

Efforts to Improve Mathematics Learning Outcomes Through the Application of Problem Based Learning Models for Class VII F Students of SMP Negeri 9 Palu

Nurhalisa¹ Sukayasa² Siti Nurbaya³

Teacher Professional Education Study Program, Faculty of Teacher Training and Education, Universitas Tadulako, Palu City, Central Sulawesi Province, Indonesia^{1,2,3} Email: <u>nurhalisappgmath@gmail.com¹</u> <u>sukayasa08@yahoo.co.id²</u> <u>sitiwarindo92@guru.smp.belajar.id³</u>

Abstract

The purpose of this study was to improve the mathematics learning outcomes of class VII F students at SMP Negeri 9 Palu through the application of the Problem Based Learning (PBL) learning model in the Mathematics subject of number material. This study is a classroom action research (Class Action Research) consisting of two cycles. Each cycle consists of action planning, action implementation, observation and reflection. The subjects of the study were class VII F students at SMP Negeri 9 Palu. Data sources came from teachers and students obtained through observation, interviews, tests, and document reviews. The data analysis technique used was descriptive analysis. The results of the study showed that: (1) The ability of teachers in implementing learning using the Problem Based Learning (PBL) method to improve student learning outcomes in mathematics learning at SMP Negeri 9 Palu in cycle I had an average of 78% (sufficient), while in cycle II it became 90% (very good), this shows an increase of 12%. (2) There was an increase in student learning outcomes in mathematics learning on the material of Whole Numbers using the Problem Based Learning (PBL) method in class VII-F of SMP Negeri 9 Palu, where the average student learning outcomes in cycle I were 69.70% with a completion percentage of 54.54%, while in the test results of cycle II the average score was 71.81% with a completion percentage of 75.75%. This shows an increase in student learning outcomes of 2.11%. Keywords: Problem Based Learning, Learning Outcomes, Mathematics

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INTRODUCTION

Mathematics is a science that discusses patterns or patterns of order and levels and is related to reasoning. There are two types of reasoning, namely inductive reasoning and deductive reasoning. Induction is a process of thinking to draw conclusions or make a new statement that is general in nature based on several specific statements that are known to be true. Deductive reasoning is a way of drawing conclusions from statements or facts that are considered true using logic. In addition, there are increasingly strong demands that mathematics learning in class should not always be deductive but should start inductively. The mathematics learning process should be directed at activities that encourage students to learn actively both mentally, physically and socially. In learning, the involvement of all senses, emotions, will, work and reason of students should be prioritized actively to find knowledge by themselves through interaction with the surrounding environment. In the process of learning mathematics in the classroom, it will be greatly determined by a teacher's views and beliefs about mathematics itself. The teacher acts as a facilitator and motivator in optimizing student learning (Herawaty et al., 2016:41). Therefore, the imperfect understanding of mathematics from a teacher will more or less cause imperfections in the learning process in the classroom. In addition, conscious efforts are needed that can condition interactive activities between learning components (students-teachers-learning resources), making it

easier for students to complete their assignments. Furthermore, it is hoped that each student is able to internalize in their information processing system (Herawaty et al., 2016:479).

Mathematics learning at the junior high school level has great challenges, especially in terms of increasing student engagement and encouraging them to think critically. Based on observations in class VII-F at SMP Negeri 9 Palu, many students have difficulty in understanding basic mathematical concepts, for example integers, which ultimately has an impact on low learning outcomes. In several meetings, teachers deliver material conventionally with monotonous lecture and practice methods, so that students are less active and tend to be passive during the learning process. According to Sulaiman (2018), "Teachers must be able to create a fun learning atmosphere that is in accordance with the level of cognitive development of students". A fun learning process without making students feel bored is a challenge for educators in designing the learning process. Learning that is meaningful to students and easy to understand is a factor that can improve learning outcomes. Based on these problems, a solution is needed in implementing classroom learning, namely learning that can foster students' interest and motivation to learn so that students are more active in participating in learning so that activities can be centered on students (student centered). The learning process in the classroom cannot be separated from an approach, method, and learning model, so that to realize the expected learning, a learning method or model is also needed that can design students' thinking processes so that they are accustomed to solving a problem in a question so that later it can have an impact on reducing the percentage of low student learning outcomes in schools. One learning model that can be used is the use of the Problem Based Learning (PBL) learning model. PBL is a learning model that places students as the center of learning by directing them to solve authentic and relevant problems. This is in line with Suginem's research (2021) in his research stating that PBL is a learning model that focuses on students or student centers and it is hoped that students can play an active role optimally, including students being able to explore, investigate, and solve problems and evaluate the process of overcoming problems, so that indirectly interest in learning will grow by itself. This is also in line with Eismawati et al. (2019) in his research stated that the application of the Problem Based Learning model is an appropriate alternative in involving all students to play an active role in learning and developing thinking skills, because all learning in it is linked to everyday problems.

