



# The effect of problem-based learning model assisted by Google Site on the students' mathematical concept understanding ability

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**Abstract:** The study aims to determine the effect of the problem-based learning (PBL) model assisted by Google Site on the students' mathematical concept understanding ability. This type of research uses quantitative research with an experimental method. The subject is two classes, 30 students in VIII G as the experimental class and 30 students in VIII I as the control class. The data collection technique uses a description test in the materials in flat-sided shape and interviews for observation. Technique data analysis using the t-test with SPSS version 26 and determining the magnitude of the effect using the effect size test. The result obtained that the average mathematical concept understanding ability of students who receive learning with the PBL model assisted by Google Site is better than students who receive learning with conventional learning. Thus, it can be shown that a significant effect of applying the PBL model assisted by Google Site on the mathematical concept understanding ability. The effect size on the students' post-test is 1.85. This shows that the effect of the problem-based learning model assisted by Google Site on the students' mathematical concept understanding ability is in the high category.

**Keywords:** Google site; Mathematical concept understanding ability; Problem-based learning model

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## INTRODUCTION

Mathematics is one of the sciences that must be learned at every level of student education (Komariah et al., 2018). Mathematics contains various concepts that are interconnected between one material and another (Mayasari & Habeahan, 2021). As Hernaeny et al. (2021) explain, understanding the concepts in each material in mathematics is one of the determinants of the success of a learning process. Therefore, the mathematical concept of understanding ability is an essential part of learning mathematics.

Understanding a material concept will be meaningful if students can acquire it independently based on the learning experience (Apriyanti et al., 2021). Arifin and Herman (2018) added that a good understanding of the concept would make it easier for students to solve various mathematical problems.

However, students' average mathematical concepts understanding ability is still in the low category (Anggraini, 2018). In line with that, Asih (2019) said the students' mathematical concepts and understanding ability of SMP/MTs are still in the low category. The studies align with the observations made at one junior high school in Karawang Regency. The interviews with one of the mathematics subject teachers show that the average student learning



outcomes in mathematics are still below the specified KKM. Classes are carried out using conventional learning using printed books and giving assignments to students.

In addition, the results of the mathematical concept understanding ability test adopted and modified from Nurhalipah (2021) from 32 students who filled out the test, the percentage of students who were able to meet all the indicators in the mathematical concepts understanding ability test was 28%. The remaining 72% still needed help to meet the indicators. This is because students have difficulty when asked to re-explain a concept and apply the concept in the process of solving a problem.

One of the causes of the low students' mathematical concept understanding ability is the learning process in the classroom, including the lack of variety of models and learning media, causing students to be less interested in participating in mathematics learning (Murnaka & Manulu, 2018; Ariyanto et al., 2019; Tona et al., 2019). Ariyanti and Sugandi (2022)s said that to improve students' mathematical concept understanding ability, one of the efforts that can be made is to actively involve students in the learning process so that students can understand their learning experience. One learning model that can provide students with active learning experiences is the problem-based learning (PBL) model.

Yustitia (2019) said the problem-based learning (PBL) model is an inquiry-based learning model where the learning process begins with a problem. In line with that, Amalia et al. (2021) added that the PBL model makes students understand the material through the analysis process of solving a problem, making learning meaningful and improving students' mathematical concept understanding. In addition, Sianturi et al. (2018) added that in the PBL model, learning focuses on the chosen problem, so students must also understand how to solve the problem and study the concepts related to the problem. As Dewi et al. (2021) explain, the problem-based learning model helps students develop independent study and problem-solving skills. To maximize the abilities of the learning process through the PBL model, a learning media is needed. One type of media that can be used is interactive multimedia through Google Sites.

To the results of research by A'yun & Rahmawati (2018), using interactive multimedia, especially media that can be accessed by smartphone, can make students more enthusiastic and increase student motivation to participate in learning activities. In line with that, Hafidha et al. (2022) said that interactive multimedia can involve students to interact actively to enable students to experience a more meaningful learning process. In addition, Jubaidah and Zulkarnain (2020) added that the use of interactive multimedia using a web such as Google Site could attract interest and increase students' enthusiasm for learning because Google Site has an attractive appearance and is easy to use.

