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Research Article

The Effectiveness of Learning Google Meet Assisted by the Geogebra Application to Improve Students' Understanding of Mathematical Concepts

Nina Lisnawati*, Rahayu Kariadinata, Yayu Nurhayati Rahayu

Mathematics Education Department, UIN Sunan Gunung Djati Bandung, Indonesia

ORCID
Nina Lisnawati: https://orcid.org/0000-0001-9021-2338
Rahayu Kariadinata: https://orcid.org/0000-0003-4750-1892

Abstract.
Due to the Covid-19 pandemic, online learning has decreased the comprehension of students' mathematical concepts.. It is very important to instill conceptual understanding in students, in order for them to think and solve problems correctly and appropriately. Students experience difficulties in learning and understanding mathematical concepts, especially when the material provides changes to different problems. This paper aims to find out how far the effectiveness of Google Meet learning is achieved with the help of the GeoGebra application to improve students' understanding of mathematical concepts. This study uses a quasi-experimental method with sampling using a simple random sampling technique. This research was conducted in one of the high schools in the city of Bandung with the selected sample being class XI MIA 5 as the experimental class, while XI MIA 3 as the conventional class. The instrument used was the Mathematics Preliminary Knowledge test, which is a test of the ability to understand mathematical concepts. This shows that there is an increase in the ability to understand students' mathematical concepts between the experimental class and the control class. Learning mathematics through Google Meet assisted by the GeoGebra application provides opportunities for students to be able to actively participate in mathematics learning activities through graphic visualization media. It also fosters interest, enthusiasm, and motivates the students in improving their conceptual understanding of mathematics.

Keywords: geogebra application, google meet, understanding of mathematical concepts

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1. INTRODUCTION

According to most students, mathematics is considered as one of the most difficult fields of science to understand. Difficulty understanding mathematical concepts is a difficulty that is often encountered in students. If students do not understand the concepts in mathematics, this will cause difficulties in solving mathematical problems. A student

is constrained when facing problems that require critical thinking, such as problem solving, because students do not master a mathematical concept. It is important for students to have the ability to understand mathematical concepts, because they can train themselves to deal with mathematical problems and other problems.

The essential thing to apply in exploring knowledge is an understanding of mathematical concepts. This also needs to be balanced with efforts to understand thoroughly which in the end will enable students to find solutions to various existing problems and apply the things they have learned in their daily lives. As stated by Sumarjono, it is known that understanding is included in one of the efforts applied to obtain a conclusion [1]. As for the concept, it is included in an idea that is abstract in nature and is used to classify various collections of objects. So that from these two meanings it can be seen that the efforts made in understanding a concept are included in the efforts made to obtain a conclusion related to various ideas so that in the end the objects can be classified. Although mathematics is generally considered not easy, it is important to make sense of mathematics lessons. Of the many factors that affect the difficulty of learning mathematics, one of them is the learning patterns applied by students who are not meaningful so they do not understand the concept.

Related to this, the influence on the understanding of mathematical concepts is structured into several indicators, including giving a restatement related to the concept, classifying various objects according to predetermined concepts, giving examples and non-examples in accordance with the conception, presenting concepts in the context of representation and classification or algorithm used in solving a problem [2].

Based on the actual situation in Indonesia, the ability to understand a concept mathematically is still relatively low. This statement can be seen in concrete evidence from the evaluation obtained when the TIMSS survey activities were carried out in 2011, it was found that in understanding a concept mathematically, the abilities possessed by Indonesian students were low in their class. This is also reinforced by the fact that Indonesia is in 38th position with a total of 42 countries. Related to this, the average score obtained by students in Indonesia is only 386 at class VIII. It is clear that the number of these scores decreases if a comparison is made with 2007, in that year Indonesia was in 33rd place with a total of 49 countries, and the total score was 397. This description shows that the average number of scores obtained by all countries is 500. So based on the results of the TIMSS study it can be seen that students' expertise in understanding mathematical concepts in Indonesia is still low.

In the process of providing support for the ability to understand a concept mathematically, meaningful learning activities are needed. In this case students are given active

demands and are not limited to teaching materials delivered by the teacher. However, these active subjects tend to carry out the process of thinking, searching, processing, reducing, merging, concluding and solving various problems [3].

According to the confession of a student who attends a high school in Bandung. During the learning process during the *Covid 19 pandemic,* a student needed more time to understand mathematics. Even though the learning material has been explained through *Google Meet* , through *voice notes* or links to obtain a lesson material that is distributed by the teaching staff, but it does not make it immediately understand the concept of the material to obtain a lesson material. Using *Google Meet media* during meetings, sometimes only doing the things that are asked. In obtaining a lesson material a student is not involved so actively as asking. Because they are still confused about the material to obtain a lesson material that will be asked.