According to Susanti, L., et al. (2022) Problem Based Learning (PBL) emphasizes students to be more active in learning activities. If each student begins to get used to being active in learning, this will have an impact on improving student learning outcomes. This model has the advantage of making students learn with inspiration, teaching group thinking, and using related information to try to solve both real and hypothetical problems, in addition students are trained to synthesize knowledge and skills before they apply them to problems, so that the material given is easy for students to remember (Defiyanti & Sumarni, 2019). Based on several opinions above, the PBL model is a learning model that uses real-world problems as a first step for students to learn to gain knowledge and concepts that are essential from each learning material that students have previously had, so that new knowledge is formed. In this way, students are expected to be able to develop critical and analytical thinking skills and improve conceptual understanding. Based on this background, this study aims to improve the learning outcomes of mathematics in integer material for class VII F students at SMP Negeri 9 Palu through the application of the PBL learning model. The following is a mapping of the syntax and steps that will be implemented in implementing mathematics learning using the Problem Based Learning model.

Table1. PBL Learning Model Syntax					
Syntax	Teacher Activities	Student Activities			
Student orientation	The teacher presents problems for	Students listen to the problems given			
to the problem	students to solve. The teacher motivates	by the teacher. Students actively			
	students so that students can be actively	answer the solutions to the problems.			
	involved in solving the problems.				
Organizing students	The teacher divides students into several	Students sit in groups as determined			
for learning	groups of 5-6 people. The teacher helps	by the teacher. Students define and			
	students define and organize learning tasks	organize their tasks related to the			
	related to the problem.	problem.			
Guiding individual	Teachers encourage students to gather	Students collect information and data			
and group	appropriate information, to obtain	needed to solve problems.			
investigations	explanations and problem solving.				
Developing and	Teachers assist students in planning and	Students compile reports in groups			
presenting work	preparing reports and assist students with	and present them in front of the class			
results	various tasks in their groups.	and discuss them in class.			
Analyzing and	The teacher guides students to convey	Students convey conclusions and ask			
Evaluating the	conclusions based on the results of	if there is something they don't			
Problem Solving	discussions, presentations and question	understand			
Process	and answer activities.				

RESEARCH METHODS

This research is a classroom action research (CAR) with a descriptive method. The term classroom action research (CAR) or Classroom action research is actually not very well known abroad, this term is known in Indonesia for an action research whose application in classroom teaching and learning activities is intended to improve the teaching and learning process, with the aim of improving or improving learning practices to be more effective (Husna Farhana, et al. 2019). This is in line with Suhirman (2021), Classroom action research is a form of research that is carried out or applied in teaching and learning activities in the classroom. The characteristics of PTK can be recognized from the existence of real actions carried out to solve problems that are more practical in nature. These actions are carried out in natural situations to solve problems that are generally experienced by educators. Classroom action research has 4 stages, namely (1) planning, in the initial stage the researcher analyzes the KD and learning objectives that are in accordance with the material, prepares the learning design stated in the teaching module, prepares research instruments, determines observations, and research time, (2) do (action), is the process of implementing the planning that has been made (3) observing (observation), where at this observation stage the implementation of learning activities in the classroom is observed, (4) see (reflection) is the stage where the review is carried out based on the results of implementation and observation (Afiani, KDA, & Putra, 2019). This research was conducted at SMP Negeri 9 Palu located at Jalan Zebra, Palu Selatan District, Palu City, Central Sulawesi. In every research, of course, there is while the object of research refers to the problem being investigated in the research. The subjects in this study were (a) Teachers as researchers who carried out the learning. (b) Students of class VII F totaling 33 people consisting of 20 male students and 13 female students. This study uses data analysis as follows:

Individual pass percentage

The percentage value is obtained using the formula in the press.

