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Implementing the PBL Model to Improve Students' Mathematical Problem-Solving Ability at Medan State Junior High School

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ABSTRACT

This study aims to find out: (1) what efforts are being made to improve the mathematical problem-solving skills of students in class XI, IPS 1, of Medan 7 State Senior High School through a problem-based learning model; and (2) how to improve students' mathematical problem-solving skills in class XI, IPS 1, of Medan 7 State Senior High School after applying the problem-based learning model. This type of research is called "classroom action research," which is carried out in two cycles, each of which is carried out in two meetings. The subjects in this study were 35 students in class XI at Medan 7 State Senior High School. The data collection techniques used were teacher and student observation sheets and tests of mathematical problem-solving abilities. The test was carried out three times: the initial test, the ability test to solve mathematical problems I, and the ability test to solve mathematical problems II. The findings of this study show that: (1) students' mathematical problem-solving abilities were assessed before being given action, with as many as 3 students (8.57%) achieving learning mastery and 32 students (91.42%) not achieving learning mastery. (2) After being given action in cycle I, it was found that 19 students (54.28%) had achieved learning mastery and 16 students (44.71%) had not reached the learning mastery level. (3) In cycle II, 31 students (88.57%) achieved mastery learning, while 4 students (11.429%) did not achieve mastery learning, resulting in a 34.29% increase from cycle I to cycle II.

A. INTRODUCTION

In Indonesia, all classes must study mathematics. You can find math in almost every aspect of human life. Hasratuddin (2015: 30) explains that mathematics is a way to solve human problems. According to the above, mathematics education must improve one's ability to think, communicate, and solve problems creatively. In fact, students' problem-solving abilities are still low. This has negative consequences for participating students. One of the factors that cause substandard performance in terms of learning is the learning process that is below standard. Students first take notes on what has been told to them through the lecture instruction form, and then they move on to the exercises. When students are asked questions that are different from what they see in practice, they become confused because they don't know where to start to answer them. In short, educators play an active role as information providers, while students show that they are able to become competent recipients of information. As a result, when it comes to problem-solving, students just do what the teacher does, which means they lack skills in this area. The researcher gave a test to students of class XI IPS 1 SMA Negeri 7 Medan about combining two linear variables. The results of the research on the initial problem-solving test for class XI IPS 1 SMA Negeri 7 Medan on a two-variable linear system showed low mathematical problem-solving ability. 73.21% of the 35 students who took the exam understood the problem, 46.88% could plan a solution, 37.61% could solve it, and 23.21 could evaluate the results. In terms of knowledge, students who are able to solve problems include 0 with very high knowledge, 0 with high knowledge, 3 with moderate knowledge, 9 with low knowledge, and 23 with very low knowledge.

The test results that have just been presented show that students' ability to solve math problems is still lacking; there are still many students who have difficulty determining what is known and what is asked, and students have difficulty determining mathematical concepts that need to be known. used to solve a problem.

To overcome this problem, look for the right learning method. Where learning-to-teach focuses on solving current problems, it is intended to encourage students to explore their knowledge to find solutions to real-world problems used in class.

PBL is one of several useful educational approaches. Because this learning style provides original problems, there will be a higher level of mathematical demand and guidance placed on these students. The application of PBL is expected to inspire students to be responsible for their own education and learn independently. Students' thinking methods will be improved during this learning process, which will enable them to apply their knowledge to solve any problems that arise in real life.

According to research by Marojahan Panjaitan and Sri R. Rajagukguk (2017), problem-based learning can help students solve math problems. The PBL paradigm is implemented by dividing each group into five or six people to provide a wider variety of challenges that are relevant to the real world. At the end of each lesson, the teacher will always take the time to evaluate and think about how the students did. The ultimate goal is to get past any learning barriers that either the students or the teachers may have.

