An Implementation of Problem Based Learning Model to Improve Mathematics Solving Problem Ability of the Students Class XI MIA SMA Negeri 4 Gorontalo Utara

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Abstrak

Penelitian ini bertujuan untuk meningkatkan kemampuan pemecahan masalah peserta didik pada mata pelajaran matematika. Jenis penelitian adalah penelitian tindakan kelas (PTK) yang dilaksanakan pada semester ganjil tahun ajaran 2019/2020 dengan subjek penelitian di kelas XI MIA 1 SMA Negeri 4 Gorontalo Utara. Penelitian ini menggunakan Model *Problem Based Learning* dengan jumlah siswa yang dikenai tindakan 34 orang. Desain PTK menggunakan model Kemmis dan Taggart yang meliputi perencanaan, tindakan dan observasi, serta refleksi. Teknik pengumpulan data menggunakan observasi, angket, dan tes. Analisis data yang digunakan statistik deskriptif kuantitatif dan kualitatif Penelitian berlangsung dalam 2 siklus. Hasil analisis data menunjukkan bahwa Pada penelitian ini nilai rata-rata tes formatif siklus I dan siklus II berturut-turut adalah : 73,76 dan 85,12. Berdasarkan kriteria ketuntasan minimal (KKM) yang ditetapkan sekolah yaitu 75, maka pada siklus I peserta didik yang mendapat nilai ≥ 75 adalah 24 orang atau 72,7 % dari 33 peserta didik yang hadir. Pada siklus II yang mendapat nilai ≥ 75 adalah 30 orang atau 88,23 % dari 34 peserta didik yang hadir.

Kata Kunci: Kemampuan Pemecahan masalah, Matematika, *Problem Based Learning* (PBL).

Abstract

This study aims to improve the problem-solving ability of students in mathematics. The type of research is classroom action research (CAR) which is carried out in the odd semester of the 2019/2020 academic year with the research subject in class XI MIA 1 SMA Negeri 4 Gorontalo Utara. This study uses a Problem Based Learning Model with the number of students who are subject to action being 34 people. The CAR design uses the Kemmis and Taggart models, including planning, action and observation, and reflection. Data collection techniques use observation, questionnaires, and tests. Data analysis used quantitative and qualitative descriptive statistics. The research took place in 2 cycles. The results of data analysis show that in this study the average scores of formative tests in cycle I and cycle II respectively were: 73.76 and 85.12. Based on the minimum completeness criteria (MCC) set by the school, namely 75, then in the first cycle, the students who got a score of 75 were 24 people or 72.7% of the 33 students who attended. In the second cycle who got a score of 75 were 30 people or 88.23% of the 34 students who attended.

Keyword: *Problem-Solving Ability, Mathematics, Problem Based Learning (PBL).*

INTRODUCTION

Mathematics is a specific exact science, has regularity, is systematically organized, and studies numbers, logic, space, form, calculation, and reasoning. The assumption is that mathematics is an abstract subject and has no relation to daily activity perceived by some students. Students still thought that mathematics is an exact science where there is no connection with other material

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which makes it difficult to be understood. Moreover, mathematics is needed in solving problems in daily life. So that if students still think mathematics is an abstract science that is not integrated with everyday life, it would affect their ability in solving problems related to mathematics in the future. Mathematics needs to be given to all students from elementary school to college. It aimed to equip students with abilities logical, analytical, systematic, critical, creative thinking, and teamwork. The general purpose of mathematics is to provide students with the ability to solve problems in daily life. NCSM (National Council of Supervisor Mathematics) states "Learning to solve problems is the main reason for studying mathematics", in other words, problem-solving is the axis of the mathematics learning process.

