

## **The Effect of the Blended Learning Model on Mathematical Reasoning Ability in the Material of Lines and Angles**

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### **Abstract**

This quasi-experimental research aimed to enhance mathematical reasoning abilities among students at SMPN 2 Lemahsugih Majalengka by implementing a blended learning model. The study involved 60 students from two classes, with 30 students in the experimental class (VII A) receiving the blended learning treatment and achieving an average score of 77.5. The control class (VII B) consisted of 30 students who received online learning treatment and obtained an average score of 67.17. The research utilized a valid essay questionnaire consisting of seven questions to assess learning outcomes in the topic of lines and angles. Data analysis involved normality and homogeneity tests, which confirmed that the data was normally distributed and homogenous. Subsequently, a hypothesis test was conducted, revealing a significant difference in mathematical reasoning abilities between students who learned using the blended learning model and those who received online learning. This research underscores the effectiveness of blended learning in improving students' mathematical reasoning skills in the context of lines and angles.

Keywords: blended learning models, lines and angles, mathematical reasoning

## **1 INTRODUCTION**

Currently, Indonesia is shocked by the outbreak of a disease caused by the corona virus or known as COVID-19 (corona virus diseases-19). The COVID-19 pandemic that has spread requires various sectors to immediately take a stand in preventing wider transmission. One of the efforts that must be implemented, so that transmission is not more widespread, is to implement social distancing. This application of social distancing also applies in the world of education, where the government through the Ministry of Education and Culture Circular Letter (Kemendikbud) Number 4 of 2020 regarding education policies during the COVID-19 pandemic, in this circular letter the Ministry of Education and Culture advises students to study from home and instructed that learning activities be carried out online. (Buska et al., 2021) explained that this policy is supported by UNESCO, implementing a large-scale distance learning program to reach students. This is because the emergency situation, along with the world of education, did not escape this impact. The spread of the corona virus which has become a pandemic, this fact is the reason for the central government to the regions issuing a policy to eliminate face-to-face activities in all educational institutions. This policy was taken to break the chain of transmission of the corona virus.

The implementation of online learning in the midst of the current pandemic has caused many difficulties in understanding the material in studying mathematics because students rarely ask questions and are not active during learning, too many students do not know and understand what will be asked in learning, students rarely give responses and ideas, not yet able to explain mathematical ideas properly and correctly, and many more. This situation causes students to develop less thinking skills (Sari & Hidayat,

2019), so students lack associations. (Sukirwan et al., 2018) said reasoning is always a major concern for all people, especially mathematicians. Its role in solving mathematical problems but the implications of reasoning are crucial problems that are always present in everyday learning.

Based on the results of the pre-survey the researchers conducted interviews with the mathematics teacher, it was stated that the mathematical reasoning abilities at SMPN 2 Lemahsugih are currently still unsatisfactory. Mathematics learning at SMPN 2 Lemahsugih is still teacher-centred, this causes students' mathematical reasoning abilities to be less than optimal. Weaknesses in students are the lack of logical reasoning ability in solving problems or math problems. The results of learning mathematics from students show that there are still some students who have a mastery score below the average. The low understanding of students' mathematical reasoning in the sub-subject matter of lines and angles affects the learning outcomes of students who have not reached the minimum completeness criteria.

These learning problems need efforts to improve the quality of learning mathematics need to consider changes in the learning process, one of which is marked by changes in the learning model. In this case, learning is required to attract the attention of students in the midst of the Covid-19 pandemic (Hamid et al., 2020). In this learning situation, the teacher can provide learning models in various ways that are adapted to the situation and can increase enthusiasm for learning so that in any situation students can improve learning achievement. This is the teacher should be able to provide treatment with a blended learning model. According to (Krismadinata et al., 2020), blended learning is a learning process that combines face-to-face and online learning. Before implementing blended learning, the things that need to be considered for implementing blended learning are first to consider the development of the blended learning model correctly.

The application of blended learning in learning mathematics in previous research was conducted by (Ulfa & Puspaningtyas, 2020). Reasoning is a thought process in drawing conclusions in the form of knowledge from various known statements. Reasoning is an activity or thought process to draw conclusions or make new statements based on previous statements. Reasoning is a thought process in entering a conclusion that produces knowledge (Subekti et al., 2021). So, it can be concluded that reasoning is the process of drawing conclusions from previous statements so that new statements are formed.

In addition, blended learning can increase student access and flexibility, actively increasing learning levels and outcomes (Hadisaputra et al., 2020). In this regard, this study focuses on discussing the mathematical reasoning of lines and angles. In learning material lines and angles the role of mathematics is very important in facing challenges in current conditions (Hartono et al., 2021), so that we are expected to be able to become a thinking process in good reasoning, as educators we need to innovate and create learning models in the midst of a pandemic Covid-19.

Based on the theory above, the research will discuss the problems that arise in online learning, including whether there is an effect of the blended learning model on the mathematical reasoning abilities on lines and angles in students at SMPN 2 Lemahsugih Majalegka. Discussion of this research problem in achieving the goal of improving students' mathematical reasoning abilities at SMPN 2 Lemahsugih Majalengka through a blended learning model.

## **2 RESEARCH METHODS**

This research was conducted on class VII students of SMPN 2 Lemahsugih, Majalengka City. The sample used in this study was 60 students, namely class VII A, which consisted of 30 students who were given the blended learning model and 30 students in class VII B who were given the online learning model. This research method is Quasi Experimental Design. This form involves two groups, namely the experimental group and the control

group. The sample used for the experiment as well as the control group was taken randomly from a certain population. To determine the effect of the two groups, given different treatments, the two groups were given a posttest. Posttest results are used to find out which one is more effective. Research design can see in Table 1.