B. RESEARCH METHODS

This study was carried out in the odd-numbered semester of the 2022–2023 school year, from August to December. SMA Negeri 7 is located on Jln. Timor Agarwood No. 36, Medan City, North Sumatra. Grade 3 students of State Senior High School 7 Medan for the 2022–2023 academic year participated. 35 students from class XI, IPS 1, were selected for this study. This line of inquiry focuses on applying a problem-based learning approach to improve students' arithmetic problem-solving skills. This research uses class-active research, often called following-class research (CAR). Using PBL to improve student's learning of mathematics.

The teacher is involved in the process from the beginning, preparing for it, carrying it out, and observing and reflecting on what is happening. In the event that the research results collected meet predetermined success criteria, the cycle will end. The steps involved in conducting this research are outlined in the following chart:

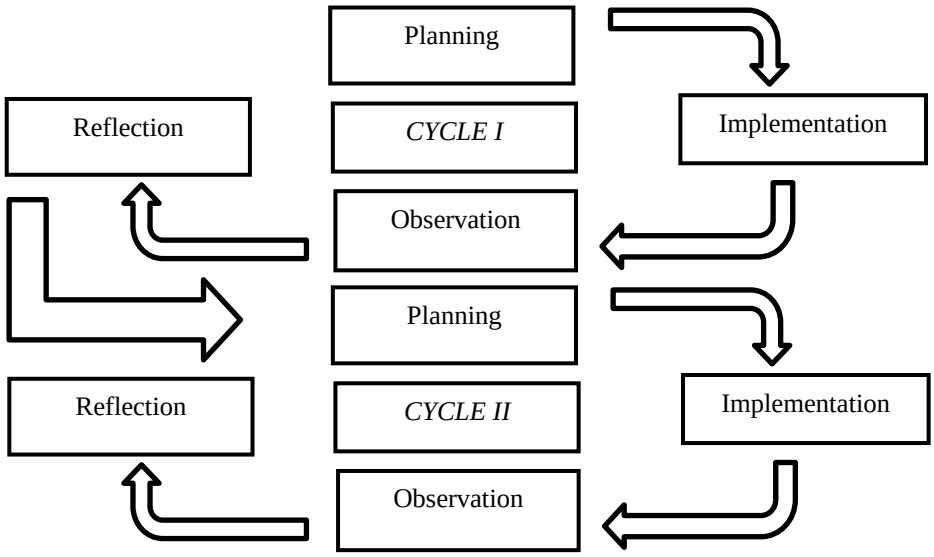

Figure 1. Classroom Action Research Model Cycle

This research, like other types of research, including classroom action research, can be broken down into several stages of a cycle. Each cycle makes the desired changes.

This test measures children's math problem-solving abilities before and after the intervention. The exam is descriptive. The exam was given three times, namely before the research, after the first cycle, and after the second cycle test (after the second cycle).

When taking action, observe all activities and changes. Observation sheets are very good for evaluating ongoing learning. This activity records the behaviour of researchers and students during the teaching and learning process.

Students' linear programming problem-solving skills Here are several ways to classify students' mathematical abilities:

Table 1: Mathematical Problem Solving Ability Criteria

Assignment Level	Criteria
90% - 100%	very high ability
80% - 89%	High ability
75%-79%	Moderate ability
55%-74%	Low ability
0%-54%	very low ability

Based on the information in Table 1, it can be concluded that learning mastery has been achieved if the degree of students' mathematical problem-solving ability meets the minimum criteria.

❖ The following equation can be used to determine whether or not a student has completed their studies (at the individual level):

$$KB = \frac{T}{T_1} x100\% \text{ (Trianto, 2011:241)}$$

Information : KB = Mastery learning
T = Siswa's total number of skor
T1 = Total number of skor

If a student's ability to solve math problems is 75% or higher, the student has completed learning, which is called individual completion.

❖ Learn how a student can successfully complete a klasik math assignment by observing student attitudes toward learning.

$$D = \frac{X}{N} x100\% \text{ Trianto (2009: 243)}$$

Information :
D = Present your siswa response
X = the number of students who are eager to learn 75
N = Number of siswa

C. RESULT AND DISCUSSION

Description of Cycle I Research Results

According to the pre-examination, students' problem-solving abilities were classified as low, with an average score of 44.62. Only three of the 35 test takers scored 75 or more (KKM set by the school is 75). 0 students have very high skills and 0 have good skills. However, there were 3 students who had moderate abilities (8.57%), 9 students who had less abilities (35.7%), and 23 students who had very low abilities (65.7%). The following table provides an overview of the findings from the preliminary examination.

