

The Influence of the Problem Based Learning Model on Students' Mathematical Problem Solving Ability

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Abstract

This research aims to determine the effect of the problem based learning model on mathematical problem solving abilities in class VII social arithmetic material at MTs. Al-Khairiyah South Tambun. This research uses a quantitative approach with a quasi-experimental method. The population in this study was all Class VII students at MTs Al-Khairiyah Tambun Selatan, totaling 172 students with a sample of 44 students obtained randomly using problem based learning techniques. The instrument used to collect data was an essay test, in accordance with the indicators for solving mathematical problems on the subject of social arithmetic, totaling 8 questions. Based on the results of hypothesis testing, the value of $t_{\text{count}}=8.6182 > t_{\text{tabel}}=1.6819$ is obtained so that it can be concluded that there is an influence of the problem based learning model on mathematical problem solving abilities in social arithmetic material in class VII MTs Al-Khairiyah for the 2022/2023 academic year.

Keywords: Learning media, Mathematical problem solving ability, Problem based learning.

1 INTRODUCTION

Education is one of the steps that can be taken to form quality Human Resources (HR), both in terms of knowledge and in terms of skills according to Rohida (2018). Quality human resources (HR) are really needed by the Indonesian people to keep up with the very rapid development of science and technology, according to Ashadi (2016).

Education has a very important role in creating quality human resources. Education is always concerned with humans, in the sense of an effort to foster and develop basic human abilities optimally according to individual capacities according to Baharun (2017).

Apart from human resources, in this case educators and educational staff, there are still students who are not serious about learning. For students, studying is an obligation because their parents order them and register them for school. What they understand is that they have to attend school every day and take part in learning activities in class. However, the learning process carried out does not show a sense of responsibility as a learner. So there are still many students who are negligent in completing the tasks given by the teacher, especially in mathematics lessons. For those who come to school every day to learn effectively, they have fulfilled their obligations as students. The rest they are more concerned with friendship, playing and having fun.

When interviews were conducted with some of the students, students were still found at MTs. Al Khairiyah, doesn't like mathematics lessons. On average, they said that the reason they didn't like mathematics lessons was because it was difficult to solve problems or math questions, apart from that they were always given practice assignments with a large number of questions. In this case, teachers should motivate students by conveying the benefits of learning mathematics, or the benefits of the material studied. If they know the benefits, it is hoped that students will be more serious and like learning mathematics.

because mathematics is really needed by humans in everyday life. According to La'ia and Harefa (2021). Studying mathematics indirectly functions to train the human left brain according to Yuni, Darhim, and Turmudi (2018).

Where the left brain is better for carrying out tasks that involve logic, language and analytical thinking. Studying mathematics actually has to start from very basic understandings, working on practice questions from an easy level first, then over time, increasing to a more difficult and challenging level. That way, our brain will slowly be able to apply what we have learned to solve the problems given. This practice question or problem solving activity is really good for improving the quality of thinking, calculating and logically systematically and correctly. Because teachers are obliged to motivate students to like mathematics lessons, because with mathematics they can get many benefits, one of which is that it can improve the performance of our brains.

Considering the importance of Mathematics in producing a quality next generation, mathematics learning taught by teachers must pay attention to the selection of appropriate approaches, models, methods and mathematics learning media. All of these things aim to make mathematics lessons popular with students. However, the facts in the field are that the mathematics learning process tends to be carried out by teachers using the lecture method, explained classically, with students taking notes in notebooks and giving assignments. Due to the dominant use of the lecture method, students are not yet maximally active. In fact, they become bored and tired of learning mathematics with the same method or steps continuously. They only listen, pay attention to the teacher's explanations, and complete assignments that sometimes do not have time to be evaluated, which has a less than optimal impact on building mathematical problem solving abilities according to Jenab, Yuni, and Huda (2019).

Teachers' lack of creativity in developing and applying mathematics learning models is one of the factors that causes students' low mathematical problem solving abilities. Therefore, improving the ability to solve mathematical problems requires a variety of mathematics learning models, including using the Problem Based Learning model. PBL is a learning model that has been very popular in the world of medicine since the 1970s according to Siregar, Nara, and Jamludin (2010). Considering the steps in PBL learning and its advantages, the researcher wishes to conduct research with the title: The effect of using the Problem Based Learning model on learning outcomes.

2 RESEARCH METHODS

This research uses a quantitative approach with a Quasi Experimental method carried out at MTs Al-Khairiyah Tambun Selatan. With the Posttest Only Control Group Design, it can be seen as follows.