Table 1. Research Design

| Group | Treatment | Posttest |
|-------|-----------|----------|
| E     | X         | 0        |
| K     | -         | 0        |

Table 1 shows that the two groups were given different treatments but with the same test questions. The sampling technique in this study was Cluster Random Sampling, namely the sampling technique. research instrument in the form of essay questions as much as 8 questions. The questions were tested for validity and reliability by managing the data Ms. Excel and manual. Furthermore, the data were tested for the prerequisites for data analysis, namely first, the normality test to prove that the samples were normally distributed using lilliefors. Second, the homogeneity test, using Fisher's test, to find out the variance of each group of data. If the analysis prerequisite test is fulfilled, then a hypothesis test is then carried out to test the difference in the means of the two groups of data.

### 3 RESULT AND DISCUSSION

The data analyzed in this study is data on students' mathematical reasoning abilities after being taught using a blended learning model. The description of the results and discussion consists of seven stages, namely: validation and reliability testing (Anggraini et al., 2020) using Ms. Excel and manual calculations, level of difficulty, discriminating power, normality test, homogeneity test, and hypothesis testing.

#### 3.1 Instrument Validity and Reliability Test Results

The results of the instrument validity test that were tested using Ms.Excel and manual calculations on essay questions from the variable mathematical reasoning ability on the material lines and angles obtained 7 valid questions and 1 invalid item. The results of the instrument reliability test that have been tested using Ms.Excel and manual calculations yield  $r_{11} = 0.57$  with moderate criteria.

##### 3.1.1 Difficulty Level Test Results and Discriminating Power

The results of the difficulty level test that were tested using Ms.Excel and manual calculation of the questions obtained the results of questions with moderate criteria of 6 questions, 1 easy question, and 1 difficult item. The results of the discriminating power test were tested using Ms.Excel and manual calculations on the questions, obtaining the results of questions with sufficient criteria of 5 items and 3 items of insufficient criteria.

##### 3.1.2 Data Analysis Prerequisite Test Results

The results of the research from the prerequisite test, obtained the following results; 1) the normality test results obtained  $L_{count} = 0.121 < L_{table} = 0.161$  then  $H_0$  is accepted, it is concluded that the data is normally distributed (Ag-Yi & Aidoo, 2022), 2) homogeneity test, obtained  $F_{count} = 1.32 < F_{table} = 1.84$  then  $H_0$  is accepted, it is concluded that the variance of the data is from the homogeneous group (Bull et al., 2021). For normality test results can be seen in Table 2.

Table 2. Normality Test

| Class      | N  | $\alpha$ | $L_{count}$ | $L_{table}$ | Category |
|------------|----|----------|-------------|-------------|----------|
| Experiment | 30 | 0,05     | 0,121       | 0,161       | Normal   |
| Control    | 30 | 0,05     | 0,135       | 0,161       | Normal   |

Table 2 shows the value of  $L_{count} < L_{table}$ , this means that the sample comes from a normally distributed population.

### 3.1.3 Hypothesis testing

This hypothesis test is to see the effect of the Blended Learning model on mathematical reasoning abilities in the line and angle material for class VII students of SMPN 2 Lemahsugih Majalengka. The results obtained are  $t_{count} = 3.020 > t_{table} = 2.002$ , then  $H_0$  is rejected, meaning; on the ability of mathematical reasoning on lines and angles there is a significant difference in effect between students who learn using blended learning models and online learning

## 3.2 Discussion

The ability of students to collect and process information in a learning activity in the form of the results of experiments or observations, so that students can create new knowledge. The students' mathematical reasoning abilities in this study were built through a blended learning model. Blended learning is a combination of face-to-face learning in class with web-based learning (e-learning). Advantages of blended learning. In this learning activity, students can discuss with teachers or other students outside of face-to-face hours, and learning activities carried out by students outside of face-to-face hours can be managed and controlled appropriately by the teacher (Sulisworo et al., 2020). Based on the theory, the blended learning model can provide an advantage to train students as pedagogics in understanding the material being studied. Seeing from these advantages, this research strategy seeks to improve students' mathematical reasoning abilities through blended learning, by developing learning effectiveness through giving questions in the form of essays or HOTS questions (Sagala & Andriani, 2019).

Based on the results of testing the research hypothesis (t-test) obtained  $t_{count} = 3.020$  and  $t_{table}$  is 2.002, with a significant level of 0.05. The results of testing this hypothesis can be concluded that there is an effect of applying the Blended Learning model to students' mathematical reasoning abilities on lines and angles in class VII SMPN 2 Lemahsugih. The findings of this study are supported by the theory of (Fitri & Zahari, 2019) which has proven that the blended learning model can support students' creative thinking or reasoning in learning mathematics.

The teacher as a facilitator can provide learning models in various ways that are adapted to the situation and can increase the enthusiasm for learning so that in any situation students can improve learning achievement. (Mahmud, 2021) informed that blended learning is a learning model that has been carried out by many educators, blended learning is preferred because blended learning gives satisfaction, blended learning can increase mastery of the material.

## 4 CONCLUSION

The blended learning model is a learning process that combines face-to-face and online learning which is very suitable for use in learning during a pandemic. Government policy through the Circular Letter of the Ministry of Education and Culture (Kemendikbud) Number 4 of 2020 regarding education policies during the COVID-19 pandemic, in the

circular letter the Ministry of Education and Culture suggested that students can learn from home, however over time the adaptation of this learning pattern makes students feel bored. This saturation will reduce the creative thinking of students. With the blended learning model, it provides new innovations in learning activities that can build student enthusiasm for learning, so that students can be creative in operating technology media in the education sector.

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