Table 2. Description of the Results of Mathematical Problem Solving Ability in the Preliminary Test

Percentage	Ability Level	Total students	Percentage	Percentage of Average Ability Score
90% - 100%	Very high	0	0%	44,62 (Very low)
80% - 89%	High	0	0%	
75% -79%	Currently	3	8,57%	
55% - 74%	Low	9	25,7%	
0% - 54%	Very low	23	65,7%	

Preliminary test results reveal students' problem-solving abilities. 73.21% of students understand the problem, 46.88% plan problem solving, 37.61% solve the problem, and 23.21% recheck the results. 73.21% of students can understand the problem, while 46.88% can plan problem-solving.

The following table provides an overview of the level of mathematical problem-solving ability that can be seen:

Table 3. Description of Students' Mathematical Problem-Solving Ability Levels in Cycle I

Percentage	Ability Level	Total Students	Percentage	Percentage of Average Ability Score
90% - 100%	Very high	2	6,90%	66,29 (Low)
80% - 89%	High	2	10,35%	
75% - 79%	Currently	15	34,48%	
55% - 74%	Low	11	13,79%	
0% - 54%	Very low	5	34,48%	
		35	100%	

Based on the level of students' problem-solving abilities in learning mathematics, students are said to be able to solve problems if the percentage score of the total aspect of problem-solving abilities is greater than or equal to 75. The level of completeness of students' problem-solving abilities in cycle I is shown in Table 4 as follows:

Table 4. Completeness Level of Students' Problem-Solving Ability in Cycle I

Completeness Presentation	Completeness Level	Total Students	Percentage For Amount
<75	Not Completed	16	44,71%
≥ 75	complete	19	54,28%
Amount		35	100%
Average			66,28%

Description of Cycle II Research Results

Based on student responses to the four questions on the second math problem-solving test administered to 35 students 15 students have very high ability, 11 students have high ability, 5 students have medium ability, four students have low ability, and 0 students have very low ability. The second cycle of math problem solving averaged 89.64. The table below provides an overview of the level of ability to understand mathematical concepts II:

Table 5. Description of Students' Mathematical Problem-Solving Ability Levels in Cycle II

Percentage	Ability Level	Total Students	Percentage	Percentage of Average Ability Score
90% - 100%	Very high	15	42,85%	89,64 (High)
80% - 89%	High	11	31,42%	
75% - 79%	Currently	5	14,28%	
55% - 74%	Low	4	11,42%	
0% - 54%	Very low	0	0%	
		35	100%	

Based on the level of students' problem-solving abilities in learning mathematics, students are said to be able to solve problems if the percentage score of the total aspect of problem-solving abilities is

greater than or equal to 75. The level of completeness of students' problem-solving abilities in cycle II is shown in Table 6. as follows:

Table 6. Completeness level of students' mathematical problem-solving abilities in cycle II

Completeness Presentation	Completeness Level	Total Students	Percentage For Amount
< 75	Not Completed	4	11,42%
≥ 75	complete	31	88,57%
Amount		35	100%
Average		88,57	(Tinggi)

Before the research was conducted, students were given pre-tests, and it was found that of the 35 students who took the test, the class average score was 44.62. These results indicate that the level of students' mathematical problem-solving ability is still very low. One of the efforts made to overcome and improve it is through a problem-based learning model.

After cycle 1, 35 students took the exam and got an average score of 66.28. For student mastery, there are 2 very high children, 2 high children, 15 medium children, 11 low children, and 5 very high children. incompetent. 5.7% of children are very gifted. Based on these data, students' mathematical problem-solving abilities were inadequate. Because it has not yet reached 85%, cycle II will continue in this manner. Through additional actions, students' math problem-solving skills are improved. These additional actions include increasing the number of instructions and guidance given to all students, modifying problem-solving questions for each indicator, and encouraging students to be more active in their learning. And provide motivation to students in the form of awards and prizes for student learning outcomes, so that students are more motivated to participate in class discussion activities, as well as to express their opinions or present the results of their understanding in front of the class.