In this case, related to the process of providing support for the ability to understand a mathematical concept is to try for learning that is assisted by an application known as Geogebra. As stated by Suweken, it is known that this application is basically intended for various purposes in obtaining a lesson related to mathematics. This is supported by the display given which is classified as optimal so that it can provide accommodation to represent various concepts mathematically which are multimode. It can be seen that GeoGebra is included in an application whose interactions are very active, the areas of focus are on algebra, geometry, calculus and statistics and it is intended for activities to learn and teach about natural sciences and also mathematics with educational levels starting from elementary school to to high school [4]. For anyone who uses this application, it can be ensured that he has the opportunity to obtain a new learning method so that he can fully understand an existing concept. This application also has a unique and interesting way of teaching so that it makes it easier for students to understand existing concepts [5].

2. RESEARCH METHOD

research method used is quasi-experimental (quasi-experimental) and uses a quantitative approach. In this case the researcher matched the group that was given the *treatment* with the comparison group that was not given the *treatment* . In this study, the design used was *pretest-posttest control group design* , in which there is involvement between two types of classes namely control and experiment. The learning experimental group used *Google Meet learning with the help of the GeoGebra* application ,

while the conventional learning used *Google Meet* without the help of the *GeoGebra application* . The following is the research design [6] contained in Table 1.

TABLE 1: Research design.

Class	Pretest	treatment	Posttest
Experiment	O	X	O
Control	O		O

Information :

X : *Google meet learning* with the help of the geogebra application

O : *Pretest* and *posttest* control and experimental class

The sample in this research design will receive two different treatments, namely given a *pretest* , then in the experimental class students will learn by learning *Google Meet with the help of the GeoGebra* application while in the control class students will learn by the lecture method, namely in the form of *Google Meet learning* without the help of the *GeoGebra application.* . After that students are given a *posttest* when the learning process is complete . *The posttest* instrument given is identical to the *pretest instrument* that was given before. The instrument is an instrument that measures the ability to understand concepts mathematical student.

The data in this study is the result of the ability to understand the concept students' mathematics obtained from the results of the students' *pretest* and *posttest* which will be calculated using *N-Gain.* The research instrument consisted of tests in the form of *pretest* and *posttest* to determine the ability to understand concepts mathematical.

To find out the ability to understand students' mathematical concepts after obtaining mathematics learning using Google *Meet learning* assisted by the *GeoGebra application* and conventional learning models, the data analysis was carried out on the data obtained from the *pretest* and *posttest results* in each group using *N-Gain* [7] , the formula are as follows.

$$N - gain = \frac{Skor_{posttest} - Skor_{pretest}}{Skor_{maksimal} - Skor_{pretest}} \quad (1)$$

Then after knowing the N-Gain value , it is to find out the increase in the ability to understand concepts students using Google Meet learning assisted by the GeoGebra application better than students who use conventional learning then use the t -independent test. The effectiveness of learning Google Meet by getting help from the GeoGebra application in improving students ' understanding of mathematical concepts can be seen from the pretest and posttest test data. So that the data analysis of the formulation of the problem of learning effectiveness is only for the experimental class.

2.1. Effectiveness Category

The test is given before giving an understanding as initial data before being given treatment using the GeoGebra application and posstets as data after being given treatment using the GeoGebra application. The data obtained were analyzed using Effect Size [8]. Cohen's formula is used to calculate the effect size.

$$d = \frac{M\,Posttest - M\,Pretest}{\sqrt{\frac{SD^2\,Posttest + SD^2\,Pretest}{2}}} \quad (2)$$

Information :

d = *effect size*

M = average test score

SD = Standard Deviation or Standard Deviation

effect size calculation with the interpretation as in Table 2.

TABLE 2: Table of criteria in effect size.

No	Effect Size (d)	Category
1	d ≥0.80	Big
2	d> 0.5 d < 0.80	Currently
3	d< 0.5	Small

This research was conducted at one of the State Senior High Schools in the city of Bandung. Sampling in this study using simple random sampling technique without paying attention to the differences in the characters that exist in each member of the population as long as they do not have a significant influence on the results of later research. The XI-MIA 5 class was selected which was an experimental class that obtained the Google Meet learning model assisted by the GeoGebra application, while XI-MIA 3 class was the control class which received conventional learning in the form of Google Meet learning without the help of the GeoGebra application. (talk) .

3. RESULTS AND DISCUSSION

3.1. Enhancement Ability to Understand Mathematical Concepts

The difference in increasing the ability to understand concepts mathematics among students who use *google meet* learning with the help of *geogebra* applications and conventional learning models . To answer the formulation of the problem can be known

by calculating the *n gain value* of each student and testing the difference with the T-Independent test.

The data gain normality test was carried out by the Kolmogoro f Smirnov test with the help of SPSS 16.0 *software* . Guidelines for making a decision on the normality test, namely, if the value is Sig. > 0.05 , then the data is normally distributed, if the value is Sig. ≤ 0.05 , then the data is not normally distributed. The results of the data testing carried out are presented in Table 3.

