PROBLEM BASED LEARNING'S EFFECT ON MATHEMATICAL PROBLEM SOLVING ABILITY IN GEOMETRY FOR GRADE 5 MI AL-QORYAH PEMALANG

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ABSTRAK

Penelitian ini bertujuan untuk mengetahui pengaruh *problem based learning* terhadap kemampuan pemecahan masalah matematika pada materi geometri siswa kelas 5 MI Al-Qoryah Pemalang. Penelitian ini merupakan penelitian kuantitatif dengan sampel siswa kelas 5A dan 5B MI Al-Qoryah Pemalang. Observasi dan angket digunakan untuk memperoleh data-data yang berkaitan dengan pelaksanaan pembelajaran matematika, sedangkan tes digunakan untuk memperoleh nilai kemampuan pemecahan masalah matematika siswa. Hasil penelitian ini menyatakan bahwa kemampuan pemecahan masalah matematika siswa mengalami peningkatan setelah mendapatkan pembelajaran *problem based learning*. Hasil tersebut diperoleh melalui uji *paired t tes*t yang menunjukkan nilai *sig = 0,00 < 0,5* dan korelasi sebesar 0,771 atau 77,1%. Selain itu, *problem based learning* juga berpengaruh terhadap kemampuan pemecahan masalah matematika siswa. Berdasarkan hasil uji *independent t test* menunjukkan nilai *Sig* (*2-tailed)* sebesar 0.009 < 0,05.

Kata kunci: Problem based learning, pemecahan masalah matematika, geometri

ABSTRACT

This study aims to determine the effect of problem-based learning on mathematical problem solving ability in geometry for grade 5 MI Al-Qoryah Pemalang. This research is a quantitative study with a sample of students in grade 5A and 5B MI Al-Qoryah Pemalang. Observations and questionnaires are used to obtain data related to the implementation of mathematics learning, while tests are used to obtain scores on students' mathematical problem solving ability. The results of this study indicate that mathematical problem solving ability has improved after problem based learning. These results were obtained through paired t-test which showed the value of sig = 0.00 <0.5 and the value was 0.771 or 77.1%. Furthermore, problem based learning also affects students' mathematical problem solving ability. Based on the results of the independent t-test, it shows the Sig (2-tailed) value of 0.009 <0.05.

Keyword: *Problem based learning, mathematical problem solving, geometry*

INTRODUCTION

The rapid development of the industrial era 4.0 at this time has an impact on the development of the information technology field. This causes major changes in various aspects of human life. This situation encourages the technology sector in Indonesia to continue to develop innovations in human resources so that they have high competitiveness. One aspect that determines the formation of quality human resources (HR) is education (Oviyanti, 2013). Education plays a role in developing students' potential to think critically, creatively and innovatively.

In Finland, the capacity to think mathematically is the primary purpose of education at all levels (NBE, 2004). Improving problem-solving skills can help you enhance your mathematical thinking skills (Zavenbergen, 2004).

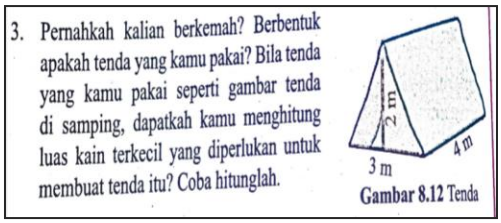
In general, Indonesian students have difficulty solving mathematical problems because they are not accustomed to working on problem solving problems (Putra, et al, 2018). One of the components that must be included in the educational process is the ability to solve problems (NCTM, 2000). Permendikbud No. 21 of 2016 also confirms that problem solving ability is one of the competencies that must be achieved in learning mathematics

The results of research conducted by Trends in International Mathematics and Science Study (TIMSS) 2015 showed that the mathematics scores of Indonesian students at the SD/MI level were still below the average of other countries. These results indicate that learning in Indonesia has not been fully successful in improving students' mathematics learning outcomes. Such conditions raise the assumption that the practice of education in the field is not in accordance with the government's goal to make problem solving one of the competencies that must be achieved by students.

The capacity to solve problems is the most important and significant aspect of mathematics. Engaging in a task whose solution is unknown in advance is referred to as problem solving. Students must draw on their knowledge to find solutions, and in the process, they will build new mathematical understandings.

Students must develop methods of thinking, perseverance habits, and problem-solving skills through learning problem solving in mathematics (NCTM, 2000).

Based on the results of observations, students of MI Al Qoryah Pemalang need learning that can facilitate students to be able to understand the steps of completion correctly in solving mathematical problems.