The final test score of the cycle I showed an average of 89.64 students. Fifteen children have very high mastery, 11 high, 5 medium, 4 low, and 0 very low. 0% to 100% of students have low aptitude. This shows that the students' mathematical problem-solving abilities in cycle II were higher than in cycle I. The problem-solving test in cycle I averaged 64.92, while cycle II averaged 89.64. The average problem-solving test score increased by 24.72 points. 19 students (54.28%) completed Cycle I, and 31 students (88.57%) completed Cycle II. This resulted in an increase of 34.29 per cent in the percentage of students who had completed their studies.

Asmar Bani (2011) found that problem-based learning improves students' math problem-solving skills more than standard education. Traditional students grew less than problem-based learners (control class). Mariani Manik and Mukhtar (2017) discuss "Application of Problem-Based Learning Models in Efforts to Improve Mathematical Problem-Solving Ability in Class XI of SMA Negeri I Panyabungan."

D. CONCLUSION AND SUGGESTIONS

Students in Class XI IPS 1 SMA Negeri 7 Medan demonstrated that they were able to improve their mathematical problem-solving abilities through problem-based learning supported by research and discussion. In cycle I, the percentage of students who fulfilled the learning outcomes was 66.2%; in cycle II, the figure increased to 89.64%. Student learning outcomes have increased as a result of problem-based learning. Because the prerequisites for success have been fulfilled by increasing from cycle I to cycle II, this research can be said to be successful.

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REFERENCES

Hasratuddin. 2015. Mengapa Harus Belajar Matematika?. Medan: Perdana. Publishing.

Marojahan Panjaitan, Sri R Rajagukguk. 2017. Upaya Meningkatkan Kemampuan Pemecahan Masalah Matematika Siswa dengan Menggunakan Model Pembelajaran Problem Based Learning di Kelas X SMA. Jurnal Inspiratif, Vol. 3 No. 2 Agustus 2017.

Herman Hudojo, 2016. *Pengembangan Kurikulum dan Pembelajaran Matematika.* Malang: Universitas Negeri Malang.

Ali Mudlofir, E.F. (2017). Desain Pembelajaran Inovatif. Jakarta: Rajawali Press.

Mudlofir, Ali & Rusydiyah, Evi Fatimatur. (2016). *Desain Pembelajaran Inovatif dari Teori ke Praktik.* Jakarta: PT Raja Grafindo Persada.

Bakoban, F. I., & Amry, Z. (2017). Perbandingan Kemampuan Pemecahan Masalah Matematika Siswa Menggunakan Model Pembelajaran Kooperatif Tpe Student Teams Achievement Division Dengan Team Games Tournaments Di SMP Negeri 35 Medan. *Jurnal Inspiratif*, 3(2), 68–79.

Hudojo. (2016). Pengembangan Kurikulum dan Pembelajaran Matematika. Malang: Universitas Negeri Malang.

Trianto (2009).Mendesain Model Pembelajaran Inovatif Progresif.Surabaya:Kencana.

Trianto. (2011). *Desain Pengembangan Pembelajaran Tematik.* Jakarta. PT Fajar Interpratama Mandiri.

Manik, Mariani dan Mukhtar. (2017). Penerapan Metode Penemuan Terbimbing dalam Upaya Meningkatkan Kemampuan Pemahaman Konsep Matematika di Kelas VIII SMP Negeri 1 Ajibata. *Jurnal Inspiratif,* Vol. 3, No. 2.

Bani, Asmar. 2011. "Meningkatkan Kemampuan Pemahaman dan Penalaran Matematik Siswa Sekolah Menengah Pertama Melalui Pembelajaran Penemuan Terbimbing, SPS, UPI, Bandung". Dalam *Jurnal Penelitian Pendidikan* Edisi Khusus No. 1.