Volume 4, Number 1, December 2022
Journal of Research on Mathematics Instruction
DOI: https://doi.org/10.33578/jrmi.v4i1.75
Journal's Webpage: http://jrmi.ejournal.unri.ac.id

Application of the Problem-Based Learning Model to Improve the Mathematical Problem-Solving Ability of Class VII Students of SMP Negeri 23 Pekanbaru

Eli Ningsih [1], Nelli Susanti [2], Yenni Elifa [3]
[1] Universitas Riau, INDONESIA
[2] SMP Negeri 23 Pekanbaru, INDONESIA
[3] SMP Negeri 23 Pekanbaru, INDONESIA

ARTICLE'S INFORMATION

Article history:

Received: Dec-25-2022

Reviewed: Jan-02-2023

Accepted: Jan-07-2023

Keywords: Classroom Action Research, Mathematical Problem-Solving Abilities, Problem-Based Learning

Corresponding address:

Eli Ningsih,
E-mail: eli.ningsih1216@student.unri.ac.id

ABSTRACT

This study aims to enhance students' capacity for solving mathematical problems through a problem-based learning style. One kind of research that is applied is classroom action research. 37 SMP Negeri 23 Pekanbaru grade 7 kids representing a range of academic abilities were used as research participants. Planning, execution, observation, and reflection are divided into two cycles in this study. The gathering of data involved watching teachers and students in action and administering learning achievement exams as part of daily quizzes. The study results suggest that a problem-based learning strategy can improve students' problem-solving abilities. As evidence, the value of learning outcomes rises from cycle I to cycle II. Cycle I and Cycle II students who passed the KKM had success rates of 27.03% and 29.73%, respectively. According to the study's findings, class VII students at SMP Negeri 23 Pekanbaru can improve their arithmetic problem-solving skills and learn more about math by employing a problem-based learning strategy.

INTRODUCTION

One of the most significant disciplines in school is mathematics. According to [1], mathematics is a scientific concept with abstract objects that can turn ordinary ideas into mathematical, logical, careful, orderly, and critical ones. Learning mathematics aims to provide students with the knowledge and skills to understand mathematical topics and explain how they are connected. In solving problems, algorithms are used flexibly, correctly, efficiently, and appropriately. Problem-solving ability is one of the qualities needed to study mathematics [1].

A lot of knowledge is needed when solving problems to find solutions to challenges or difficulties in achieving the final result. Solving problems is a basic mathematical ability that helps critical and creative thinking and develops other mathematical problem-solving skills in humans. Learning to think, reason, and apply the latest information is the essence of problem-based learning.

One of the fundamental abilities that every student must master to understand mathematics is the ability to solve problems [2]. If students are involved in problem-solving skills training for new challenges, students' problem-solving skills will increase [3]. If students can understand, choose the appropriate approach, and then use it to solve a problem, they can be said to be able to solve mathematical problems [1]. Therefore, one of the things that every student must have is the ability to solve problems. Students will also be better prepared to solve logical difficulties that arise in everyday

life because of this problem-solving ability.

Based on observations on the steps for implementing mathematics learning for class VII SMP Negeri 23 Pekanbaru, it appears that students experience problems in answering questions or questions presented in story form due to a lack of experience answering questions given in the form of problems and because students with high abilities more dominating when working on questions or practicing in front of the class so that some students with average abilities tend to be inactive learners. This observation is appropriate to the research, which states that the students who take integral calculus, it was found that the students are still experiencing an error in solving the problems given [4]. This is considered to influence student learning outcomes that are deemed unsatisfactory.

Using models, methodologies, or learning approaches that are not appropriate results in a lack of involvement of students in their learning [5]. In addition, the learning steps, which are dominated by the teacher (teacher center), where students only listen to the concepts conveyed, cause the students' lack of activity. Similar findings by [6] show that teachers master the educational process in the classroom. In terms of teaching materials, teaching materials used in schools are still mostly focused on conceptual understanding [7]. Students also believe that mathematics is difficult because it relates to abstract ideas, even though students' perceptions of the subject matter will contribute to student academic achievement [8].

