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IMPROVING STUDENTS' MATHEMATICAL UNDERSTANDING ABILITY THROUGH CANVA ASSISTED PROBLEM-BASED LEARNING MODEL ON STRAIGHT LINE EQUATIONS

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Abstrak

This study aims to determine whether there is an increase in students' mathematical understanding if learning is carried out using the scientific method compared to problem-based learning methods on straight line equations material. This research was conducted at SMP Negeri 5 Cimahi. This study uses a quantitative and descriptive qualitative approach. Learning outcomes data is used as a parameter to measure the increase in mathematical understanding ability. The results showed an increase in students' mathematical understanding abilities when learning using problem-based learning methods increased by 18% compared to scientific methods.

INTRODUCTION

Education is a conscious and planned attempt to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, well-mannered character and the skills needed by themselves, society, nation and state (UU No. 20 of 2003). According to previous research which was conveyed by Romlah et al (2019) a teacher must be able to create a situation or system that is able to straightforward students to do learning activities. The aim of students in carrying out learning activities is the first step in realizing educational goals.

However, even though student learning activities are directed, it is possible that there are still student problems in learning activities, especially in mathematics.

Mathematics is one of the important sciences to teach to every student. This is in line with previous research that was conveyed by Sholihah & Mahmudi (2015), that important mathematics lessons are given at all levels of education starting from elementary school to a higher level as a basic knowledge of application in other fields of science. Mathematics is present in every human activity, from traders, students to housewives, which means that indirectly we cannot be separated from mathematics. Unfortunately mathematics is always considered a difficult and frightening subject, even though studying mathematics can train us to think logically, critically and systematically. In line with a statement by Angriani et al (2020) that mathematics is a difficult subject. There are many abilities that can be developed through learning mathematics starting from reasoning abilities, problem solving abilities, critical thinking skills, and so on. However, there are basic abilities that must be achieved before improving the abilities mentioned above, that is the ability to understand mathematics.

According to Qohar (Muna and Afriansyah 2015) states that the ability to understand mathematics is the ability to classify mathematical objects, interpret ideas or concepts, find examples of a concept, provide examples and non-examples of a concept and restate mathematical concepts in their own knowledge. To be expected that students' understanding will improve by themselves or students can learn meaningfully not only knowing but also understanding. Good mathematical understanding skills can support students in achieving other abilities such as problem solving skills, critical thinking skills, mathematical connection skills, and so on.

The reality shows that the mathematical abilities possessed by students are still relatively low. According to research conducted by Putra (2014) on students in a junior high school, it was found that in a class consisting of 35 students, only 5 students were already at the formal (abstract) thinking stage, while 30 students were at the operational thinking stage concrete, so that students have difficulty understanding mathematical concepts that are still abstract. And according to previous research by Chotimah (2014) it was found that junior high school students' mathematical understanding was still low. Similar to the findings of

Putra et al (2018) in one of the junior high schools as many as 41.67% of students still had an understanding of the low criteria, 30.56% were in the medium criteria, and 27.72% were in the high criteria.

Referring to improving students' mathematical understanding abilities it is necessary to design a learning approach. Scientific approach is the approach that is usually used in school. The scientific approach is an approach used in learning activities by associating learning material with daily activities around students so that it will make it easier to understand and apply the concepts obtained. In the initial study conducted at Junior High School 5 Cimahi, it was found that a problem that is often encountered in learning mathematics is that students have not been able to master the prerequisite material for Straight Line Equations such as integer operations, algebraic operations and determining points in the cartesian coordinate even though the learning activities have been completed using a scientific approach. Therefore, we need an approach or other learning models that can overcome these obstacles. Students must be able to think openly about a problem, understand the problem so that they can then actively think, communicate, search, process, and conclude data. This activity is obtained by applying the Problem Based Learning learning model considering the characteristics of Problem Based Learning in Arends (2012), namely (1) posing problems in the real world, (2) focusing on interdisciplinary interrelationships, (3) authentic investigations, (4) producing product/work and show it, as well as (5) cooperation.

The Problem Based Learning model is a learning model that involves students' activeness in solving problems through scientific stages by using various thinking skills individually and in groups so that problems can be resolved. In learning using the Problem Based Learning model the teacher acts as a facilitator so that student activities in solving problems can be well organized. With the implementation of the Problem Based Learning model, it is hoped that it can improve students' understanding abilities. Apart from that, the learning process can also be assisted with applications to support learning, one of the applications is with Canva.

RESEARCH METHOD

This research is a class action research because this research was conducted to solve problems in class and was carried out in accordance with the steps in class action research namely planning (*planning*), acting, observing, reflecting (Hayati 2019)

Research Approach

This study is uses quantitative descriptive approach. The aim of this study is to find out how much improvement on mathematical understanding abilities before and after using Problem Based Learning.

Time and Location

This study was conducted in the odd semester of the school year 2022/2023 at SMP Negeri 5 Cimahi, Cimahi City, West Java.

Population and Samples

The population of this study was all of the eighth graders of SMP Negeri 5 Cimahi, while the number of samples selected through purposive sampling technique. Thus the sample of this study was 32 students.

Procedures

The procedures carried out in this study followed the flow of classromm action research, those are planning, implementations, and reflection. The difference between first and second cycle lies in implementation of activities where different actions are given between first and second cycle.