The problem-solving is one of the mathematical activities that are difficult to conduct both for teachers and students. When the students provide a problem, students start looking for the solutions, but often stop in the middle of the process and end up without an answer. This goes on continuously until at the end every given problem is unable to be solved and they do not get a solution. As a result, students feel afraid and have difficulty solving mathematics problems. The difficulty of solving mathematical problems is due to the special nature of mathematics which has abstract objects. It needs to be realized and discover the solution so the students can solve math problems easily and be fun. The mathematical problem-solving ability of students in Indonesia is low. Based on the results of the International Program for International Student Assessment (PISA) mathematics competition which is held once in 3 years in the fields of reading, mathematics, and science. The test results show that the mathematical problem-solving ability of Indonesian students is below the international average score. Based on the results of PISA 2012 the quality of mathematics learning in Indonesia is ranked 64th out of 65 participating countries. In addition, in the Trends in International Mathematics and Science Study (TIMSS) test, held once in 4 years for mathematics and science. The test results show that the mathematical problem-solving ability of Indonesian students is below the international average score. Based on the results of the 2011 TIMSS, the quality of mathematics learning in Indonesia is ranked 38 out of 42 countries. Based on the results of the TIMSS and PISA studies in mathematics, Indonesian students have yet been able to solve problems that require high-order thinking skills such as problem-solving skills.

Fact because the ability of students in solving mathematical problems is still low, it is necessary to apply a learning model that is expected to be able to persuade the students to think in finding the solution of the problem. One of the learning models is Problem-Based Learning or problem-based learning. According to Muslimin I problem-based learning is an approach to teach the students to develop problem-solving skills, learn authentic adult roles and become independent learners. Problem-based learning is not designed to help educators provide so much information to the students, but problem-based learning is to help students develop their thinking skills, problem-solving and intellectual skills, learn various roles. adults through engaging them in real experiences and becoming self-directed learning. The Problem-Based Learning model requires students to actively analyze the investigations in solving problems and the teachers as facilitators or mentors. Based on the description above, the research on "Application of Problem-Based Learning Models to Improve Students' Mathematical Problem-Solving Ability" is conducted.

METHOD

The classroom action research follows the research model of Kemmis and Mc. Taggart consists of 2 (two) cycles, each cycle consisting of three meetings with four cycles, there are planning, action, observation, and reflection. However, the decision to continue or stop the research depends on the results in the last cycle. If the result is achieved, the research would stop. However, if the results did not achieve, then the research would continue to the next cycle.

The Classroom Action Research (CAR) conducts in SMA Negeri 4 North Gorontalo, Tolinggula Pantai village, Tolinggula sub-district, North Gorontalo Regency, Gorontalo Province, in the odd semester of the academic year 2019/2020 taken from August to September 2019. The subjects in this study are the students of class XI MIA 1 SMAN 4 North Gorontalo, with a total of

34 students consisting of 8 males and 26 females. The subjects of this research are very heterogeneous in terms of their abilities, high, medium, and low abilities.

RESULTS AND DISCUSSION

1. Observation Results Analysis of Student Activity

The observation was held by teachers from the research site and conducted in every meeting. The formulation of the problem is the observed problem about the activities of students and observations about educators during learning activity with the Problem-Based Learning model.

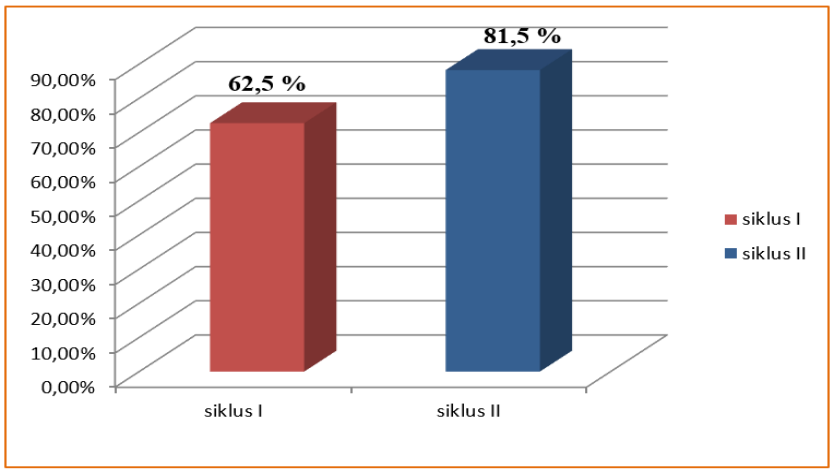

Diagram 1 Percentage of Student Learning Activities

The graphic shows that the learning activities of students increase from cycle I to cycle II. These results are obtained because students are able to adapt and are enthusiastic about the learning model used.

Analysis of observational data conducts in each cycle as below:

a) The observation result of cycle I

The first cycle conducts by the researcher partner from a mathematics teacher from SMA Negeri 4 North Gorontalo. In this cycle, observations conduct at meetings I and II. The results of observations in cycle I as below.