To improve learning, the teacher has tried to re-explain the understanding that students have not mastered. When students with ordinary abilities have difficulty understanding learning, the teacher tries to be close to students by helping and guiding students in the learning process [9]. Supposedly, self-management and an attitude of not giving up easily need to be raised in learning activities [10]. However, this does not have a major impact on improving student learning outcomes. Learning methods that can help students learn and the models used to enhance their mathematical problem-solving skills must be adapted to the constraints they face.

According to Arends, problem-based learning supports students' intellectual growth, thinking, and problem-solving [11]. According to [13], the Problem-Based Learning paradigm combines the context of learning from the classroom with learning that occurs naturally in real life to motivate students to be involved in active learning.

Problem-Based Learning offers students the greatest opportunity to research the problems they encounter in their application. Because using this learning approach allows students to actively participate in solving problems, which can help students to learn more about how to solve problems. In addition, research findings [12] show that students' mathematical problem-solving abilities can be helped by using the Problem-Based Learning methodology. As a result, it is believed that using the Problem-Based Learning approach when learning can increase the capacity of students to solve mathematical problems.

METHODS

This type of research is called Classroom Action Research (CAR). Classroom Action Research (CAR), according to [13], is a project designed to enhance learning or overcome problems experienced during the learning process. The research was conducted with a math teacher as an observer and a researcher as a class VII teacher at SMP Negeri 23 Pekanbaru. The teacher's actions in implementing learning in the classroom involve using the Problem-Based Learning model to teach class VII students of SMP Negeri 23 Pekanbaru about Linear Equations and Inequalities of One Variable. This is done to help students become proficient in solving mathematical problems. The process of implementing learning in this study applies two cycles with eight meetings consisting of four stages: planning,

implementing, observing, and reflecting.

RESULTS AND DISCUSSION

The research results were obtained based on the PTK stages, which were divided into four stages, and below is the description of each cycle.

1. Cycle I

Cycle I has four meetings, the first meeting to the third meeting is a meeting using the Problem-Based Learning model with teaching modules and two worksheets, and the fourth meeting is Daily Deuteronomy I (UH-I).

a. The First Meeting

The meeting was held for two learning hours (80 minutes). Preliminary activities start with students greeting and praying, then the teacher checks the presence of students. Then the teacher instructs students to prepare equipment for learning. The teacher conveys the objectives and stages of learning, and students pay attention and listen carefully. The teacher also motivates students by discussing the benefits of studying open sentences and closed sentences and being able to create a mathematical model of a one-variable linear equation problem. After the teacher conveys an apperception about algebraic forms, the teacher instructs students to sit in groups. The teacher then gives LKPD-1 to each group to work on and discuss.

Core Activity, Phase-1 students observe the problems found in LKPD-1; many students question how to write down what is known and are asked about the problems that exist after seeing the problems contained in LKPD-1. In Phase 2, students ask the teacher for suggestions on how to solve the problem after the teacher encourages students to write down what they already know and are asked. In Phase 3, the teacher supervises students by monitoring the activeness of each group member in solving problems on LKPD-1. Many students still have difficulty and are confused about completing LKPD-1 because they are still beginners in using LKPD. The teacher explains to students how to solve the questions in LKPD-1 by going through each of the stages in LKPD-1.

Several groups had not completed LKPD-1 when they entered Phase 4, so the teacher added more time for students to complete LKPD-1. Therefore, the timing for the implementation of Phase-4 and Phase-5 could not be carried out because the bell for changing class hours would ring in a few moments. So, presenting the results of group discussions, concluding activities, and conducting formative tests during today's meeting is impossible because students are still having difficulties and confusion in solving problems using LKPD and applying the Problem-Based Learning model.

The closing activity was done by giving students homework and asking them to prepare for the next meeting by reading material, namely determining variable values and solving one variable linear equation problems using addition and subtraction on pages 258-263. The teacher then ends the lesson by praying together, followed by greetings.

b. Second Meeting

The meeting was held for two learning hours (80 minutes). Implementation of the learning process through three activities. Preliminary activities start with students greeting and praying, then the teacher checks the presence of students. Then the teacher instructs students to prepare equipment for learning while the teacher displays PPT through infocus. The teacher conveys the objectives and stages of learning, and students pay attention and listen carefully. The teacher also motivates students by discussing the benefits of solving one-variable linear equation problems using addition or subtraction. After the teacher conveys apperceptions about how to model a one-variable linear

equation problem, the teacher instructs students to sit in groups. The teacher then gives LKPD-2 to each group to work on and discuss.

