



Blended Learning Model During Covid-19 Pandemic to Increase Mathematics Learning Outcomes in Senior High School

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Abstract

Distance learning requires teachers to select appropriate instructional methods to ensure that students comprehend what the teacher communicates without meeting face to face. The purpose of this study is to demonstrate how a Blended Learning model centered on two-way communication can be applied during a pandemic. This is a quantitative method of research that employs a quasi-experimental design. The research variables include the dependent variable, which is the outcome of mathematics instruction, and the independent variable for the Blended Learning model. The research design used was a pretest-posttest randomized control group design. Subjects were assigned randomly to the experimental group, administered a pretest, and received treatment using a blended learning model. Following that, the final test (posttest) was administered. Given that the final value of the test in this study is 1.712, the table value at a 0.05 significance level, and a sample size of 30 students is 1.697. The conclusion is that the value of 1.712 is greater than the 1.697 t table value. Because the value of t count is greater than the value of the t table, the criteria H_0 is rejected, and H_a is accepted. The blended learning model can effectively improve students' mathematics learning outcomes.

Abstrak

Pembelajaran jarak jauh mengharuskan guru untuk memilih metode pembelajaran yang tepat untuk memastikan bahwa siswa memahami apa yang dikomunikasikan guru tanpa bertatap muka. Tujuan dari penelitian ini adalah untuk mendemonstrasikan bagaimana model Blended Learning berpusat pada komunikasi dua arah dapat diterapkan selama pandemi. Penelitian ini menggunakan metode penelitian kuantitatif yang menggunakan desain eksperimen semu. Variabel penelitian meliputi variabel terikat yaitu hasil belajar matematika, dan variabel bebas untuk model Blended Learning. Desain penelitian menggunakan pretest-posttest randomized control group design. Subyek ditugaskan secara acak ke kelompok eksperimen, diberikan pretest, dan menerima perlakuan dengan menggunakan model blended learning. Setelah itu dilakukan tes akhir (posttest). Nilai akhir tes dalam penelitian ini adalah 1,712, nilai tabel pada taraf signifikansi 0,05, dan jumlah sampel 30 siswa adalah 1,697. Kesimpulannya adalah nilai 1,712 lebih besar dari nilai t tabel 1,697. Karena nilai t-hitung lebih besar dari nilai t-tabel, maka kriteria H_0 ditolak, dan H_a diterima. Model blended learning efektif meningkatkan hasil belajar matematika siswa.

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INTRODUCTION

Two words make up the term blended learning: Blended and Learning. When we say "learning" we mean "mixed." To put it another way, the term "Blended Learning" refers to education in which students are exposed to various instructional approaches. Through the use of blended learning, it is possible to combine the benefits of online instruction with the interaction and participation afforded by face-to-face instruction (Sjukur, 2012). To improve the classroom experience, information and communication technology (ICT) such as blended learning (face-to-face and online) is being developed (Kusumaningrum, 2019). Technology is used in the teaching process by combining face-to-face instruction with online instruction. In order to meet learning objectives, blended learning incorporates both synchronous and asynchronous learning methods (Kusumaningrum, 2019). In the end, blended learning is a method of learning in which two learning styles are combined, face-to-face and online, using technology.

The outcomes of student learning are essentially changes in behavior. Which of the following encompasses the cognitive, affective, and psychomotor domains. This transition from ignorance to knowledge strengthens students' psychomotor abilities (Sudjana, 2009). Determining how far students can master learning after participating in teaching and learning activities is called assessing learning outcomes. Students' success is denoted by specific numbers, letters, or symbols. Have students mastered the teacher-provided material or not? (2006) (Dimiyati and Mudjiono). Learning outcomes are abilities acquired by individuals following a learning process. They can result in changes in students' behavior in terms of their knowledge, comprehension, attitudes, and skills, making them better than previously (M. Ngalim Purwanto, 2002). Each student undergoing the learning process must be provided with new knowledge and experiences by the teacher, where each body of knowledge contains data that must be imparted to students. Thus, learning outcomes can be defined as improvements in behavior across the cognitive, affective, and psychomotor domains.

This type of research has been conducted to determine the effect of blended learning on the learning outcomes for geography in class X. This study demonstrates that when compared to conventional learning models, the blended learning model can increase average student learning outcomes by 12.70. (Rasti and Believers, 2019). A similar study was conducted in order to determine the relationship between the blended learning model and motivation and level of understanding in algorithmic and programming courses. The research demonstrates a mean score of 11.705 between classes taught using the blended learning model and classes taught using the conventional learning model (Sarah and Handaru, 2015). Additionally, research on blended learning was conducted about oral tradition learning. The findings indicate that students achieve a significant increase in learning outcomes after three stages of learning, indicating that blended learning is appropriate for use in oral tradition learning (Muhammad, 2020). According to the preceding discussion, the blended learning model has been researched, but researchers have difficulty locating research on mathematics learning. Additionally, despite the fact that blended learning models were specifically designed to combine face-to-face and distance learning models, they were rarely applied during the COVID-19 pandemic. Based on these issues, researchers are interested in determining the effectiveness of the blended learning model as the best solution for improving students' mathematics learning outcomes during the pandemic.

