

Improving Mathematics Problem-Solving Skills of Grade IV Elementary School through Problem-Based Learning

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1. Abstract

Elementary mathematics subject matter is generally related to everyday life problems. So it is very appropriate to target the achievement of student competence in mastering problem solving. It is the teacher's responsibility to achieve these competencies, namely by accustoming students to learning that leads to problem solving activities. The study aims to determine how the application of the problem-based learning model affects the mathematical problem solving ability of fourth grade elementary school students. The type of research used in this study is collaborative classroom action research. The subjects in this study were fourth grade elementary school students with a total of 26 students. The instruments used in this research are observation, interview, and final test. The test used was in the form of essay. This research uses qualitative descriptive data analysis techniques. Based on the results of the study, the score of mathematical problem solving ability increased in each cycle, with an average score of 58.57 in the pre-cycle, increased to 68.89 in cycle I, and increased significantly in cycle II to 78.89. The criteria for problem solving ability met the excellent criteria for the indicators of Understanding the problem, planning the solution, and explaining/checking the correctness of the answers obtained. In addition, the indicator of implementing the plan met the good indicator. The number of passing students increased from cycle I which was only 19 people, increasing to 26 people at the end of cycle II. Based on the overall data analysis, the PBL model can make students' mathematics problem solving skills better.

Keywords: problem solving, problem-based learning, mathematics.

2. Introduction

Problem solving skills are important for students to master in facing the 21st century global era. This is because society needs intellectuals who are able to solve problems systematically and are able to interpret into oral and written language that is easy to understand. According to Prihadi (2018: 465), the 21st century skills that students must have are commonly known as the 4Cs, namely creativity, critical thinking, communication, and collaboration. Primary school as the initial place of formal education is expected to foster the development of students' problem solving skills in facing the global era Marjohan (Widhiyani, et al., 2019).

Problem-based learning (PBL) as one of the learning models has the characteristic that it always starts and centres on the problem. In PBL, students work in small groups and must identify what they know and what they don't know and must learn to solve a problem. The main role of the teacher is to facilitate the group process and learning or as a facilitator, not to provide answers directly.

Several studies on PBL in mathematics learning obtained positive results (Nahdi, 2018; Kristanto, 2023). However, research that also looks at problem solving skills through PBL in Grade IV Primary School Mathematics has not been conducted.

Based on the results of observations of mathematics learning carried out in class IV elementary schools, the mathematics learning carried out has not led students to hone their problem-solving skills, the learning methods applied are assignments, lectures, and practice problems, students are more dominant in recording the material presented by the teacher than trying practice problems, so that students' ability to analyse, plan solution methods, carry out solutions and conclude problem results has not been carried out optimally. According to

Roebyanto and Sri (2018), before solving problems, learners must know what the problem is and how the right strategy is to solve the problem, learners need to assess what they know and what they will look for. In addition, the learning model implemented has not involved students to the fullest, so that most students are less active in participating in the ongoing learning. Problems in learning mathematics in grade IV elementary schools are reinforced by pre-cycle learning pre-test data, mathematical problem solving skills conducted by researchers on 10 May 2023 showed that 20 students out of 26 children had not reached the KKM which is 70. The highest score obtained was 80 while the lowest score was 20. Based on these problems, it is necessary to apply models and media in learning that are innovative and according to the characteristics of students. Researchers apply the Problem Based Learning (PBL) model, as an appropriate alternative to improve problem solving skills.

The purpose of the study was to improve the ability to solve mathematical problems through Problem Based Learning (PBL) in learning Mathematics grade IV Elementary School.

3. Methods

This research is a collaborative classroom action research (PTK-K). PTK-Collaborative is a renewal of a reflective research that is carried out cyclically (repeatedly) by teachers / teacher candidates in the classroom. PTK-Collaborative is also carried out by teachers involved in the work team to reflect on the pedagogical practices carried out (Rasyimah & Sari, 2022). In this study, collaboration between researchers, Field Lecturers (DPL) and Pamong Teachers, as well as classroom teachers. This collaborative PTK was conducted from April to June 2023. The independent variable of this research is the Problem Based Learning learning model, while the dependent variable is mathematics problem solving skills. This research involved fourth grade

elementary school students in the 2022/2023 school year as the research population. The total population was 26 students with details of 12 boys and 14 girls. Therefore, the saturated sample technique was used in this study.

This research uses a device design composed of four components, namely planning, action, observation, and reflection. The four components are put together in a cycle. Therefore, the cycle here is defined as a round of activities consisting of planning, action, observation and reflection and is carried out repeatedly until the research objectives are achieved. The material contained in this study is Mathematics in the chapter on measurement of flat shapes.