Core Activities, Phase-1 students observe the problems found in LKPD-2. There are still students who question how to write down what they know and are asked about the existing problems after seeing the problems contained in LKPD-2. In Phase 2, there were still students who asked the teacher for advice on how to solve the problem, but most of the students could write down what they knew and were asked on the LKPD. In Phase 3, the teacher supervises students by monitoring the activeness of each group member in solving problems on LKPD-2. Students can work on and complete LKPD-2 and discuss it with their groups correctly and in an orderly manner. Furthermore, in Phase 4, each group has completed its LKPD-2 so students can present the results of their group discussions in front of the class.

In Phase 5, after the student presentation, the teacher asks other students about the responses or questions they want to convey to the presenter group. Several students gave questions to the presenter group and continued with the presenter group, who responded to the question. The teacher then asked the students whether there were students who had different responses, then all students answered the same. Furthermore, the group that presented the discussion results in front of the class received applause from the teacher and other students as appreciation. Then the teacher conveys conclusions about the learning outcomes at today's meeting. Because the time for changing class hours will ring soon, the teacher cannot give formative tests to students.

The closing activity is done by giving students homework and asking them to prepare for the next meeting by reading the material, namely solving one variable linear equation problems using multiplication or division on pages 264-271. The teacher then ends the lesson by praying together, followed by greetings.

c. Third Meeting

The meeting was held for two learning hours (80 minutes). Implementation of the learning process through three activities. Preliminary activities start with students greeting and praying, then the teacher checks the presence of students. Then the teacher instructs students to prepare equipment for learning. The teacher conveys the objectives and stages of learning, and students pay attention and listen carefully. The teacher also motivates students by discussing the benefits of solving one-variable linear equation problems using multiplication or division. Then the teacher conveys apperceptions about how to solve one-variable linear equation problems using addition or subtraction.

Core Activity, Phase-1 students observe the problems in the table on page 265 of the Package Book. After observing the existing problems, students are directed to see what is known and ask questions. In Phase 2, students can determine what is known and ask about existing problems. Next, students ask how to solve the problem. Furthermore, the teacher explains how to solve the problem by presenting the problem in the form of an equation first, then the problem is solved by multiplication or division. To see students' understanding, the teacher gives exercises to students and is done individually. In Phase 3, the teacher supervises students by monitoring each student's activity in solving the given practice questions. Furthermore, in Phase 4, students are asked to write down and present the results of their answers on the blackboard.

In Phase 5, after the student presentation is finished, the teacher asks other students about the responses or questions they want to convey regarding the results of the answers that students have submitted. All the students were silent and didn't answer anything, so the teacher asked if anyone had

a different answer. Then the students all answered the same. Furthermore, the teacher asks students to convey their conclusions about the learning outcomes of this meeting. Several students pointed their hands, and the teacher pointed to the three students to convey their conclusions. Then the teacher will give reinforcement regarding the conclusions that have been submitted. The teacher then assigns exercises to complete to measure students' understanding of the material discussed. The teacher instructs students to collect the results of their practice.

The closing activity passed with learning reflections on what has been done today. Then students are given homework, followed by the teacher asking students to review previous material about one-variable linear equations because, in the next meeting, students will carry out UH-I to see the participants' abilities to educate in understanding and solving problems about one-variable linear equations. The teacher then ends the lesson by praying together, followed by greetings.

d. Fourth Meeting

This meeting lasted for two learning hours (80 minutes). Implementation of the learning process begins with students greeting and praying then the teacher checks the presence of students. The teacher then asks students to prepare equipment for the implementation of UH-I. After distributing the UH-I question sheets to students, the teacher reminded students that completing UH-I had to be done individually within 80 minutes.

e. Cycle I Reflection

The deficiencies that occur in teachers and students include: 1) Students are still not orderly when asked to sit in groups, especially at the first meeting; 2) In working on LKPD, many students experience problems and confusion when trying to solve problems on LKPD, especially at the first meeting, 3) The teacher is still lacking in time management, so several stages cannot be carried out.