METHODS

The study was conducted on class XI students of State High School Number 1 Dolok Silau in Dolok Silau District, Simalungun Regency, located at street Example No. 01 Field Suggestions. This research was carried out in the even semester which was carried out in stages and began to be carried out in May 2021. This type of research is quantitative with a quasi-experimental method.

The research variables include the dependent variable, namely the results of learning mathematics, and the independent variable, namely the Blended Learning learning model. The research design used was the randomized control group pretest-posttest design. Subjects were randomly assigned to the experimental group, given a pretest (Pretest), and then treated with a blended learning model. After that, the final test (posttest) was given. The research design is as shown in table 1 below.

The instrument in this study consisted of a treatment instrument and measurement instrument. The measurement instrument consists of a syllabus, lesson plans, and student worksheets. The measurement instrument consists of 20 multiple choice questions to measure learning outcomes. The research implementation process will be explained as follows preparation phase:

1. In the preparatory stage,

The researcher made observations through informal interviews with students and teachers related to mathematics learning that was carried out during online learning. Good way of delivering material, models, and media used by teachers.

2. Research Stage

First, the researcher conducted a pretest on the class that was the sample in the study. After that, the treatment was carried out by applying the Blended Learning model to the class used as the research sample. After the treatment, the research collects research data by giving posttests to students.

3. Data Processing Stage

After the data is collected, data analysis is carried out. In this process, students' test scores are calculated and analyzed to determine learning mathematics. This research will go through several tests at the data processing stage, namely data normality test, homogeneity test, and hypothesis testing.

4. The normality test in this study will use the Kolmogorov-Smirnov test, the homogeneity test will use the Bartlett test, and the hypothesis test will use the test. All of these test calculations will use the Microsoft Excel application. This data processing stage serves to answer the formulation of the problem in this study, namely:

a. H_0 : Blended Learning Model is not effective to improve students' mathematics learning outcomes $\rho = 0$;

b. H_a : Blended Learning Model is effective for improving students' mathematics learning outcomes $\rho \neq 0$; (Arikunto, 2019)

FINDINGS AND DISCUSSION

In the research process, the researchers found a fairly disturbing obstacle. All students of State High School Number 1 Dolok Silau did not know the use of the zoom application, which is usually used in online learning. This is because the school makes learning policies in schools not online or offline, but only collects assignments given by the teacher. Therefore, researchers need to do a short exercise on using the Zoom meeting application so that the research process with online learning can be carried out in the future.

The implementation of online learning through the zoom meeting went smoothly, even though some students were still confused or forgot about using the zoom meeting facility. Even so, it was clear that the students' enthusiasm in participating in the lesson was proven by the fact that all students were present and followed the lesson with a focus without turning off the camera. Students who take part in online learning also respond positively by providing many questions and responses related to the material provided.

However, the difference in student scores obtained when doing the initial test using the conventional learning model that teachers at State High School Number 1 Dolok Silau usually use with the final test using the blended learning model is very visible. The elaboration of student scores

using multiple-choice questions will be explained through the following graph.

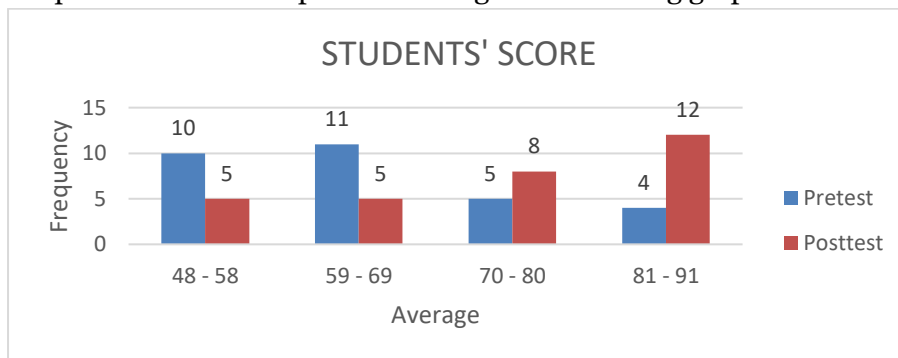


Figure 1. Graph of Student Average Score

Based on the graph above, we can see that the pretest value has a lower average value when compared to the posttest value. This can also be seen at the time of conducting the research; the level of enthusiasm for learning up to the initial test using conventional learning models was lower when compared to learning up to the final test using the blended learning model. The quantity of questions and responses is more visible in the treatment of the blended learning model. Broadly speaking, the scores obtained through the elaboration of the two tables can answer the effectiveness of the blended learning model by linking student learning outcomes. However, to answer definitively the problems in this study, the data that has been obtained will go through several stages of testing, namely normality test, homogeneity test, and hypothesis testing.

The entire data obtained has gone through the calculation of the test requirements for data analysis using the Microsoft Excel application. In the following, the researchers describe the results of these calculations.