In this study, researchers used a descriptive approach with data collection techniques with test and non-test techniques. The test technique according to Arikunto (Widodo, 2018) is a way to measure skills, knowledge, and ability or talent. The non-test techniques used are observation and interviews.

Initial data collection through observation and pre-test as initial data as a reference for research action. Then enter the action cycle with data collection techniques with observation during learning, evaluation at the end of learning, and interviews after learning. Furthermore, the data was analysed qualitatively and quantitatively. The research is said to be successful if the research conducted reaches the predetermined success indicators. The success indicator of the action category percentage is at least 70% (Nugraheni, 2020). Therefore, this study targets 75% in the success indicator to measure students' problem-solving skills.

4. Results and Discussion

This research was only conducted in two cycles with four meetings. The steps of the Problem Based Learning (PBL) learning model that have been implemented in each cycle

are: 1) problem orientation; 2) organising learning; 3) guiding students; 4) presenting work or discussion results; 5) analysis and evaluation of the problem solving process. The steps used by researchers refer to the steps of the PBL approach quoted from the opinion of Hotimah (2020) which essentially argues that the Problem Based Learning (PBL) learning model has five stages, namely: 1) orienting students to the problem; 2) organising students to learn; 3) guiding individual and group investigations; 4) developing and presenting work; 5) analysing and evaluating the results of problem solving.

The observation results of the application of the Problem Based Learning (PBL) learning model have increased in each cycle to achieve the targeted research performance of 75%.

Table 1. Inter-cycle Comparison of the Application of the Problem Based Learning (PBL) learning model to Teachers and Students

No.	PBL Syntax	Cycle I		Cycle II		Average	
		G (%)	S (%)	G (%)	S (%)	G (%)	S (%)
1	Problem orientation	87,5	75	100	87,5	93,75	81,25
2	Preparing students to learn	100	87,5	100	100	100	93,75
3	Individual and group enquiry	75	75	81,3	81,3	78,15	78,15
4	Presentation and exchange of discussion results	93,8	87,5	100	87,5	96,9	87,5
5	Analyse and evaluate the problem-solving process	93,8	93,8	90,7	93,8	92,25	93,8
Average		93,8	83,8	94,4	90,5	94,1	87,15

Based on table 1, it can be seen that the percentage of the application of the Problem Based Learning (PBL) learning model for teachers and students has increased.

Table 2. Inter-cycle comparison of student learning outcomes in mathematics about the perimeter and area of flat buildings in solving mathematical problems

Description	Cycle I	Cycle II
	Pert. 2	Pert. 2
Highest Score	100	100
Lowest Score	30	70
Average	68,69	78,89
Completed (%)	71,43	100
Not Completed (%)	28,57	0

Based on table 2, it can be seen that the problem-solving skills measured through student evaluation activities increased from cycle I to cycle II. Based on the explanation above, it can be concluded that the application of Problem Based Learning (PBL) can improve the skills of solving mathematical problems of flat building measurement as seen from the percentage of students who meet the target achievement from cycle I - II. This learning improvement occurs because the application of Problem Based Learning (PBL) provides problem solving stages that build constructively on student skills (Yulianti & Gunawan, 2019). This research is in line with research conducted by Sukmawarti (2022) based on the results of research that has been conducted, it is known that using the Problem Based Learning (PBL) learning model can improve the mathematical problem solving skills of elementary school students. Other relevant research is research conducted by Putri, Suryani, and Jufri (2019) which found that the application of the Problem Based

Learning (PBL) learning model has an effect on students' mathematical problem solving skills.

5. Conclusion

Students' problem solving skills can be improved through the application of the Problem Based Learning (PBL) learning model in mathematics learning. This is evidenced by the results of the study which have exceeded the success indicator of 75%. The principles of the Problem Based Learning (PBL) learning model can be integrated in activities and learning tools to help develop students' mathematical problem solving skills. These results are in accordance with the research findings of Widodo (2018); Nahdi. (2018); Kristanto (2023); Sukmawati et al. (2022); which shows that the application of Problem Based Learning (PBL) has a significant effect on students' mathematical problem solving. Teachers can also apply Problem Based Learning (PBL) to improve concept understanding (Putri, R. S., Suryani, M., & Jufri, L. H. 2019; Effendi, R., Herpratiwi, H., & Sutiarso, S. 2021) and can be further investigated through other studies.

6. Confession

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