The plans that will be implemented by the teacher in minimizing errors from actions in the first cycle: 1) Organizing discussion groups based on the results of the UH-1 score and gender considerations. The aim is to involve more students in group discussion activities, increasing motivation and producing a better and more structured learning environment. 2) More effective time management so that each activity can be carried out according to plan. 3) Motivate and guide students, especially during class and group discussions.

2. Cycle II

The second cycle has four meetings; the fifth meeting to the seventh is a meeting applying the Problem Based Learning model with teaching modules and two worksheets, and the eighth is Daily Deuteronomy II (UH-II).

a. Fifth Meeting

The meeting lasted for two learning hours (80 minutes). The learning process is passed through three activities. Preliminary activities start with students greeting and praying then the teacher checks the presence of students. Then the teacher instructs students to prepare equipment for learning. The teacher conveys the objectives and stages of learning, and students pay attention and listen carefully. The teacher also motivates students by discussing the benefits of drawing a number line. Then the teacher conveys apperceptions about one-variable linear equations and inequalities.

Core Activity, Phase-1 students observe the problems in the table on page 277 of the Package Book. The teacher asks students to observe and understand the problems on the table. In Phase 2, students already know how to solve the problem. Furthermore, the teacher explains how to solve the problem by describing it as a number line. To see students' understanding, the teacher gives exercises to students and is done individually. In Phase 3, the teacher supervises students by monitoring each

student's activity in solving the given practice questions. Furthermore, in Phase 4, students are asked to write down and present the results of their answers on the blackboard.

In Phase 5, after the student presentation is finished, the teacher asks other students about the responses or questions they want to convey regarding the results of the answers that students have submitted. All the students were silent and didn't answer anything, so the teacher asked if anyone had a different answer. Then the students all answered the same. Furthermore, the teacher asks students to convey their conclusions about the learning outcomes of this meeting. Several students pointed their hands, and the teacher pointed to the three students to convey their conclusions. Then the teacher will give reinforcement regarding the conclusions that have been submitted. The teacher then assigns exercises to complete to measure students understanding of the material discussed. The teacher instructs students to collect the results of their practice.

The closing activity passed with learning reflections on what has been done today, then giving students homework and asking them to prepare for the next meeting by reading the material, namely making a mathematical model of a one-variable linear inequality problem on pages 275-280. The teacher then ends the lesson by praying together, followed by greetings.

b. Sixth Meeting

The meeting was held for two learning hours (80 minutes). Preliminary activities start with students greeting and praying then the teacher checks the presence of students. Then the teacher instructs students to prepare equipment for learning while the teacher displays PPT through infocus. The teacher conveys the objectives and stages of learning, and students pay attention and listen carefully. The teacher also motivates students by discussing the benefits of learning how to model one-variable linear inequalities problems. After the teacher conveys the apperception about the concept of one-variable linear inequality and how to draw a number line, the teacher instructs students to sit in groups. The teacher then gives LKPD-3 to each group to work on and discuss.

Core Activities, Phase-1 students observe the problems found in LKPD-3, and the teacher instructs students to observe and understand the problems in LKPD-3. In Phase 2, students hold discussions with their groups to find solutions to the problems in LKPD-3 after writing down what is known and what is asked of the problems presented. In Phase 3, the teacher supervises students by monitoring the activeness of each group member in solving problems on LKPD-3. Students can work on and complete LKPD-3 and discuss it with their groups properly and orderly. Furthermore, in Phase 4, each group has completed its LKPD-3 so students can present the results of their group discussions in front of the class.

In Phase 5, after the student presentation, the teacher asks other students about the responses or questions they want to convey to the presenter group. Several students gave questions to the presenter group and continued with the presenter group, who responded to the question. The teacher then asked the students whether there were students who had different responses, then all students answered the same. Furthermore, the group that presented the discussion results in front of the class received applause from the teacher and other students as appreciation. Moreover, the teacher asks students to convey their conclusions about the learning outcomes of this meeting. Several students pointed their hands, and the teacher pointed to the three students to convey their conclusions. Then the teacher will give reinforcement regarding the conclusions that have been submitted. The teacher asks students to sit in their original places and continues with the teacher giving a formative test where the questions are displayed through infocus. This formative test is done individually as an evaluation of student learning. Then students are asked to collect the results of their formative tests.