 $S_n = \frac{x_n}{\sum N} \times 100$ n = Activity n

 S_n = Percentage Value of Students Who Undertake Activity N

 x_n = Many Students Do Activities



= Total Number of Students ΣN

Average Value of Learning Outcomes

The average value of students can be obtained using the formula in the press.

 $\overline{x} = \frac{\Sigma x}{\Sigma N}$

 \overline{x} = Average Value Σx = Total Score of All Students ΣN = Total Number of Students

This classroom action research consists of 2 cycles that are adjusted to the syllabus of mathematics lessons for grade VII of SMP Negeri Palu. Each cycle is carried out according to the changes to be achieved. This study uses a test research instrument to determine the effectiveness of the Problem Based Learning (PBL) learning model in improving student learning outcomes. Data collection techniques are carried out by students working on test questions given before being given the action (pre-test), and after being given the action in cycles I and II (post-test). The action is carried out with the steps of the Problem Based Learning (PBL) learning model, namely, 1) Orienting students to the problem, 2) Organizing students to learn, 3) Assisting individual and group investigations, 4) Developing and presenting work results and 5) Analyzing and evaluating the problem-solving process.

RESULTS AND DISCUSSION

Problem Based Learning (PBL) is a learning model based on the many problems that require authentic investigations, namely investigations that require real solutions (Fitri et al., 2020). One of the learning models that is often applied by teachers is the Problem Based Learning learning model which allows students to think critically in solving problems (Umi Muslimah, 2021). In this learning model, the teacher guides students to describe the problemsolving plan into stages of activities such as the teacher giving examples of the use of skills and strategies needed so that these tasks can be completed, the teacher creates a flexible classroom atmosphere that is oriented towards student investigation efforts. According to (Putriani et al., 2017) that problem-based learning is an educational approach where the problem is the starting point of the learning process. Usually, problems are based on real-life problems that have been selected and edited to meet educational objectives and criteria (Arwanda et al., 2020). Several learning processes are involved in acquiring knowledge and skills, together with the abilities of each individual to then be applied to life applications that are applied through the Problem Based Learning learning model. The research activities that have been carried out have produced 2 types of data, namely the first data from observations in the form of teacher activity data during the learning process. The second data is data obtained from the results of student learning evaluations on critical thinking skills.

In cycle I and cycle II, the researcher conducted research using the Problem Based Learning (PBL) learning model on number material. There are several phases in the implementation of this research, namely the planning phase, implementation phase, observation and evaluation/reflection so that the results are obtained. Based on the results of observations in the planning phase, which states that the results of student activities in the learning process in the classroom have been quite good in critical thinking, where it can be seen that students have the ability to provide simple explanations but students are still unable to determine the basis for decision making and also in drawing conclusions. So in this study,



the teacher uses learning by implementing the Problem Based Learning (PBL) model. Combining the results of the study of the material with increasing cognitive development of students is very important with the application of the PBL model which will facilitate students in interpreting learning. So, the researcher plans learning by implementing the PBL learning model in order to create a pleasant learning atmosphere that is oriented towards students. In the action phase in the application of Problem Based Learning (PBL) it is carried out in accordance with the teaching module that has been designed. At this stage, the researcher observes the implementation of learning carried out by the teacher in the classroom. During this observation, the researcher was assisted by colleagues and mentor teachers as observers. The assessment criteria are presented in table 2.