Table 1. Posttest Only Control Group Design Scheme

Group	Treatment	Posttest
Experiment	X	O ₁
Control	-	O ₂

Information:

X= treatment using Problem Based Learning media

O₁= Final test (posttest) in the experimental class

O₂= Final test (posttest) in the control class

The population of this study was all students in class VII MTs. Al-Khairiyah South Tambun has 172 students for the 2022/2023 academic year. Sampling in this research used the Cluster Random Sampling technique. In the process of collecting data in this research, test instruments were used that refer to indicators of mathematical

understanding in social arithmetic material. The form of the test given is in the form of 8 essay questions on the topic of social arithmetic.

3 RESULT AND DISCUSSION

3.1 Mathematical Understanding

The results of this research are in the form of test score data on mathematical problem solving abilities as a result of applying the Problem Based Learning learning model in the experimental class and project based learning in the control class. Students' mathematical problem solving ability scores were obtained through a posttest.

Based on data obtained from the results of testing mathematical problem solving abilities with a test instrument consisting of 22 students as a whole, it can be described as follows: average value (mean)= 78; median (Me)= 80; mode (Mo)= 81; standard deviation= 8.44; maximum value= 87; minimum score= 60. Experimental class understanding data can be presented in histogram form as in Figure 1.

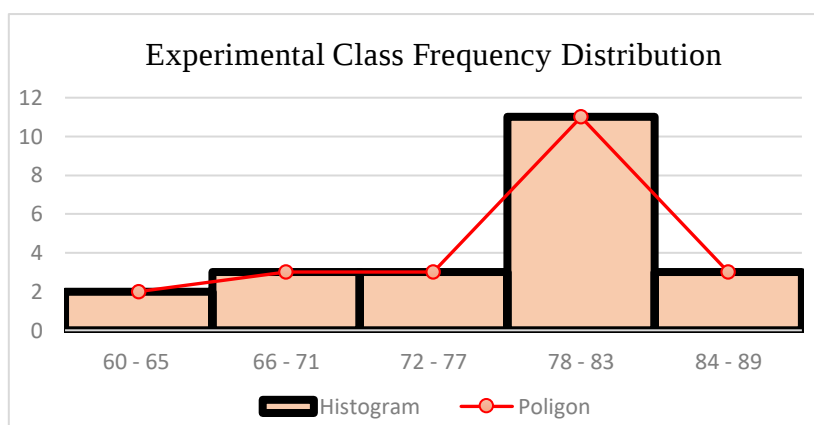


Figure 1. Histogram and Frequency Polygon of Experimental Class mathematical problem solving ability testing results

Meanwhile, control class mathematics understanding data: average value (mean)= 74.6; median (Me)= 75; mode (Mo)= 75; standard deviation= 5.90; maximum value= 85; minimum value= 59. Control class understanding data is presented in histogram form as in Figure 2.

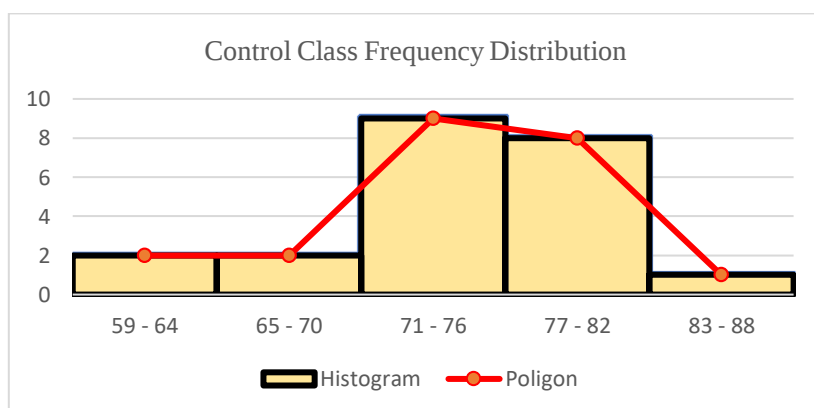


Figure 2. Histogram and Frequency Polygon of Control Class mathematical problem solving ability testing results

Before testing the hypothesis, prerequisite testing is first carried out on the data obtained. Analysis prerequisite testing consists of a normality test and a homogeneity test.

3.3.1 Normality test

The normality test is carried out to determine whether the data to be analyzed is normally distributed or not. The results of the normality test calculations can be seen in Table 2.

Tabel 2. Test Normality

Class	N	α	L_{count}	L_{table}	Conclusion
Experiment	25	0,05	0,1522	0,1815	Normal
Control	26	0,05	0,1281	0,1815	Normal

Based on the calculation results as listed in Table 2, it shows that the data comes from the experimental class and the control class $L_{count} < L_{table}$ because $0.1522 < 0.1815$ and $0.1281 < 0.1815$ then it is at a significant level $\alpha = 0.05$, it can be concluded that the normality test results on the posttest data are normally distributed.

3.3.2 Homogeneity test

The homogeneity test in this study was used to determine whether the samples came from the same variance or not (homogeneous). The results of the homogeneity test calculation can be seen in Table 3.