3. Pernahkah kalian berkemah? Berbentuk apakah tenda yang kamu pakai? Bila tenda yang kamu pakai seperti gambar tenda di samping, dapatkah kamu menghitung luas kain terkecil yang diperlukan untuk membuat tenda itu? Coba hitunglah.

Gambar 8.12 Tenda

Figure 1. Problem Solving

In this problem, students are required to understand the type of spatial structure, the purpose of the problem, then be able to determine the smallest area of cloth needed to make a tent. The purpose of these questions is to apply an understanding of the types of building blocks and determine the area of the blanket.

$$luas\ tenda = luas\ segitiga + luas\ persegi\ panjang$$
$$= \frac{1}{2}.a.t + p.l$$
$$= \frac{1}{2}.3.2 + 4.2$$
$$= 3 + 8$$
$$= 11$$

Figure 2. Student Answers

Figure 2. shows students have not been able to answer correctly. Planning for solving problems written by students is wrong, resulting in students' answers being wrong. These results indicate that the average student of MI Al Qoryah is less able to analyze non-routine questions to determine the steps for solving the problem. This is an indication that MI Al Qoryah students are not used to being trained to work on non-routine questions with the right steps. Thus, learning innovation is needed to increase the effectiveness of mathematics learning.

The four stages of issue resolution, according to Polya (1973), are: (1) comprehending the problem, (2) devising a plan, (3) carrying out the plan, and (4) checking back. Measurement of problem solving ability is based on the process carried out by students. In other words, the steps of students' work in solving questions must be

valued fairly based on an objective assessment.

One of the learning models that support problem solving abilities is problem based learning (Setiyadi et al, 2018). Problem based learning can improve problem solving skills (Bruder, 2016).

Problem based learning (PBL) is a student-centered teaching style that entails learning by addressing problems that have no clear solution but are real. (Etherington, 2011). In this case, students are faced with real-life problems that require solutions. Thus, in the PBL the problems faced by students become the impetus in the learning process. Students not only look for the right answer but students go through several stages, namely interpreting the problem, looking for the information needed, identifying possible solutions, evaluating options, and concluding the results of the work. (Padmavathy and Mareesh, 2013).

Problem based learning learning model, the teacher acts only as a facilitator, not the main source of information. This method is intended so that students have broad insight and everyday experiences that they will face in everyday life. The experience is very important because effective learning starts from real experience. Questions, experiences, formulations, and conceptualization of problems that they create themselves are the basis for learning (Ali *et al*, 2020). The problem given to students in the PBL is not an easy problem to solve. However, these problems must require strategies and stages to solve them. For this reason, what needs to be improved is the ability to deal with various problem-solving techniques and strategies (Suherman et al, 2003). Thus, PBL is the right solution to overcome the low mathematical problem solving ability of students. Abstract mathematical problems can be solved systematically through PBL syntax.

This research is a type of quantitative research with the research method used is an experiment. The research subjects were students of class 5A and 5B MI Al Qoryah Pemalang. Data collection techniques in the form of observation and tests. Observation is used to obtain data related to the

implementation of mathematics learning, while the test is used to obtain data about students' mathematical problem solving abilities. The test was carried out twice, namely before and after the application of the PBL. This research was conducted to see how the problem based learning model affects students' mathematical problem solving abilities in geometry class 5 MI Al-Qoryah Pemalang.

DISCUSSION

The Problem-Based Learning Model is being implemented.

The implementation of problem based learning referred to in this study is a series of processes that include the learning planning stage, learning process and evaluation. This study uses descriptive analysis to show how the implementation of problem based learning in research. The instruments used in the learning implementation analysis process include a learning device validation questionnaire to measure the learning planning process for problem based learning, an observation sheet questionnaire to measure the problem based learning learning process and problem solving ability test questions to measure evaluation in learning. In terms of evaluation of learning, the test will be assessed based on its validity and reliability. The results obtained from the planning, process and evaluation stages of learning will be described to answer how to implement problem based learning.

Based on the validation process carried out by the validator, the average score for the syllabus assessment is 4.86, lesson plan is 4.84 and module is 4.79. These results indicate that the three devices are predicated very well and deserve to be used in research. At the stage of the learning process, which was measured using a learning observation sheet, the average score for filling out the observation sheet was 4.33. These results indicate that the implementation of problem-based learning gets a very good predicate. The learning evaluation stage is measured through the results of the validity and reliability of the problem-solving ability test based on the results of the test instrument trial. The results of the validity test show that of the 6 questions prepared,

there is 1 question that has an invalid, namely the question with code 4 because it gets an r value of 0.316 < from an r table of 0.349. The results of the reliability test of the test items were obtained which showed that the test items were reliable. Thus, it can be concluded that the implementation of problem-based learning in research went through the planning stage with very good criteria based on the results of the validation of the learning devices, the learning process was observed with very good criteria and the test instrument met valid and reliable criteria for use at the evaluation stage.

