
The Influence of the Problem-Based Learning Model on the Numeracy Skills of Students SDN 2 Bugel

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Abstract

The core of mathematical proficiency lies in students' ability to analyze, reason, formulate, solve, and interpret mathematical problems in various forms and contexts. Teaching mathematics in elementary school is not easy, with educators facing numerous obstacles and challenges. This is especially true for instruction that supports numeracy skills and has contextual benefits for solving real-life problems. The goal of this study was to evaluate the impact of a problem-based learning model on the mathematical and numerical skills of sixth-grade students at SDN 2 Bugel Jepara. The study employed a quasi-experimental method and a quantitative survey method, using a pre-test and post-test group design. The analysis in this study included descriptive statistics and inferential statistical analysis. Descriptive statistics were used for the initial data analysis, revealing that before the implementation of the problem-based learning model at SDN 2 Bugel Jepara, 24% of students performed in the low category, and 76% performed in the moderate or achieved category. However, after implementing the problem-based learning model, there was a significant improvement in student performance. The proportion of students in the moderate category increased by 20%, while the proportion in the high category increased by 80%. The results of the inferential statistical analysis using a paired sample T-test showed that the significance value was greater than 0.05. This indicates that the application of the problem-based learning model had a positive impact on students' mathematical and numerical abilities after statistical testing. Therefore, it can be concluded that the influence of the problem-based learning model in SDN 2 Bugel Jepara Class VI has a positive impact on students' mathematical and numerical skills.

Keywords: *Problem-Based Learning, Numeracy Skills, Mathematical and numerical skills*

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INTRODUCTION

Education is a dynamic expression of human culture and a necessity for its development. Enhancing the quality of human resources and striving to realize the ideals of the Indonesian nation to achieve prosperity and comprehensive education in the lives of its citizens are part of education's strategic role.

In today's advanced era, the development of science and technology has a major impact on the world of education. The increasing expertise, skills, and discipline of society are inseparable from the vital role of education. Furthermore, educators always strive to improve and enhance the quality of education services. The main goal of Indonesian education is to shape perfect human beings, both physically and spiritually. The educational process is directed towards developing humans in various dimensions, including emotional, cognitive, and psychomotor dimensions.

In the world of education, one important subject is mathematics. It is important that students are able to understand, reason, and solve problems using mathematical concepts. Students are also expected to use symbols, tables, charts, or other information to communicate mathematical ideas through relevant situations, problems, and attitudes, which is the goal of learning mathematics based on the Regulation of the Minister of National Education No. 22 of 2006.

Computation in the PISA (International Student Assessment Program) program not only constructs, solves, and interprets mathematical problems but also analyzes, reasons, and communicates ideas effectively. It focuses on student excellence for various forms and situations (Qosim et al., 2015).

The ability to perform calculations is essential in everyday life. It involves applying numerical concepts and mathematical operations in various daily situations, including at home, at work, and in social interactions. As (Susanto et al., 2017) note, it enables individuals to meet essential life needs by applying mathematical skills practically. Demonstrating computational skills, including interpreting diagrams, graphs, and tables, requires recognizing and understanding information.

Numeracy is defined as the ability to analyze and understand assumptions related to manipulating symbols and everyday language, as well as conveying these assumptions through writing; it encompasses computational understanding (Ekowati et al., 2019). Numeracy is more than just basic calculation; it involves critical and logical thinking about problems involving numbers. This includes understanding mathematical concepts such as ratios, fractions, percentages, and statistics; understanding data presented in various forms, such as graphs, tables, and diagrams; and using mathematics in decision-making processes, such as comparing prices, calculating budgets, or understanding risks.

The implementation of teaching and learning activities in formal education has not fully promoted students' numeracy skills, which contributes to the low numeracy proficiency among students (Kusuma et al., n.d.). One explanation is that the problem-based learning model places authentic problems at the core of learning, enabling students to solve related problems and develop high levels of numeracy and critical thinking

(Juniarso, 2019). However, teaching mathematics in schools is not easy, especially when emphasizing calculations and aiming for contextual benefits in solving everyday problems.

Research findings indicate low average mathematics learning outcomes in seventh grade, as well as a lack of interest, motivation, and problem-solving skills among students, highlighting challenges in teaching mathematics at SDN 2 Bugel Jepara. This is also reflected in the school's numeracy proficiency score in 2024, which was at a weak level (37.93%). Therefore, using the PBL model in numeracy learning is expected to bring positive changes in students' learning interest, motivation, and problem-solving abilities at SDN 2 Bugel Jepara. This model can also provide a more challenging and useful learning experience for students, potentially boosting their mathematics learning outcomes.

From the explanations above, a research topic focusing on "The Influence of the Problem-Based Learning (PBL) Model on the Numeracy Skills of Students at SDN 2 Bugel Jepara" is highly relevant and compelling. Having good math skills helps with managing finances, avoiding transaction errors, and optimizing resource use¹. Math enhances logical thinking, problem-solving, and the ability to recognize patterns and structures. It's applicable in various fields like technology, economics, science, and design.

METHOD

This research employs a quantitative approach. Quantitative research is defined as research providing results obtained through statistical measurement. This study is designed as a quasi-experimental study. A quasi-experiment is a type of research that aims to establish a cause-and-effect relationship between an independent and dependent variable. Unlike true experiments, quasi-experiments do not randomly assign participants to control and experimental groups. Instead, intact groups are used. This is often necessary when random assignment is not feasible or ethical. The specific design used is a 'one-group pre-test-post-test design,' a method commonly used to test the effectiveness of an intervention or treatment in research. In this design, the group of research subjects undergoes measurement before and after the treatment is administered. The subjects of this research are all 128 students across all classes at SDN 2 Bugel Jepara. A total of 25 sixth-grade students were selected for this study. The instrument used in this study is a mathematical numeracy ability test. To analyze the data in this study, two types of statistics are used: descriptive statistics and inferential statistics. A prerequisite for this research is to test the hypotheses using SPSS.

