This study's sample consisted of students from classes VIII C and VIII D, with a certain number of each collected. Table 1, in the form of reports compiled through the acquisition of students' mathematical problem-solving ability tests, is presented after being given treatment.

Table 1. Data Description Mathematical Problem-Solving Ability

Descriptive Statistic	Class	
	Experiment	Control
Number of students	25	23
Maximum (X_{max})	78	72
Minimum (X_{min})	0	27
Average	67.56	58.17
Std. Deviation	20.722	13.037

Table 1 describes the range of grades in the test class with a total of 25 students, which is dominant compared to the range of class management with 23 students. When the control class deviation condition is dominant over the experimental class deviation condition. It demonstrates that if the distribution in the control class is not aligned, the mathematical problem-solving ability of students in the control class broadens the range, whereas it is only consistent in the experimental class, which shows a comparison of the mathematical problem-solving ability for each class.

After each class is given treatment and data is obtained, it will then be tested for analysis prerequisites, namely the normality test and homogeneity test, before carrying out the hypothesis test.

The normality test uses the Shapiro-Wilk test formula to give a value for whether the data is spread evenly or not.

Table 2. Normality Test

Classes	Sig.
Experimental	<0.01
Control	0.006

According to Table 2, the experimental class's mathematical problem-solving ability test score obtained a significant value of <0.001, while the control class's mathematical problem-solving ability test score obtained a significant value of 0.006. The results were not normally distributed because the experimental and control classes' problem-solving ability test scores were less than 0.05.

The test of homogeneity is used to examine whether population variances are similar, whereas the two-variance similarity test is used to observe whether the data distribution is homogenous or not by comparing the two variances.

Table 3. Homogeneity Test

	Sig.
Levene Statistic	0.514

Table 3, obtaining homogeneity using the Tests of Homogeneity of Variances at a significant level of 0.05, shows that the significance value obtained in the homogeneity test is 0.514 > 0.05. It was indicating that the score data for the post-test acquisition of mathematical problem-solving skills of control class students and homogeneous experiments.

According to the normality and homogeneity test findings, the posttest scores of mathematical problem solving abilities in the two groups are not normally distributed, and the variances of the two groups are also the same or

homogenous. As a result, hypothesis testing using the Mann-Whitney Test can be continued.

Table 4. Hypothesis Testing

	Sig.
Mann-Whitney	<0.001

Table 4 shows a significance value of calculation <0.001, which is less than 0.05, and the results of hypothesis tests on mathematical problem-solving skills show the PBL model assisted by Google Sites is used against the problem-solving abilities of students.

The results of the assessment show that the students' mathematical problem-solving skills after being taught through the Google Sites-assisted Problem Based Learning model were significantly better than those taught through PBL learning without Google Sites after being given treatment and given instruments of mathematical problem-solving abilities. When using the PBL model with Google Sites, the average score of students' Mathematical problem-solving skills is higher than when using the PBL model without an LMS. This occurs because the Google Sites LMS-based PBL model encourages students to solve mathematical problems better, such as elements in geometry subjects. Which broadens the experimental class reference because in Google Sites students can play the learning videos repeatedly and comprehend once more by reading the material provided on Google Sites. As a result, students have a better understanding of the content and are more motivated to learn to solve mathematical problems with new learning variations.

Then, in line with the previous study, with the acquisition of an average score assessment from the material validator of 4.22, including the appropriate criteria, and the average score assessment of the media validator of 4.15, including the very feasible criteria, The outcomes were in the form of employing LMS tools with problem-based learning in the cube and block teaching materials for junior high school grade VIII pupils, who were provided appropriate information since it is helpful for studying activities (Panjaitan & Haris, 2022). Other studies show that the consistency of students' knowledge in the long term of the effectiveness of implementing PBL, as well as in the application of their knowledge, shows that changes in the improvement of student learning outcomes are influenced by each phase of PBL (Yew & Goh, 2016). In accordance with the findings of earlier studies, it was possible to boost students' knowledge and abilities after treatment with digital problem-based learning (Car et al., 2019).

Based on the researchers' experiences during the study process, several errors, strengths, and limits should be addressed so that schools and future researchers may improve future studies.

The researchers' limitations in this study were that there is no persistent focus in the research class, so it is necessary to build it first when learning, and carrying a laptop may be challenging for some junior high school students.

The students in this study are not permitted to carry cell phones; therefore, learning media applications must be completed on a laptop. The benefits of this study include increased variety in learning media for schools, Researchers accumulating expertise with learning models and learning content that may be employed in the classroom, as well as creative learning media that motivate students to learn.

CONCLUSIONS AND SUGGESTIONS

Based on the research findings and discussion, it is feasible to conclude that implementing the Problem Based Learning (PBL) model with Google Sites affects students' mathematical problem-

solving abilities in junior high school when compared to using the PBL model without Google Sites.

Furthermore, the researcher believes that future studies at a similar high school level might be undertaken to maximize media consumption because high school students are more likely to use cell phones or laptop computers. Besides that, the learning resources developed and supplied on Google sites can encourage students to better study the subject provided, allowing them to explore their learning experience and knowledge.

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