Closing activity passed with learning reflections on what has been done today, then giving students homework and asking them to prepare for the next meeting by reading material, namely determining variable values and solving one-variable linear equation problems on pages 283-290. The teacher then ends the lesson by praying together, followed by greetings.

c. Seventh Meeting

This meeting was conducted for 2 hours of learning (80 minutes). Preliminary activities start with students greeting and praying then the teacher checks the presence of students. Then the teacher instructs students to prepare equipment for learning while the teacher displays PPT through infocus. The teacher conveys the objectives and stages of learning, and students pay attention and listen carefully. The teacher also motivates students by discussing the benefits of learning how to solve one-variable linear inequalities problems. After the teacher conveys apperceptions about how to model a one-variable linear inequality problem, the teacher instructs students to sit in groups. The teacher then gives LKPD-4 to each group to work on and discuss.

Core Activities, Phase-1 students observe the problems found in LKPD-4, and the teacher instructs students to observe and understand the problems in LKPD-4. In Phase 2, students hold discussions with their groups to find solutions to the problems in LKPD-4 after writing down what is known and what is asked of the problems presented. In Phase 3, the teacher supervises students by monitoring the activeness of each group member in solving problems on LKPD-4. Students can work on and complete LKPD-4 and discuss it with their groups properly and orderly. Furthermore, in Phase 4, each group has completed its LKPD-4 so students can present the results of their group discussions in front of the class.

In Phase 5, after the student presentation, the teacher asks other students about the responses or questions they want to convey to the presenter group. Several students gave questions to the presenter group and continued with the presenter group, who responded to the question. The teacher then asked the students whether there were students who had different responses, then all students answered the same. Furthermore, the group that presented the discussion results in front of the class received applause from the teacher and other students as appreciation. Moreover, the teacher asks students to convey their conclusions about the learning outcomes of this meeting. Several students pointed their hands, and the teacher pointed to the three students to convey their conclusions. Then the teacher will give reinforcement regarding the conclusions that have been submitted. The teacher asks students to sit in their original places and continues with the teacher giving a formative test where the questions are displayed through infocus. This formative test is done individually as an evaluation of student learning. Then students are asked to collect the results of their formative tests.

The closing activity passed with learning reflections on what has been done today. Then students are given homework, followed by the teacher asking students to review previous material about one-variable linear inequalities. In the next meeting, students will carry out UH-II to see the participants' abilities in understanding and solving problems about one-variable linear inequalities. The teacher then ends the lesson by praying together, followed by greetings.

d. Eighth Meeting

The meeting lasted for two learning hours (80 minutes). The learning process begins with students greeting and praying then the teacher takes student attendance. The teacher then asks students to prepare equipment for the implementation of UH-II. After distributing the UH-II question sheets to the students, the teacher reminded the students that completing UH-II had to be done individually within 80 minutes.

e. Cycle II Reflection

The learning process of cycle II compared to cycle I experienced improvements, namely: 1) Group and class discussions were carried out properly and according to plan, 2) Students behaved more orderly when sitting in their groups compared to the first cycle, 3) The level of self-confidence of students improve in communicating responses and conclusions in learning, 4) Students also know and understand the learning activities used, and 5) Students pay more attention during group discussions. Overall, at every meeting, the activity of teachers and students increases.

3. Analysis of Teacher and Student Activities

The suitability of the procedures for implementing the Problem-Based Learning model, which is planned by implementing corrective actions in the classroom learning process, is assessed through teacher and student activity data analysis. There is an increase in student activity in a better direction during the learning process based on observational findings on teacher and student activity sheets based on the procedures for each activity that have been explained at each meeting. Compared to the previous session, there were fewer deficiencies and weaknesses in learning. The data in table 1 below shows that teacher activity is increasing.