Table 2.	Teacher Activity Criteria

Score	Criteria	
1	Less than once	
2	Not enough	
3	Enough	
4	Good	
5	Very well	

The following is a recapitulation of teachers' abilities in implementing learning in cycles I and II:

Table 5. Teacher 5 Ability to implement Learning in Cycle 1					
No	Observed Aspects	Meeting		Awamaga	
INU	observeu Aspects	Ι	II	Average	
1.	Providing orientation about the problem	4	4	4	
2.	Organizing students to research	4	4	4	
3.	Assisting with independent and group investigations	3	3	3	
4.	Develop and present results	4	4	4	
5.	Analyze and evaluate problems	4	5	4.5	
	Amount	19	20	19.5	
	Presentation	76%	80%		
	resentation	,0,0	0070		
	Final Percentage 78% (Enough) Table 4. Teachers' Ability to Implement Learn	ning in Cv	rcle II		
No	Final Percentage 78% (Enough) Table 4. Teachers' Ability to Implement Learn	ning in Cy Mee	rcle II ting	Avoraça	
No	Final Percentage 78% (Enough) Table 4. Teachers' Ability to Implement Learn Observed Aspects	ning in Cy Mee I	rcle II ting	Average	
No 1.	Final Percentage 78% (Enough) Table 4. Teachers' Ability to Implement Learn Observed Aspects Providing orientation about the problem	ning in Cy Mee I 5	rcle II ting II 5	Average 5	
No 1. 2.	Final Percentage 78% (Enough) Table 4. Teachers' Ability to Implement Learn Observed Aspects Providing orientation about the problem Organizing students to research	ning in Cy Mee I 5 4	rcle II ting II 5 5	Average 5 4.5	
No 1. 2. 3.	Final Percentage 78% (Enough) Table 4. Teachers' Ability to Implement Learn Observed Aspects Providing orientation about the problem Organizing students to research Assisting with independent and group investigations	ning in Cy Mee I 5 4 4	rcle II ting <u>II</u> 5 5 4	Average 5 4.5 4	
No 1. 2. 3. 4.	Final Percentage 78% (Enough) Table 4. Teachers' Ability to Implement Learn Observed Aspects Providing orientation about the problem Organizing students to research Assisting with independent and group investigations Develop and present results	ning in Cy Mee I 5 4 4 4 4	vcle II ting II 5 4 4	Average 5 4.5 4 4 4	
No 1. 2. 3. 4. 5.	Final Percentage 78% (Enough) Table 4. Teachers' Ability to Implement Learn Observed Aspects Providing orientation about the problem Organizing students to research Assisting with independent and group investigations Develop and present results Analyze and evaluate problems	ning in Cy Mee I 5 4 4 4 4 5	rcle II ting II 5 5 4 4 5	Average 5 4.5 4 4 5	
No 1. 2. 3. 4. 5.	Final Percentage 78% (Enough) Table 4. Teachers' Ability to Implement Learn Observed Aspects Providing orientation about the problem Organizing students to research Assisting with independent and group investigations Develop and present results Analyze and evaluate problems Amount	ning in Cy Mee I 5 4 4 4 4 5 22	rcle II ting II 5 5 4 4 5 23	Average 5 4.5 4 4 5 22.5	
No 1. 2. 3. 4. 5.	Final Percentage 78% (Enough) Table 4. Teachers' Ability to Implement Learn Observed Aspects Providing orientation about the problem Organizing students to research Assisting with independent and group investigations Develop and present results Analyze and evaluate problems Amount Presentation	ning in Cy Mee I 5 4 4 4 4 5 22 88%	rcle II ting II 5 5 4 4 4 5 23 92%	Average 5 4.5 4 4 5 22.5	

Based on the results of observations on the ability of teachers to carry out learning in cycles I and II, it is known that there was an increase, namely with the final percentage in cycle I, which was 78% (quite good) increasing to 90% (very good), where there was an increase of 12%. So overall there was an increase in the ability of teachers to carry out learning by implementing the Problem Based Learning (PBL) model in the teaching and learning process. In this phase, the researcher also observed the progress of students by



giving tests in the form of evaluation questions in the form of formative tests on previously studied material. Student scores were determined from the results of the formative tests of each cycle that had been carried out during the study. The scale value in the assessment is 100, with the minimum completion criteria (KKM) for mathematics subjects set by the school being 70. The following is a recapitulation of the learning outcomes of class VII F students in cycles I and II:

Table 5. Learning Outcomes of Class VII-F Students Cycle I				
No	Student Name	Gender	Mark	Information
1	ABD. Gani	Man	60	Not Completed
2	Aisha Nurul Damara	Woman	65	Not Completed
3	Aldi Arianto	Man	65	Not Completed
4	Aliesya Zahwa	Woman	70	Completed
5	Anggun Janu Antin	Woman	70	Completed
6	The Story of Aqilah Nariyah Pratiwi	Woman	80	Completed
7	Azrabill Satar Kawarismi	Man	70	Completed
8	Azzam Ardhani Arya Satyo	Man	85	Completed
9	Airin's Dream	Woman	65	Not Completed
10	Dedi Einstein D. GiLi	Man	70	Completed
11	Dila Alfariza	Woman	70	Completed
12	English: Fakhri Rizki	Man	60	Not Completed
13	Febran Fabiano	Man	65	Not Completed
14	Gleon Ivanden Tolulue	Man	75	Completed
15	The Greatest Showman	Woman	60	Not Completed
16	Lionel Brilliant Pongi	Man	75	Completed
17	Mifta Nurul Afika	Woman	80	Completed
18	Moh. Rizky Ramadhan	Man	65	Not Completed
19	Moh. Aksan	Man	60	Not Completed
20	Moh. Arfan Maulana	Man	70	Completed
21	Moh. Adnan	Man	70	Completed
22	Muh. Dimaz Pradita	Man	85	Completed
23	Muh. Jumaidil Fitraman Guci	Man	65	Not Completed
24	Muh. Akil Sautra	Man	65	Not Completed
25	Muhammad Fauzil	Man	75	Completed
26	Nasya Ananda Sheny	Woman	80	Completed
27	Nazril Aimar Al-Amri	Man	65	Not Completed
28	Holy Ramadhan	Woman	75	Completed
29	Syaqilla	Woman	80	Completed
30	Tasya Pegia	Woman	75	Completed
31	Vincent Valentino Biralemba	Man	60	Not Completed
32.	Virly Axilia Musa	Woman	60	Not Completed
33.	The Holy Spirit	Man	65	Not Completed
	Amount			2,300

Table 6. Learning Outcomes of Class VII-F Students Cycle II				
No	Student Name	Gender	Mark	Information
1	ABD. Gani	Man	60	Not Completed
2	Aisha Nurul Damara	Woman	70	Completed
3	Aldi Arianto	Man	70	Completed
4	Aliesya Zahwa	Woman	75	Completed
5	Anggun Janu Antin	Woman	70	Completed
6	The Story of Aqilah Nariyah Pratiwi	Woman	80	Completed
7	Azrabill Satar Kawarismi	Man	75	Completed
8	Azzam Ardhani Arya Satyo	Man	85	Completed
9	Airin's Dream	Woman	65	Not Completed

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10	Dedi Einstein D. GiLi	Man	65	Not Completed
11	Dila Alfariza	Woman	70	Completed
12	English: Fakhri Rizki	Man	65	Not Completed
13	Febran Fabiano	Man	70	Completed
14	Gleon Ivanden Tolulue	Man	75	Completed
15	The Greatest Showman	Woman	70	Completed
16	Lionel Brilliant Pongi	Man	75	Completed
17	Mifta Nurul Afika	Woman	85	Completed
18	Moh. Rizky Ramadhan	Man	60	Not Completed
19	Moh. Aksan	Man	65	Not Completed
20	Moh. Arfan Maulana	Man	70	Completed
21	Moh. Adnan	Man	70	Completed
22	Muh. Dimaz Pradita	Man	85	Completed
23	Muh. Jumaidil Fitraman Guci	Man	65	Not Completed
24	Muh. Akil Sautra	Man	70	Completed
25	Muhammad Fauzil	Man	75	Completed
26	Nasya Ananda Sheny	Woman	80	Completed
27	Nazril Aimar Al-Amri	Man	75	Completed
28	Holy Ramadhan	Woman	75	Completed
29	Syaqilla	Woman	80	Completed
30	Tasya Pegia	Woman	75	Completed
31	Vincent Valentino Biralemba	Man	60	Not Completed
32.	Virly Axilia Musa	Woman	70	Completed
33.	The Holy Spirit	Man	70	Completed
	Amount		2,370	