Table 1. Analysis the Observation Results of the Student Activity in Cycle I

No.	Observation Aspect	Meeting		Score Average	Description
		I	II		
Visual Activities:					
1	Students pay attention to educators when given apperception/motivation.	2.6	3.2	2.90	Quite Active
2	Students pay attention to indicators of learning competence delivered by the teacher.	2.4	3.2	2.80	Quite Active
3	Students listen to the explanations of other teachers/students.	3	3.4	3.20	Active
4	Students observe the problems in the teaching materials.	3	3.4	3.20	Active
5	Students read the problems through the LKPD	3.2	3.4	3.30	Active
Oral Activities:					
6	Students ask the teacher if they have difficulty.	2.6	3.2	2.9	Quite Active
7	Students express their thoughts on	2.8	3.4	3.1	Active

No.	Observation Aspect	Meeting		Score Average	Description
		I	II		
	problems given by other teachers/students.				
Listening Activities					
8	Students listen to the description explained by the teacher.	3.2	3.4	3.3	Active
9	Students listen to the explanations of other students who are presenting the results of their discussions in the class.	2.6	3.4	3	Quite Active
Writing Activities					
10	Students write their answers on the blackboard/ notebook.	2.6	3.2	2.9	Quite Active
11	Students write a summary of the material and conclusions of today's learning.	2.6	3.4	3	Quite Active
Drawing Activities					
12	Students draw the graphic	3.4	3.6	3.5	Active
13	Students make tables of several problems that allow their solutions using tables.	3.4	3.6	3.5	Active
Metric Activities					
14	Students and their groups present their work in the class.	2.8	3.4	3.1	Active
15	Students work together in solving problems presented by teachers from LKPD.	3.2	3.4	3.3	Active
Mental Activities					
16	Students can remember and explain the material which is a prerequisite for today's meeting.	2.4	3.4	2.9	Quite Active
17	Students able to solved the problem given from LKPD.	3	3.4	3.2	Active
18	Students reflect and make conclusions by remembering today's material	2.6	3.4	3	Quite Active
Emotional Activities					
19	Students feel enthusiastic about learning with the Problem-Based Learning model.	2.8	3.4	3.1	Active
20	Students are more active in discussions.	3.2	3.4	3.3	Active
Average		**2.87**	**3.38**	**3.13**	**Active**
Percentage		**62,5 %**			

The table shows that the average score of student activity is 3.13 or 62.5% with active interpretation.

b) Observation result of cycle II

In the second cycle, observations were conducted by the researcher partner from a mathematics teacher from SMA Negeri 4 North Gorontalo. In cycle II, the observation is conducted at meeting I and II. The observations result of cycle II is as below.

Table 2. Analysis of Observation Results of the Student Activity in Cycle II

No.	Observation Aspect	Meeting		Score Average	Description
		I	II		
Visual Activities					
1	Students pay attention to educators when given apperception/motivation.	3.4	4	3.70	Active
2	Students pay attention to indicators of learning competence delivered by the teacher.	3.4	4.4	3.90	Active

No.	Observation Aspect	Meeting		Score Average	Description
		I	II		
3	Students listen to the explanations of other teachers/students.	3.6	4.2	3.90	Active
4	Students observe the problems in the teaching materials.	3.6	4.4	4.00	Active
5	Students read the problems through the LKPD	3.6	4.6	4.10	Very Active
Oral Activities					
6	Students ask the teacher if they have difficulty. Students express their thoughts on problems given by other teachers/students.	3.6	4.2	3.9	Active
7	Students ask the teacher if they have difficulty.	4	4.8	4.4	Very Active
Listening Activities					
8	Students listen to the description explained by the teacher.	3.8	4.6	4.2	Very Active
9	Students listen to the explanations of other students who are presenting the results of their discussions in the class.	3.6	4.6	4.1	Very Active
Writing Activities					
10	Students write their answers on the blackboard/ notebook.	3.8	4.8	4.3	Very Active
11	Students write a summary of the material and conclusions of today's learning.	3.6	4.2	3.9	Active
Drawing Activities					
12	Students draw the graphic	4	4.6	4.3	Very Active
13	Students make tables of several problems that allow their solutions using tables.	3.6	4.4	4	Active
Metric Activities					
14	Students and their groups present their work in the class.	3.6	4.4	4	Active
15	Students work together in solving problems presented by teachers from LKPD.	3.8	4.4	4.1	Very Active
Mental Activities					
16	Students can remember and explain the material which is a prerequisite for today's meeting.	3.4	4.4	3.9	Active
17	Students able to solved the problem given from LKPD.	4	4.6	4.3	Very Active
18	Students reflect and make conclusions by remembering today's material	3.6	4.6	4.1	Very Active
Emotional Activities					
19	Students feel enthusiastic about learning with the Problem-Based Learning model.	3.8	4.4	4.1	Very Active
20	Students are more active in discussions.	4	4.6	4.3	Very Active
Average		**3.69**	**4.46**	**4.08**	**Very Active**
Percentage		**81,5 %**			