Table 1. Teacher Activity Achievement Scores at Each Meeting and Each Cycle

	Cycle I			**Cycle II**		
	Meeting					
	1	**2**	**3**	**5**	**6**	**7**
Score	15	18	21	21	21	21
Percentage (%)	71,43	85,71	100	100	100	100
Category	B	SB	SB	SB	SB	SB
Average	85,71% (SB)			100% (SB)		

Ideal Score = 21

Table 1 shows that planning to improve the learning process carried out in cycle I and applied to cycle II resulted in the implementation of learning in cycle II increasing compared to cycle I. Furthermore, table 2 below shows students' activity data from cycles I to II.

Table 2. Student Activity Achievement Scores at Each Meeting and Each Cycle.

	Cycle I			**Cycle II**		
	Meeting					
	1	**2**	**3**	**5**	**6**	**7**
Score	10	16	19	19	19	19
Percentage (%)	52,63	84,21	100	100	100	100
Category	B	SB	SB	SB	SB	SB
Average	78,94% (SB)			100% (SB)		

Ideal Score = 19

Analysis of the learning activities of all meetings, class VII students' participation level at SMP Negeri 23 Pekanbaru has increased.

4. Data Analysis of Students' Mathematics Learning Outcomes

a. Analysis of Achievement of KKM Knowledge Learning Outcomes

The mathematics learning outcomes of students individually are examined for their completeness. Students who score above or equal to the KKM set by the school, namely 80, are considered to have reached the KKM. From the results of students' daily test scores in cycles I and II, it can be seen that some students at UH-I and UH-II have not yet reached the KKM. Table 3 below can be used to compare student learning outcomes before and after the activity to assess

whether there is an increase.

Table 3. Percentage of Students' KKM Achievement

	UH-I	UH-II
The number of students who achieve KKM	10	11
Percentage (%)	27,03%	29,73%

Table 3 above shows an increase in the proportion of students who achieved KKM from UH-I to UH-II scores.

b. Analysis of Achievement of KKM Indicators of Knowledge

In determining the number of students who meet the completeness criteria for each indicator at UH-I and UH-II based on the mathematics learning outcomes obtained from the KKM achievement of each indicator. Based on the UH-I and UH-II scores, it can be seen from the number of students who have achieved KKM on each indicator that the completeness of students' mathematics learning outcomes is checked individually for each indicator. Table 4 below shows the percentage of KKM achievement on the knowledge indicator at UH-I.

Table 4. Achievement of students' KKM on Knowledge Indicators at UH-I

No.	Achievement Indicator	Question Number	Number of Students Reaching KKM	Percentage (%)
1.	Explain the concept of a one-variable linear equation	1	21	56,76%
2.	Determining the value of a variable in a one-variable linear equation	2	27	72,93%
		4	11	29,73%
3.	Turning problems related to one-variable linear equations into mathematical models	5	18	48,65%
4.	Solve real problems related to one-variable linear equations	3	12	32,43%

Table 4 shows that some students still do not meet the KKM for each indicator. Because some students do not understand the meaning of a one-variable linear equation, there are still students who have not reached the KKM on indicator one on question number 1. Due to the carelessness of certain students when applying addition and subtraction to calculate the value of a variable from a one-variable linear equation, there are still students who have not fulfilled the KKM on indicator 2 of question number 2. Because some students are not careful in determining the value of a variable from the form of a one-variable linear equation using multiplication and division, there are still students who have not reached the KKM on indicator 2, question number 4.

Because some students were not careful in changing one-variable linear equation questions into a mathematical model, there were still students who had not reached the KKM on indicator 3, question number 5. Because some students were not careful in choosing the steps to answer the problem in question, there are still students who have not fulfilled the KKM on indicator 4 of question number 3. The percentage of UH-II students who achieved the KKM indicator of knowledge is shown in Table 5 below.