Students' Mathematical Problem Solving Ability

The research was continued to show how the mathematical problem solving ability of 5th grade students of MI Al-Qoryah Pemalang on the material of spatial structure and the effect of problem based learning on the mathematical problem solving ability of 5th grade students of MI Al-Qoryah Pemalang on the material of building space. Before the improvement test was carried out to describe problem solving abilities and test the effect of problem based learning on research problem solving abilities, it was preceded by prerequisite tests, namely normality, homogeneity and average similarity tests of initial abilities. Normality and homogeneity tests are required as prerequisites for the T test in hypothesis testing, while the average similarity test is carried out to determine whether the two research classes have the same initial ability.

Based on the results of the normality and homogeneity test, the sig value of 0.200 > 0.05 was obtained for the normality test and the sig value of 0.710 > 0.05 which indicated that the initial abilities of the experimental class and control class were normally distributed and homogeneous. In addition, based on the average similarity test of the initial ability, the sig value of the control and experimental class tests was 0.727. Thus, the results show that the overall sig value obtained exceeds 0.05 so it can be concluded that there is no difference in the average value of students' initial problem solving abilities in all research classes. Thus, the research data has met the prerequisite test and

hypothesis testing will continue to use parametric statistics.

The next research stage is hypothesis testing to show how the mathematics solving ability of 5th grade students of MI Al-Qoryah Pemalang on the material of spatial structure. The results of the analysis show that the average mathematical problem solving ability of experimental class students has increased quite high, which is 24.68. However, the improvement of mathematical problem solving abilities is a natural thing to happen because this process compares the scores before and after learning which will naturally increase when students get learning. For this reason, hypothesis 1 testing is carried out using a paired t test which aims to see the significance of increasing problem-solving abilities that occur during the problem-based learning process.

Based on the results of the data analysis of testing hypothesis 1, the value of sig = 0.00 < 0.5 which means that Ho is rejected so that there is a difference in the average sense of problem solving ability before and after learning.

The results of the analysis also show that the average mathematical problem solving ability of students has increased by 24.68. The increase was caused by problem-based learning as indicated by the acquisition of a correlation coefficient of 0.771 or 77.1% which tends to be close to 1 so that there is a fairly strong and positive correlation. Thus, it can be concluded that the problem-solving abilities of 5th grade students of MI Al-Qoryah Pemalang increased after problem-based learning was implemented.

Test the Effect of PBL Learning Model on Students' Mathematical Problem Solving Ability

The final stage in the analysis process of this research is to examine how the influence of the problem based learning model on the mathematical problem solving abilities of 5th grade students of MI Al-Qoryah Pemalang on the spatial structure which is analyzed through the independent T test test by comparing the difference in the pretest-posttest scores of the experimental class and the experimental class. control class. The

effect of problem-based learning on students' mathematical problem-solving abilities in the spatial structure material can be observed if there is a significant difference between the pretest-posttest difference between the experimental and control classes. In this test, if the average value of the experimental class is higher and significantly different from the average value of the control class, it can be concluded that problem based learning affects the mathematical problem solving ability of the experimental class.

The results of the analysis showed that the average difference between the experimental and control classes was 4.81250 with the experimental class average being higher than the control class. Based on the results of the analysis, an independent T test was carried out to test the significance of the difference in the average. The results of the independent T test resulted in a Sig (2-tailed) value of 0.009 < 0.05 so that H¬o was rejected and a decision could be made that there was a significant average difference between the experimental class and the control class. Thus, it can be concluded that problem based learning has an effect on students' problem solving abilities.

Based on the explanation of the results of the research analysis, it can be concluded that this study resulted that problem based learning learning had been implemented with very good criteria, students' mathematical problem solving abilities in building material had increased after problem based learning was implemented, and problem based learning learning models had an effect on mathematical problem-solving abilities of 5th grade students of MI Al-Qoryah Pemalang on the material of building space.

CONCLUSION

Based on the results of the study, it can be concluded that (1) Problem based learning has been implemented with very good criteria based on the validation assessment and observation during the planning process and problem based learning activities; (2) The mathematical problem-solving ability of 5th grade students of MI Al-Qoryah Pemalang increased after receiving problem-based learning on the flat-sided building material; and (3) Problem-

based learning has an effect on students' problem-solving abilities based on the results of the comparison between the difference in the improvement of problem-solving abilities in classes that receive problem-based learning and classes that do not.

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