The table shows that the average score of students' activities during learning mathematics with the Problem-Based Learning model is 4.08 or 81.5% with a very active interpretation.

2. Results Analysis of Cycle Test

The school set the minimum completeness criteria (KKM) to be 75, then in the first cycle, the students who scored 75 were 24 people or 72.7% of the 33 students who attended. In the second cycle, the score is 75 obtained by 30 students or 88.23% of the 34 students who attended. It states that the class absorption capacity (DSK) in cycle I the 85% of students unable to achieve the KKM. While the class absorption capacity (DSK) in the second cycle the students were able to achieve because more than 85% of students gained their score and achieve the KKM set by the school. For more details, the result is as below.

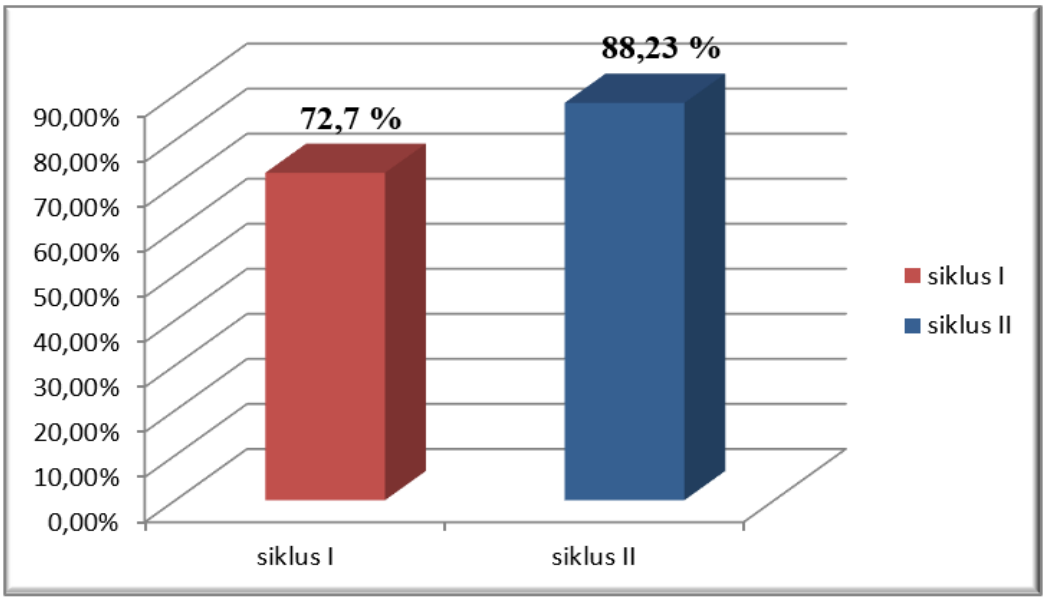

Diagram 2. Average Value of Students' Mathematical Problem Solving Ability Test

The graphic shows that there is an improvement in class absorption from cycle I to cycle II. In the first cycle, the students were curious about the applied model so they follow the class actively. In cycle II, students begin to adapt and familiar with the applied learning model so the class absorption is increased. The detail is as below:

a) Test Result of Cycle I

The results of the Cycle 1 were 73.76 obtained by the 33 students shows that the students were able to receive lessons well. The highest score was 88 and the lowest score was 58. The KKM score for mathematics was 75, in this test nine students were unable to achieve the KKM.

The number of questions in the first cycle test was five questions, with different weight values according to the level of difficulty of the questions. Question number 1 is a question that contains indicators of solving mathematical problems about "explaining or interpreting the results according to the problem". The average score of students is 14.39 from the maximum score of question number 1 is 15, so the percentage of students who can answer the question is 95.96%.