One-Sample Kolmogorov-Smirnov Test

		N_Gain_Eks	N_Gain_Knv
N		17	13
Normal Parameters[a]	Mean	.5312	.3990
	Std. Deviation	.17470	.14509
Most Extreme Differences	Absolute	.101	.188
	Positive	.101	.188
	Negative	-.076	-.079
Kolmogorov-Smirnov Z		.418	.679
Asymp. Sig. (2-tailed)		.995	.745

Figure 1: N-gain data normality test.

In Table 3 you can see the values . (2 −) in Experiment class 0.995 > 0.05 means that the data is normally distributed, while the value is ⊠⊠⊠⊠⊠. in the conventional class 0.745 > 0.05 means that the data is normally distributed. Furthermore, to test the second prerequisite, a homogeneity test of the variance of Ngain's data was carried out using SPSS. with decision-making guidelines, namely, if the value of ⊠⊠⊠⊠⊠. > 0.05, then the variance of the data is homogeneous, if the value is ⊠⊠⊠. ≤ 0.05 , then the variance of the data is not homogeneous. The results of the homogeneity test can be seen in Table 4.

TABLE 3: *N-Gain* data homogeneity test of variance.

Levene Statistics	df1	df2	Sig.
.353	1	28	.557

In Table 4 it can be seen that the results of the homogeneity test for variance of the n-gain data show a sig value of 0 .5 5 7 > 0.05, meaning that the data has a homogeneous variance. After the assumptions of normality and homogeneity are met, then a t-independent test of N-gain is performed . The independent t- test was carried out using SPSS software . The decision making criteria is if $sig \geq 0,05$ then ⊠$_0$ accepted

and if $sig < 0,05$ then H_0 rejected. The results of the independent t- test are presented in Table 5.

TABLE 4: *T* test –independent data N-gain.

Q	df	Sig. (2-tailed)
2.206	28	0.036

Based on Table 5 the value of . (2 –) ?? < 0.05 . This means that there is a difference in the increase in the ability to understand mathematical concepts of students who use Google Meet learning with the help of the GeoGebra application with students who get google meet learning without the help of the geogebra application . It can be concluded that the increase in the ability to understand mathematical concepts of students who use Google Meet learning assisted by the GeoGebra application is higher than students who use Google Meet learning without the help of the GeoGebra application [10].

Pretest and posttest data were used to see the effectiveness of Google Meet learning with the help of the GeoGebra application in improving students' understanding of mathematical concepts.

TABLE 5: Recapitulation of the highest, lowest, *pretest* mean score and standard deviation.

Class	The highest score	Lowest Value	$\underline{x}$	N	S
XI A 5	75	20	50.3	17	21.7

Based on table 6, it can be seen from the results of the pretest before students were given Google Meet learning assisted by the GeoGebra application, it was obtained from 17 students in the form of the lowest score = 20, the highest value = 75, the average pretest value = 50.3 and standard deviation (s) = 21.7.

TABLE 6: Summary of highest, lowest, posttest average scores and standard deviation.

Class	The highest score	Lowest Value	$\underline{x}$	N	S
XI A 5	95	50	77.35	17	12.13

From table 7 it can be seen from the results of the posttest after the students were enacted with google meet learning assisted by the Geogebra application to 17 students, the lowest score = 50, the highest score = 95, the average posttest result = 77.35 and standard deviation (s) = 12.13 . Then used the analysis through the effect size of the average pretest and posttest results.

$$d = \frac{M\,Posttest - M\,Pretest}{\sqrt{\frac{SD^2\,Posttest + SD^2\,Pretest}{2}}}$$

$$d = \frac{77,35 - 50,3}{\sqrt{\frac{12,13^2+21,7^2}{2}}}$$

$$d = \frac{27,05}{\sqrt{\frac{147,13+470,89}{2}}}$$

$$d = \frac{27,05}{\sqrt{\frac{147,13+470,89}{2}}}$$

$$d = \frac{27,05}{\sqrt{309}}$$

$$d = \frac{27,05}{\sqrt{309,01}}$$

$$d = \frac{27,05}{17,57}$$

$$d = \frac{27,05}{17,57}$$

$$d = 1,54$$

TABLE 7: Table of criteria in *effect size*.

No	Effect Size (d)	Category
1	d ≥0.80	Big
2	d> 0.5 , d < 0.80	Currently
3	d< 0.5	Small

The magnitude of the effectiveness of the Google Meet learning model assisted by the Geogebra application in increasing students' understanding of mathematical concepts through effect size analysis is 1.54 and belongs to the large category.

4. CONCLUSION

Based on the results of the research that has been presented, the following conclusions can be drawn: Improving the ability to understand mathematical concepts of students who use Google Meet learning assisted by the Geogebra application is better than students who receive conventional learning. Based on the description and analysis of the data through effect size analysis. Based on the results of the analysis obtained, it can be said that student activities during learning can be said to be effective and can improve students' understanding of mathematical concepts.

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