Normality test

The normality test in this study aims to determine whether the data obtained in this study are normal or not. In the following, I will explain the results of this test calculation through table 2 the following.

Table 1. Description of Data Normality Test

One-Sample Kolmogorov-Smirnov Test		
Unstandardized Residual		
N		30
Normal Parameters, b	mean	2,960
	Std. Deviation	2.24870635
Most Extreme Differences	Absolute Positive	,061
	negative	,061
		-,055
Kolmogorov-Smirnov Z		,337
asymp. Sig. (2-tailed)		1,000

Based on the description of the table above, it is known that the final value of Kolmogorov-Smirnov z is 0.337. The criteria for the normal distribution of data are that the final value of Kolmogorov-Smirnov must be greater than the 0.05 significance level. Because the final value of

Kolmogorov-Smirnov in this study is greater than the 0.05 significance level, the data in this study are normally distributed. It is feasible to continue the test of the next data analysis requirements.

Homogeneity Test

The homogeneity test in this study was carried out to see the equality of the data between pretest and posttest. This test uses the Bartlett test, whose significance level is = 0.05. The criterion in this test is if the calculated chi-squared value is smaller than the table chi-square value. In the following, the researcher will describe the results of calculations using Microsoft Excel through the following table.

Table 2. Description of Data Homogeneity Test

Test of Homogeneity of Variances			
Math Learning Results			
Levene Statistics	df1	df2	Sig.
1,538	1	58	0.220

Based on the table above, we can see that the final calculation value is 0.22 and the table chi-squared value with a significance level of 0.05% is 3.84, and therefore, we know that the final value is 0.22 smaller than the chi-squared value. The table is 3.84 so that the data in this study is homogeneous and feasible to test the next data analysis requirements.

Hypothesis testing

Decision making of the H_0 and H_a hypotheses is accepted or rejected, so for this reason, a test of this hypothesis is carried out using the test which is used to determine the effect of the independent variables individually on the dependent variable whether the effect is significant or not with the following criteria.

H_0 : Blended Learning Learning Model is not effective for improving students' mathematics learning outcomes if the t-count value is < from the t-table value $\rho = 0$;

- a. H_a : Blended Learning Model is effective for improving students' mathematics learning outcomes if the t-count value is > from the t-table value $\rho \neq 0$;

To find out the accepted and rejected criteria in the study, the results of the calculation of the t-test hypothesis with the application will be described in *Microsoft Excel* through the following table.

Table 3. Description of Data Hypothesis Testing

Model	Coefficient's			t	Sig.
	Unstandardized Coefficients	Standardized Coefficients			
	B	Std. Error	Beta		
1 (Constant)	6,683	3,713		1,800	,083
Class A	,375	,219	,308	1,712	,098

Based on the table above, it is known that the final value of the test in this study is 1.712 and the t table value at a significance level of 0.05 and a sample of 30 students is 1.697 so the conclusion is that the t-count value is 1.712 greater than the t-table value, which is 1.697. Because the value of t count is greater than the value of t table, the criteria H_0 rejected and H_a accepted so that in this study

it is proven The Blended Learning model is effectively carried out to improve students' mathematics learning outcomes during the pandemic at State High School Number 1 Dolok Silau.

The results of this study are in line with previous research conducted by Marhendra (2016), showing that the Blended Learning model has a positive and significant effect on student learning outcomes. Student learning outcomes in the experimental class were better than those in the control class. The results of research conducted by Nugraha (2017) concluded that blended learning had a positive effect on understanding concepts and the fluency of students' mathematical procedures. In addition, the results of research conducted by Wijaya (2016) stated that (1) the achievement motivation of students who were taught using the Blended Learning model was better than students who were taught using the conventional learning model, (2) the learning achievement of students who are taught using the Blended Learning model is better than the students who are taught using the conventional learning model, and (3) the achievement motivation and learning achievement of students who are taught using the Blended Learning model has differences with students who are taught using this model. Conventional learning. Thus, it can be concluded that the Blended Learning learning model positively affects achievement motivation and student learning achievement in mathematics.

Similar to the results of Diana Riasari's research (2018), which states that problem-solving-based Blended Learning can develop students' mathematical communication skills to use mathematical ideas and understand in solving mathematical problems as outlined both orally and in writing. In the current new normal era, Hamela (2021), the results of her research show that the application of the Blended Learning model can improve student learning and learning outcomes.

CONCLUSION

After the research was completed, it went through various analytical requirements tests with the results H_a accepted. This study concludes that the blended learning model is very suitable for use in learning, especially online learning, especially during the COVID-19 pandemic, which is predicted to last a long time. Even so, the process of learning activities must continue to be carried out and teachers are required to meet all the demands of learning objectives with various obstacles due to face-to-face learning, which is limited by the government to prevent the spread of the COVID-19 virus. However, researchers pay attention to how well the learning model used during learning is online. The learning process and results obtained are no better than face-to-face learning. So the researchers hope that the results of this study will become a reference for other researchers and teachers to develop or look for online learning models that can balance the process and results of face-to-face teaching and learning activities.

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