Table 5. Achievement of students' KKM on Knowledge Indicators at UH-II

No.	Achievement Indicator	Question Number	Number of Students Reaching KKM	Percentage (%)
1.	Explain the concept of one-variable linear inequality	2	21	56,76%
		3	17	45,95%
2.	Draws the number line of a one-variable linear inequality problem	4	14	37,84%
3.	Determining the value of a variable in a one-variable linear inequality	1	19	51,35%
4.	Determine the set of solutions to the one-variable linear inequality problem	5	15	40,54%

Based on the information in table 5, there are still students who have not completed the KKM for each indicator. Because some students do not understand the meaning of one-variable linear inequality, there are still students who have not reached the KKM on indicator one questions 2 and 3. Because some students cannot draw a number line, there are still students on indicator 2, question number 4, who have not reached KKM. Some students still have not fulfilled the KKM indicator 3 question number 1 because some students are careless when determining the value of a variable from the form of one variable linear inequality using addition and subtraction. Because some students are not careful in calculating the set of solutions for one-variable linear inequalities, there are still students who have not reached the KKM on indicator 4 of question number 5.

Based on the UH analysis of class VII students at SMP Negeri 23 Pekanbaru, the results for the first cycle were 27.03%, and the second cycle was 29.73%. Because problem-based learning allows students and groups to actively participate in developing their knowledge and solving problems from the material being studied, there is an increase in the daily test scores given to students. These results are in accordance with [14].

The results of the analysis of students' answers to the UH tests cycles I and I errors that occur to students, in general, include the inability of students to write problem-solving plans correctly, lack of conceptual understanding, and lack of accuracy in answering questions that cause errors in calculation operations. To correct and reduce student errors in solving given problems, learning must be done by providing lots of practice questions in the form of problem-solving.

CONCLUSIONS AND SUGGESTIONS

Based on the findings and analysis obtained, it can be said that applying the Problem-Based Learning model can increase the activity value of teachers and students in each cycle. The value of teacher activity cycle I was 85.71%, and cycle II was 100%. At the same time, the activity value of students in the first cycle was 78.94%, and 100% in the second cycle. In addition, the percentage of students whose KKM scores were achieved from UH I to UH II in cycles I and II increased by 27.03% and 29.73%. Based on the results of students' daily tests, the errors experienced by students generally include the inability of students to write problem-solving strategies correctly, lack of understanding of concepts, and lack of accuracy in answering questions which cause errors in calculation operations.

Efforts to reduce student errors in solving one-variable linear equations and inequalities are that students must be trained in understanding questions and problem-solving techniques to solve a given problem. Therefore, in correcting and reducing the error rate of students in answering or solving

the problems presented, students are accustomed to receiving practice questions related to solving mathematical problems during the learning process.

REFERENCE

[1] T. Latifah and E. A. Afriansyah, "Kesulitan dalam Kemampuan Pemecahan Masalah Matematis Siswa pada Materi Statistika," *J. Authentic Res. Math. Educ.*, vol. 3, no. 2, pp. 134–150, 2021, doi: https://doi.org/10.37058/jarme.v3i2.3207.

[2] N. Z. Af-idah and U. Suhendar, "Analisis Kemampuan Pemecahan Masalah Siswa Berdasarkan Teori APOS saat diterapkan Program Belajar dari Rumah," *Edupedia*, vol. 4, no. 2, pp. 103–112, 2020, doi: 10.24269/ed.v4i2.480.

[3] M. Ahmad and S. Asmaidah, "Pengembangan Perangkat Pembelajaran Matematika Realistik untuk Membelajarkan Kemampuan Pemecahan Masalah Matematika Siswa SMP," *Mosharafa J. Pendidik. Mat.*, vol. 6, no. 3, pp. 373–384, 2017, doi: https://doi.org/10.31980/mosharafa.v6i3.326.

[4] H. M. Siregar and T. Solfitri, "An Analysis of Students' Errors in Solving Indefinite Integral Problems Viewed From Gender Differences," *J. Res. Math. Instr.*, vol. 1, no. 1, pp. 17–24, 2019, doi: 10.33578/jrmi.v1i1.12.

[5] S. Raoda, "Peningkatan Hasil Belajar Matematika Siswa Melalui Pembelajaran Buzz Grup pada Siswa Kelas VIII SMPN 9 Palopo," Ilmu Keguruan Institut Agama Islam Negeri Palopo, 2019.

[6] A. Fauzi, D. Sawitri, and S. Syahrir, "Kesulitan Guru Pada Pembelajaran Matematika Di Sekolah Dasar," *J. Ilm. Mandala Educ.*, vol. 6, no. 1, pp. 142–149, 2020, doi: 10.36312/jime.v6i1.1119.