Tabel 3. Homogeneity Test

Class	Varians	dk	F_{count}	F_{table}	Conclusion
Experiment	50,755	22	1,4456	4,3600	Homogen
Control	35,110	22			

Based on the table above, it is known that the Fisher test calculation for the experimental class and control class, $F_{count} = 1.4456$ with $F_{table} = 4.3600$ at a significant level of $\alpha = 0.05$, because $F_{count} \leq F_{table}$, it can be concluded that the sample comes from a homogeneous population.

3.3.3 Hypothesis testing

After it was discovered that the posttest data on the mathematical understanding ability of the experimental class and control class were normally distributed and homogeneous, hypothesis testing was then carried out. Hypothesis testing is carried out using the t -test which can be seen in Table 4.

Tabel 4. Hypothesis Test Results

Class	X	N	X^2	S_{gab}	t_{count}	t_{table}
Experiment	78	22	50,755	6,55	8,6182	1,678
Control	75	22	35,110			

Based on the results of the hypothesis test, the value of $t_{count} = 8.6182$ is obtained, while the value of t_{table} for the t -test at significance $\alpha = 0.05$ is $t_{table} = 1.678$. These results show that $t_{count} > t_{table}$ with the decision criteria showing that H_0 is rejected and H_1 is accepted, which means that the influence of the Problem Based Learning learning model is better than conventional learning media on mathematical problem solving abilities in social arithmetic material.

3.2 Interpretation of Research Results

Based on studies and research carried out, the Problem Based Learning learning model influences mathematical problem solving abilities. Then, based on the calculation results of hypothesis testing using the t -test, the value of $t_{count} = 8.6182 > t_{table} = 1.678$, so it can be

stated that H_0 is rejected and H_1 is accepted, meaning that there is a significant influence between the influence of the Problem Based Learning learning model on mathematical problem solving abilities.

This is because in contextual learning, students use critical thinking skills using question and answer methods, discussions, and giving assignments. Students are fully involved in seeking an effective learning process and working together with heterogeneous groups, exchanging opinions and knowledge.

This means providing different treatment and providing significant changes to the experimental group, namely the Problem Based Learning learning model. So it can be concluded that applying the Problem Based Learning learning model can influence mathematical problem solving abilities in social arithmetic material.

4 CONCLUSION

There is a very significant difference in average scores in students' mathematical problem solving abilities, students' abilities in social arithmetic material in the experimental class which uses Problem Based Learning are higher compared to the abilities of control class students. This is supported by the results of hypothesis testing using the t -test (difference test) which shows that t_{count} is greater than t_{table} , so it is stated that the research hypothesis (H_1) is accepted or H_0 is rejected. This shows that there is a positive influence on the Problem Based Learning learning model on mathematical problem solving abilities in social arithmetic material in class VII MTs Al-Khairiyah Tambun Selatan for the 2022/2023 academic year.

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6 REFERENCES

- Ashadi, F. (2016). Pengembangan sumberdaya manusia dalam lembaga pendidikan anak usia dini. *Jurnal Pembelajaran Fisika*, 4(5), 717-729.
- Baharun, H. (2017). Peningkatan kompetensi guru melalui sistem kepemimpinan kepala madrasah. *At-Tajdid: Jurnal Ilmu Tarbiyah*, 6(1), 1-26.
- Siregar, E., Nara, H., & Jamludin, A. (2010). *Teori Belajar dan Pembelajaran*. Ghalia Indonesia.
- Jenab, S., Yuni, Y., & Huda, S. A. (2019). Perbedaan Hasil Belajar Aritmetika Sosial Siswa antara Model Think Pair Share dan Pembelajaran Berbasis Masalah. In *Prosiding Seminar Nasional Pendidikan STKIP Kusuma Negara* (pp. 1-4). STKIP Kusuma Negara
- La'ia, H. T., & Harefa, D. (2021). Hubungan Kemampuan Pemecahan Masalah Matematis dengan Kemampuan Komunikasi Matematik Siswa. *Aksara: Jurnal Ilmu Pendidikan Nonformal*, 7(2), 463-474. <http://dx.doi.org/10.37905/aksara.7.2.463-474.2021>
- Rohida, L. (2018). Pengaruh era revolusi industri 4.0 terhadap kompetensi sumber daya manusia. *Jurnal Manajemen Dan Bisnis Indonesia*, 6(1), 114-136. <https://doi.org/10.31843/jmbi.v6i1.187>

Yuni, Y., Darhim, D., & Turmudi, T. (2018). Peningkatan Berpikir Intuisi Dan Penalaran Matematis Melalui Pembelajaran Inquiry Berbasis Open-Ended. *Prima: Jurnal Pendidikan Matematika*, 2(2), 107-126. <http://dx.doi.org/10.31000/prima.v2i2.760>