RESULTS AND DISCUSSION

A student's numerical ability is determined from student calculation data before the test is given and data obtained from student calculation results after the test. Before conducting the one-group pretest and posttest design test, the initial step is to carry out a prerequisite test which includes a normality test of the pretest and posttest results. The research was conducted at SDN 2 Bugel Jepara and revealed the results of the math

calculation test given to students before and after learning in the PBL model in class VI to be analyzed using SPSS version 27. The results are presented from Table 1

Table 1. Descriptive Statistics for Pre- and Post-Test Results

Class VII Learning Outcome Values		
Statistics	Pretest Results	Post-Test Results
Number of Samples	25	25
Lowest Value	30	55
The highest score	50	80
Average	43,80	72,2
Standard Deviation	8,2006	9,251

Before applying the learning model, class VI students of SDN 2 Bugel Jepara underwent an initial test (pre-test), with the lowest score being 30, the highest score being 50, and the average score obtained being 43.80, indicating that it was a standard score. That 43.80. The standard deviation determined was 8.2006. After treatment using a problem-based learning model, a final test (post-test) was carried out with the lowest score being 55 and the highest score being 80, obtaining an average score of 72.20 with a standard deviation of 9.2511. The numerical ability of class VI students experienced an increase, as seen from the results of the average scores of the first test (pretest) and the final test (posttest). So the average score before the test was 43.80, but the average score after the test was 72.20.

Table 2. Results before and after testing.

Range Mark	Criteria	Pretest (Frequency)	Percentage (%)	Post-Test (Frequency)	Percentage (%)
0-20	Sangat Rendah	0	0	0	0
21-40	Rendah	6	24	0	0
41-60	Sedang	19	76	5	20
61-80	Tinggi	0	0	20	80
81-100	Sangat Tinggi	0	0	0	0
Jumlah		25	100%	25	100%

From both tables, it can be seen that the proficiency level of class VI students is:

- A. In the first test (pre-test) evaluation results, the number of students with a very low standard is 0%, but there are 6 students with a low standard, or 24% of students with a low standard. That is no more than the total number. Students who can use formulas. And 19 of the students scored 76 according to the average standard. This shows that the majority of students can apply formulas and follow simple processes. For high and very high standards, 0%

means not so. Students who can meet all mathematical and numerical criteria.

- B. The results of the final test (post-test) are 0% for very low and low criteria and 20% for moderate criteria. This means he has 5 students who can use the formula, and 20 on the high standard. 80% of students This means that almost all students can use mathematics in relation to the problem. However, the very high standard of 0% means that no students meet all indicators of mathematical ability.

At this stage, to see whether there is a relevant difference between the application of the PBL learning model to the arithmetic and calculation skills of class VI SDN 2 Bugel Jepara , an inferential statistical test analysis is used. This data analysis was carried out by monitoring previously obtained results data after testing.

- a) This normality test uses SPSS version 27. This normality test aims to see whether the mathematics learning outcomes in class VI SDN 2 Bugel Jepara are normally distributed. From the results of the SPSS 27 normality test above, the result is a significant value of $0.906 > 0.05$, so it is concluded that the data is normally distributed.
- b) The researcher tested the hypothesis using SPSS to test the hypothesis with the aim of finding a relevant influence on students' mathematics achievement scores before and after the introduction of the PBL learning model. Therefore, the statistical hypothesis is formulated as:

If there is no significant difference in the mathematical ability of class VI SDN 2 Bugel Jepara before and after the introduction of PBL, it is a null hypothesis (H_0) because $t\text{-count} < 0.05$. Because the alternative hypothesis (H_1) = if $t\text{-count} > t\text{-table}$ and the significance value ($\text{sig} < \alpha(0.05)$), before and after the application of the PBL model in Class VI SDN 2 Bugel Jepara , there is a wide variation in students' mathematical and numerical abilities. This test procedure was carried out using the related-samples T-test at a significance level ($\text{sig} = \alpha (0.05)$). From the results of SPSS 27 used, the significance value = 0.9063 was obtained. to conclude that H_0 is rejected and H_1 is accepted, the relevant value is $\alpha (0.906 > 0.05)$. Therefore, there is a significant difference in the mathematical abilities of SDN 2 Bugel Jepara students before and after applying the problem-based learning (PBL) model.

CONCLUSION

Based on the research conducted at SDN 2 Bugel Jepara, which yielded an average pre-test score of 43.80 and a post-test score of 72.20, it can be concluded that the application of the Problem Based Learning model has an impact on the numeracy skills of elementary school students at SDN 2 Bugel Jepara. Studies suggest that the Problem-Based Learning (PBL) model can significantly improve mathematical problem-solving abilities and numeracy skills. PBL is a learning approach that uses real-world problems to stimulate students' critical thinking and problem-solving skills. The implementation of PBL can enhance student motivation and learning outcomes

SUGGESTION

The problem-based learning model should be used in learning activities, because the problem-based learning model is a solution to increase students' numeracy skills. It is suggested that for future researchers who intend to conduct research in actualizing problem-based learning models in the classroom, they should observe several things, namely:

1. Design the preparation as well as possible in accordance with the syntax of problem-based learning.
2. Must know what learning difficulties are felt by students.
3. For further researchers, it is hoped that they will be able to carry out research that is more than what the researcher is currently doing in order to further encourage the learning spirit of our students and can help solve the problems or obstacles experienced by our students.

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