[7] H. M. Siregar, T. Solfitri, and R. D. Anggraini, "Analisis Kebutuhan Modul Kalkulus Integral Untuk Meningkatkan Kemampuan Berpikir Kreatif Matematis," *GAUSS J. Pendidik. Mat.*, vol. 5, no. 1, pp. 16–26, 2022, doi: http://dx.doi.org/10.30656/gauss.v5i1.4718.

[8] H. M. Siregar, "Pengembangan Instrumen Angket Persepsi Mahasiswa Pendidikan Matematika Terhadap Pembelajaran Daring," *AKSIOMA J. Progr. Stud. Pendidik. Mat.*, vol. 11, no. 2, pp. 971–985, 2022, doi: https://doi.org/10.24127/ajpm.v11i2.4702.

[9] C. Aries, "Penerapan Model Problem-Based Learning Untuk Meningkatkan Hasil Belajar Peserta Didik Kelas XII IPA 6 SMA Negeri 4 Pekanbaru," *J. Prinsip Pendidik. Mat.*, vol. 3, no. 2, pp. 60–73, 2021, doi: https://doi.org/10.33578/prinsip.v3i2.92.

[10] H. M. Siregar, "Pengembangan Angket Self-Regulation Mahasiswa Pendidikan Matematika di Masa Pandemi Covid-19," *AKSIOMA J. Progr. Stud. Pendidik. Mat.*, vol. 10, no. 3, pp. 1685–1695, 2021, doi: 10.24127/ajpm.v10i3.3870.

[11] A. N. Silalahi, C. L. Azhari, and Ramadhani, "Pengaruh Model Pembelajaran Berbasis Masalah Terhadap kemampuan Pemecahan Masalah dan Minat Belajar Peserta didik Kelas VII SMP Al-Bukhari Muslim," *MAJU J. Ilm. Pendidik. Mat.*, vol. 8, no. 2, pp. 502–510, 2021.

[12] D. Oktaviana and R. Haryadi, "Pengaruh Model Pembelajaran Problem Based Learning (PBL) Terhadap Kemampuan Pemecahan Masalah Mahasiswa," *AKSIOMA J. Progr. Stud. Pendidik. Mat.*, vol. 9, no. 4, pp. 1076–1085, 2020, doi: http://dx.doi.org/10.24127/ajpm.v9i4.3069.

[13] N. T. Qomariyah, M. F. Nasrulloh, and E. Lilawati, "Penerapan Model Problem Based Learning Untuk Meningkatkan Kemampuan Pemecahan Masalah Matematika Pada Materi Sistem Persamaan Linier Tiga Variabel Bagi Siswa Kelas X MIA MA-Nizhamiyah Ploso," *EDUSCOPE J. Pendidikan, Pembelajaran, dan Teknol.*, vol. 6, no. 2, 2021.

[14] G. N. K. Wali, W. Winarko, and T. R. Murniasih, "Peningkatan Keaktifan Dan Hasil Belajar Siswa dengan Penerapan Metode Tutor Sebaya," *RAINSTEK J. Terap. Sains Teknol.*, vol. 2, no. 2, pp. 164–173, 2020, doi: https://doi.org/10.21067/jtst.v2i2.3574.

BIOGRAPHY

Eli Ningsih
Year 2007-2013 SDN 010 Kampung Besar Kota Rengat, Year 2013-2016 MTsS Madinatun Najah Rengat, Year 2016-2019 MAS Madinatun Najah Rengat, Year 2019-Present, student at the University of Riau. E-mail: eli.ningsih1216@student.unri.ac.id

Nelli Susanti
From June 1, 2003, to March 30, 2006, I began teaching at SMA Negeri 12 Pekanbaru as a central assistant teacher. 01 April 2006 taught at SMP Negeri 16 Pekanbaru until 02 August 2010. August 3, 2010, moved to SMP Negeri 23 Pekanbaru until now. E-mail: nellisusanti95@guru.smp.belajar.id

Yenni Elifa
Teacher 01 February 1998 at SMP Negeri 2 Tembilahan. August 23, 2003, moved to SMP Negeri 23 Pekanbaru until now. E-mail: yennielifa59@guru.smp.belajar.id