Several findings in previous research show positive results regarding the influence of the PBL model assisted by Google Site on the students' mathematical concept understanding ability. The result of research by Sartika (2017) shows an effect of a problem-based learning model assisted by interactive multimedia on students' mathematical concept understanding ability. In line with that, the result of research by Prisa et al. (2020) shows that using interactive multimedia through video blogs can improve students' mathematical concept understanding ability.

Based on the background description above, the purpose of this research is as follows: 1) To examine the effect of the problem-based learning model assisted by Google Site on students' mathematical concept understanding ability; 2) To find out how much the effect of the problem-based learning model assisted by Google Site in students' mathematical concept understanding ability.

## METHOD

This type of research uses quantitative research with an experimental method. The research design used is a quasi-experimental design type nonequivalent control group design. The research location was conducted at SMPN 1 Purwasari on June 15 to June 29, 2022, with a population of all eighth-grade students in the academic year 2021/2022. The sampling

technique was carried out by purposive sampling and two classes were selected, namely class VIII G as the experiment class and class VIII I as the control class. The variables in this research are the mathematical concept of understanding ability and a problem-based learning model assisted by Google Sites. The data collection technique uses tests, interviews, and documentation. The test instrument was given seven questions on the flat-sided space material. The data analysis used by SPSS 26 version with a prerequisite test is the normality test and homogeneity test, then a hypothesis test using a T-test with a significance level of  $\alpha = 0,05$  and the effect size test to determine the magnitude of the effect. The hypothesis in this research is "There is an effect of a problem-based learning model assisted by Google Site on the students' mathematical concept understanding ability.

## RESULTS AND DISCUSSION

The result of this study is researched from the test in both classes, namely class VIII G and class VIII I. In this study, the two classes were given two treatments class VIII G as an experiment class, which received learning by using a problem-based learning model assisted by Google Site, and class VIII I as the control class received conventional learning. Furthermore, both classes have given a test twice, namely the pretest at the beginning of the lesson to determine the student's initial mathematical concept understanding ability and the posttest at the end of the study. Based on the research that has been done, the pretest and post-test results in the experiment and control class are recapitulated in Table 1.

**Table 1.** The Recapitulation of Students' Mathematical Concept Understanding Ability Test Results

	Experiment Class Pretest	Control Class Pretest	Experiment Class Post-test	Control Class Post-test
Minimum	6	3	30	11
Maximum	36	31	77	66
Mean	19.80	17.03	50.43	35.80
Std. Deviation	8.002	7.928	13.416	12.477
Normality Test	0.169	0.408	0.240	0.808
Homogeneity Test		0.813		0.471
T-Test		0.184		0.000
Effect Size Test				1.85

Based on Table 1, the average pretest score of the experiment class with learning using the problem-based learning model assisted by Google Site is 19.80, and the average pretest score in the control class with conventional learning is 17.03. The difference between the average pretest scores of students in the experiment and control classes is 2.77. The standard deviation for the experiment class was 8.002 and the control class was 7.928. The standard deviation value in the experiment class is greater than the standard deviation in the control class, indicating that the distribution of the pretest value data in the experiment class is more varied than in the control class.

Next, the normality test result on the experiment class pretest value data was obtained at 0.169, and the normality test results in the control class were obtained at 0.408. The results of the normality test in both classes showed a value greater than the significance level, namely  $\alpha = 0.05$ , so the data on the pretest scores of students in the experiment class and control class were normally distributed, and the next test was the homogeneity test. The results of the homogeneity test on the experiment class and control class students' pretest scores were 0.813 more than 0.05, meaning that the student's pretest categories classes were homogeneous and could be continued with hypothesis testing, namely the average difference test or T-test.

The T-test result on the pretest score of the experiment class and control class students were carried out using a two-part test, and the results obtained were 0.184, which is a more significant level than 0.05. This shows that there is no average difference in the initial ability to

understand mathematical concepts of the experiment class and control class students. Thus, both classes can be used for research.

Furthermore, the average post-test score for the experiment class students was 50.43, and the average post-test score for the control class was 35.80. The difference in the average post-test scores of students in the experiment and control classes is 14.63. The standard deviation for the post-test scores of students in the experiment class was 13.416 and the standard deviation of the scores of students in the control class was 12.477. Because the post-test scores of students in the experiment class are more significant than the standard deviation of student post-test scores in the control class, it can be said that the post-test scores of students in the experiment class are more heterogeneous or varied.