Research Intrument

Data was collected from the results of learning before and after given action, observation during action, and evaluation. The instrument that uses to collected data is 4 questions that contain materials that already given during class. The questiona are made based on indicators of mathematical understanding by Hendriana (2017) the indicators are:

Table 1
Indicators of understanding mathematics ability

No	Indicators
1	Restate the definition of a concept
2	Identifiy the relation between the newest concept with previous concept that already learned

3	Choose, use, and utilize procedures or operations that are appropriate to the given problem
4	Solving problems based on the materials that already learned

Criteria of students' mathematical understanding abilities are categorized as follows:

Table 2
Mathematical understanding ability criteria

Value	Ctiteria
85%-100%	Very High
65%-84%	High
55%-64%	Adequate
35%-54%	Low
0%-34%	Very Low

Source: Suswigi & Zanthy (2019)

Techniques of Data Analysis

Data analysis tehcniques were carried out in according to the type of research conducted, that is descriptive qualitative. According to statement by Miles dan Huberman (Sugiyono 2013) qualitative data analysis are carried out interactively and continuously until finish. Qualitative data anlysis activities include 1) Data reduction, 2) Data presentation, and 3) Conclusions (Hayati 2019).

RESULT AND DISCUSSION

Result

Results of class action research in first cycle are presented in table 3 below:

Tabel 3
Percentage of correct answers in the first cycle

No	Indicators	Percentage	Category
1	Restate the definition of a concept	48,8%	Low
2	Identifiy the relation between the newest concept with previous concept that already learned	62,8%	Adequate
3	Choose, use, and utilize procedures or operations that are appropriate to the given problem	60,92%	Adequate
4	Solving problems based on the materials that already learned	55,90%	Adequate

From table 3 it can be seen that in indicator 1 the percentage of correct answers is 48,8%, which is in low category. Then in indicator 2 the percentage of correct answers is

62,8% which is in adequate category. The next is in indicator 3 the percentage of correct answers is 60,92% which is in adequate category. The last is indicator 4, the percentage of correct answers is 55,90% which is in adequate category.

After processing the research results in the first cycle, continued with processing of research reseults in the second cycle. Results of class action research in second cycle are presented in table 4 below:

Tabel 4
Percentage of correct answers in the second cycle

No	Indicators	Percentage	Category
1	Restate the definition of a concept	58,46%	Adequate
2	Identifiy the relation between the newest concept with previous concept that already learned	63,4%	Adequate
3	Choose, use, and utilize procedures or operations that are appropriate to the given problem	72,92%	High
4	Solving problems based on the materials that already learned	78,15%	High

From table 4 it can be seen that in indicator 1 the percentage of correct answers is 58,46%, which is in adequate category. Then in indicator 2 the percentage of correct answers is 63,4% which is in adequate category. The next is in indicator 3 the percentage of correct answers is 72,92% which is in high category. The last is indicator 4, the percentage of correct answers is 78,15% which is in high category.

Each indicators has increased from the first cycle to the second cycle, which is indicator 1 has increased by 9,66%, indicator 2 by 0,6%, indicator 3 by 12%, and indicator 4 by 22,25%.

Discussion

In the first indicator students are given an illustration of straight line equations in the Cartesian plane. Students are asked to restate the gradient concept based on the illustrations provided. Some students can only rewrite the formula for the gradient without understanding that the gradient is the ratio of changes on the y-axis to the x-axis. The increasing percentage of correct answers from cycle 1 to cycle 2 shows that there is an improvement in ability after implementation of the problem based learning model.

In the second indicator students are given two general forms of straight line equations. Students are asked to write down the conditions that must be met so that when

the two equations are drawn, they form two parallel lines. Students who experience difficulties are confused because the constants and coefficients of the x and y variables are not written in numbers but in letters. The increasing percentage of correct answers from cycle 1 to cycle 2 shows that there is an improvement in ability after implementation of the problem based learning model even the increased just a little, but still it shows that there is an increase.

In the third indicator students are asked to determine one of the points of the equation of a straight line if the gradient is known. The majority of students can determine that point, while students have difficulty solving problems due to several factors. Through the interviews students admitted to being confused in operating algebraic forms. This shows that students do not understand the prerequisite material (Usman and Kristiawati 2022). In this case, the prerequisite material in question is algebraic arithmetic operations. From cycle one to cycle two there was an increase in the percentage of students' correct answers on this indicator

In the fourth indicator question, it is given a matter of applying straight-line equations in everyday life that connect time and volume of water. Students are asked to state this relationship in a graph and in the form of a straight line equation. The majority of students have been able to determine the relationship between time and volume of water, by presenting it in the form of equations and graphs of straight line equations. However, some students experienced difficulties in solving these questions, because the questions given were not routine questions.

Based on the results of the percentages in cycle one and cycle two as a whole, there was an increase that was not too significant. This was due to several factors which resulted in the research not being able to proceed until it reached the desired criteria. Among them, the research time was very limited because it was approaching the end of the year assessment, so it was not possible to continue research. The increase in students' mathematical understanding abilities occurred gradually, so that it could not increase significantly in just two cycles, but each cycle must continue to be evaluated so that it achieved expected goals. Even so, classroom action research in these two cycles has shown

an increase in student learning outcomes from the scientific model compared to the problem-based learning model.

CONCLUSION

Based on the presentation of the results and discussion, it can be concluded that the use of problem-based learning models can improve students' mathematical understanding abilities in the material of straight line equations. The results of this study can be a source of reference for further researchers to develop previous research.

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