Question number 2 is a question that contains indicators of mathematical problem solving about "applying strategies to solve various problems (of new types and problems) within or outside mathematics". The average value of students is 13.30 from the maximum score of question number 2 is 15, so the percentage of students who can answer the question is 88.69%.

Question number 3 is a question that contains indicators of mathematical problem solving about "explaining or interpreting the results according to the problem" and "using mathematics in a meaningful way". The average value of students is 14.48 from the maximum score of question number 3 is 20, so the percentage of students who can answer the question is 72.42%.

Questions number 4 and 5 are questions that contain indicators of solving mathematical problems about "identifying the elements of known, asked, and answered and the required elements" and "formulating mathematical problems or compiling a mathematical model". The

average score of students is 16.91 from the maximum score of questions number 4 and 5 is 25, so the percentage of students who can answer these questions is 67.64%. The following is the percentage of formative test scores which classified based on the 2013 curriculum (K.13), Permendikbud number 53 of 2015, as below:

Table 3. Percentage of Formative Test Scores Cycle I

No	Score	Category	Frequency	Percentage
1	0 – 59	Low	2	6,06 %
2	60 – 69	Enough	4	12,12 %
3	70 – 79	Good	16	48,49 %
4	80 – 100	Very good	11	33,33 %

b) Test result cycle II

The results from the second cycle test were better than the first cycle. The average of the results from the first cycle is 85.12 by the 34 students. It shows that students can receive the lessons very well. The highest score is 100 and the lowest score is 66. The math KKM score for SMA Negeri 4 Gorontalo Utara is 70, in this test the four students scored below the KKM.

The total number of questions, in the second cycle test, is 5 questions, the weights also vary according to the level of difficulty of the questions. Question number 1 is a question that contains indicators of solving mathematical problems about "explaining or interpreting the results according to the problem". The average value of students is 18.82 from the maximum score of question number 1 is 20, so the percentage of students who can answer the question is 94.12%.

Questions number 2 and 3 are questions that contain indicators for solving mathematical problems about identifying the elements of known, asked, and answered and the required elements" and "formulating mathematical problems or compiling a mathematical model". The average value of students is 13.96 from the maximum score of questions number 2 and 3 is 15, so the percentage of students who can answer these questions is 93.04 %.

Questions number 4 and 5 are questions that contain indicators of mathematical problem solving about "using mathematics meaningfully" and "applying strategies to solve various problems (new types and problems) inside or outside mathematics". The average value of students is 19.19 from the maximum score of questions number 4 and 5 is 25, so the percentage of students who can answer these questions is 76.76%. The following is the percentage of formative test scores is classified based on the 2013 curriculum (K.13), Permendikbud number 53 of 2015 as below:

Table 4. Percentage of Formative Test Scores in Cycle II

No	Nilai	Kategori	Frekuensi	Persentase
1	0 – 59	Kurang	0	0 %
2	60 – 69	Cukup	2	5,88 %
3	70 – 79	Baik	6	17,65 %
4	80 – 100	Baik Sekali	26	76,47 %

The table shows that there are no students who score between 0 and 59. Furthermore, the students who score between 60 and 69 are two students, about 5.88%. The students who score between 70 and 79 are six students, around 17.56%. The students who scored between 80 and 100 were 26 students, around 76.47%. In this cycle, there was an improvement in class absorption from the previous cycle, from 72.70% to 88.23%.

CONCLUSION

The research of the implementation of the Problem Based Learning model to improve students' problem-solving skills concludes that the average scores of formative tests in cycle I and cycle II were: 73.76 and 85.12. Regarding the minimum completeness criteria (KKM) set by the school is 75, in the first cycle, the students who scored 75 were 24 students or 72.7% of the 33 students who attended. In the second cycle who got a score of 75 were 30 students or 88.23% of 34 students. The students who attended got an average score above the KBM standard set by the school, which is a minimum of 75. Therefore, the researcher concludes that the implementation of the Problem Based Learning learning model can be applied to the implementation of mathematics learning, especially in materials that require the ability to solve mathematical problems. During the learning process, students are enthusiastic in learning both in working on LKPD in groups and working the exercise, so that the teaching and learning process runs well and achieves learning objectives.

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