The results of the prerequisite test, namely the normality test on the post-test value data of the experiment class students obtained 0.240, and the normality test results for the post-test scores of students in the control class were 0.808. Because the results of the normality test of students in the experiment class and control class are more than the significance level of 0.05, it can be said that the post-test scores of students in the experiment class and control class are normally distributed and can be continued with the next prerequisite test, namely the homogeneity test. The results of the homogeneity test of the post-test scores of students in the experiment class and control class were obtained at 0.471, which is more significant than 0.05, meaning that the data on the post-test scores of students in the experiment class and control class was homogeneous. Thus, it can be continued to test the hypothesis on the students' post-test scores, namely the average difference or T-test and the effect size test.

The T-test for the post-test scores of the experiment and control classes was carried out using a one-tailed test, namely the right-tailed test where the  $P - value = \frac{1}{2} \times sig. (2 - tailed)$  value with a result of 0.000 less than the significance level  $\alpha = 0.05$ . That is, it can be concluded that at the 95% confidence level, the average student's mathematical concept understanding ability who receives learning using a problem-based learning model assisted by Google Site is better than students who receive conventional learning. Thus, it can answer the hypothesis that problem-based learning assisted by Google Site influences the ability to understand students' mathematical concepts. Furthermore, because there is an effect, to find out the magnitude of the given effect, an effect size test is carried out.

The effect size test was carried out using the formula proposed by Cohen (1988) by looking at the average student post-test scores in the experiment and control classes and then dividing them by the standard deviation in the control class. The results of the calculation of the effect size test on the post-test scores of the experimental and control classes students were obtained 1.85, based on the interpretation criteria of the effect size by Cohen (1988), the value of 1.85 is included in the high category because  $\delta > 0.8$  or  $1.85 > 0.8$ .

Based on what has been explained, using interactive multimedia through various platforms, such as the Google site, in learning activities can increase student enthusiasm and interest in learning and increase students' understanding of mathematical concepts. Students' mathematical concept understanding ability in the experimental class using the problem-based learning model assisted by Google Sites is better than students in the control class who receive conventional learning with significant differences in scores. This shows that the results of this study show the effect of applying the problem-based learning model assisted by Google Sites on the students' mathematical concept understanding ability.

According to the study by Sartika (2017) the effect of the application of the problem-based learning model assisted by interactive multimedia on the mathematical concept understanding ability is 34.8%. The result of research by Setyowati et al. (2020) showed that interactive multimedia significantly affects students' mathematical concept understanding ability. Prisa et al. (2020) added that using interactive multimedia in the learning process can improve the ability to understand students' mathematical concepts with excellent responses during learning activities.

In line with that, Amalia et al. (2021) state that the students' mathematical concepts understanding ability through the problem-based learning model assisted by interactive multimedia is much more improved. The results of research by Mustajin et al. (2019) showed that the student's mathematical concept understanding ability using interactive multimedia has increased and is in the medium category. Patih et al. (2020) also revealed that problem-based learning assisted by interactive multimedia cloud improves students' mathematics learning outcomes.

Interactive multimedia can improve students' excitement for learning (Jubaidah & Zulkarnain, 2020). Interactive multimedia with practical activities can create active and conducive learning (Wulandari et al., 2021). Laksana et al. (2021) added that interactive multimedia makes students more enthusiastic about participating in learning and increases student learning outcomes. Using web-based interactive multimedia increases motivation and helps students understand learning material (Kusuma et al., 2018).

Based on the results of the research and similar research that have been carried out previously, it can be concluded that there are similarities in the results obtained, which show that there is an effect of the problem-based learning model assisted by interactive multimedia using various supporting platforms, one of which is the Google Site on the students' mathematical concept understanding ability.

## CONCLUSION

Based on the results of the data analysis and discussion of the research result above, it is concluded that the average mathematical concept understanding ability of students who receive learning using the problem-based learning model assisted by Google Site is better than that of conventional learning so that there is an effect of the problem-based learning model assisted by Google Site on the students' mathematical concept understanding ability. Calculation of the magnitude of the effect size on the students' mathematical concept understanding ability by using the effect size test, the result is 1.85 wherein the large criteria the effect size is in the high category.

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