Table 7. Recapitulation of Student Learning Outcomes Class VII-F Cycle I and II

Indicator	Cycle I Test Results	Cycle II Test Results
Average value	69.70	71.81
The highest score	85	85
Lowest Value	60	60
Completion Percentage	54.54	75.75

Based on the data obtained from the learning outcomes of cycle I, there was an increase in cycle II, namely where the test results in cycle I had an average score of 69.70% with a completion percentage of 54.54% while in the test results of cycle II the average score was 71.81% with a completion percentage of 75.75%. Based on these results, it is known that the implementation of the Problem Based Learning (PBL) learning model on the Numbers material at SMP Negeri 9 Palu has resulted in an increase in student learning outcomes from cycle I to cycle II, although in cycle II there were still some students who did not complete their scores. The PBL model provides students with a more interesting and interactive learning experience, this is proven by the application of the PBL model to class VII F students at SMP Negeri 9 Palu, which can experience an increase in terms of understanding and learning outcomes of students. In addition, the application of the PBL model is also very helpful for teachers in carrying out the learning process in the classroom. Therefore, the conclusion that can be drawn is that the application of the Problem Based Learning (PBL) learning model to the Numbers material in class VII F of SMP Negeri 9 Palu can improve student learning outcomes from cycle I to cycle II.

The research that supports these results is a study conducted by I Ketut Narsa (2021) the results of the study obtained in this study in cycle I the average value showed 77, while in cycle II the average value of student learning outcomes showed 82. The conclusion of the study is that the problem based learning model in Mathematics subjects can effectively improve student learning outcomes. The implications of this study are to teach students to



work together in groups, use information to try to solve problems and students are trained to synthesize knowledge and skills before they apply them to problems. This increase shows that the application of PBL is able to motivate students to be more active and improve their understanding of mathematics material.

CONCLUSION

From the results of this study, it can be concluded that the application of the Problem Based Learning learning model is effective in improving the mathematics learning outcomes of class VII F students of SMP Negeri 9 Palu. The percentage of learning outcome completion increased significantly from Cycle I to Cycle II, indicating that PBL encourages students to think critically, collaborate, and understand mathematical concepts better. This can be seen from: (1) The ability of teachers in implementing learning using the Problem Based Learning (PBL) method to improve student learning outcomes in mathematics learning in cycle I has an average of 70% (quite good), while in cycle II it becomes 87.5% (very good), this shows an increase of 10.5%. (2) There was an increase in student learning outcomes in mathematics learning on number material using the Problem Based Learning (PBL) method in class VII F SMP Negeri 9 Palu, where student learning outcomes in cycle I had an average of 73.14 with a completion percentage of 42.86%, in cycle II it became 79.77 with a completion percentage of 88.57%. This shows an increase in student learning outcomes of 6.63. Based on the research results and conclusions in this study, the following things can be suggested: (1) The use of the Problem Based Learning (PBL) method can be used as a solution by teachers to vary conventional learning models into innovative and constructive learning models so that they can stimulate students to learn which has an effect on student learning outcomes. (2) This research needs to be followed up by using innovative learning media because in addition to teachers being able to improve their performance, students will also be motivated by learning methods that require them to be innovative.

Suggestion

- 1. Teacher. It is recommended that mathematics teachers consider implementing the PBL model as an alternative learning method that can improve students' understanding and thinking skills.
- 2. School. Schools are expected to provide adequate facilities and support so that PBL can be implemented optimally.
- 3. Further Research. Further research is needed to examine the effectiveness of PBL on other topics or levels of education and to see its long-term impact on student skills.

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