

Improving Numeracy Literacy through Problem-Based Learning for 3rd Grade Students

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1. Abstract

This research is motivated by the findings which show that the numeracy literacy skills of grade 3 elementary school students are classified as low. The purpose of this study is to improve numeracy literacy skills using a problem-based learning model. This research is a Classroom Action Research using the Kemmis & McTaggart model. The subjects of this research were the 3rd grade elementary school students. In the first cycle, the learning completeness of students reached 39.13% then in the second cycle the learning completeness increased to 86.95%. These results indicate that the application of the Problem-Based Learning learning model can be categorized as effective.

Keywords: Numerical Literacy, Problem-Based Learning

2. Introduction

Numerical literacy is one of the life skills that students need to master in the 21st century. Numerical literacy is considered very important because it is closely related to the ability to solve problems, especially in the realm of contextual mathematics (Megawati & Sutarto, 2021).

This ability is in line with the demands of the 21st century where students must have the ability to think at a high level, think critically, collaborate, and communicate (Janah et al., 2019). Therefore, education plays an important role in preparing students to be able to face these challenges.

Numerical literacy skills need to receive special attention in order to improve the quality of education in Indonesia considering that Indonesian students have weaknesses in the field of literacy. The results of the Program for International Student Assessment (PISA) test designed by the Organization for Economic Co-operation and Development (OECD) in 2018 show that as many as 71% of students in Indonesia have difficulty dealing with problems that require problem-solving skills in mathematics (Wuryanto & Abduh, 2022). These findings indicate that the numeracy literacy skills of students in Indonesia are still relatively low and numeracy literacy should have been developed from an early age, especially when students are in elementary school.

Numerical literacy can be categorized as one of the basic skills that need to be developed and is the main focus in the implementation of basic education. In addition, this ability will be the main foundation for students to learn other skills at a higher level or level (Rakhmawati & Mustadi, 2022). Students who are able to master numeracy literacy will find it easier to acquire and empower knowledge. In other words, if students still have difficulty or cannot master basic skills, it is feared that students will experience difficulties in adapting to the rapid development of science.

Numerical literacy skills can be seen from the ability of students to: (1) apply mathematical concepts to solve practical problems in various life contexts; (2) analyze and interpret information presented in various forms (graphics, tables, charts, etc.), and; (3) predict and

make decisions from the results of the analysis (Susanto et al., 2021). The results of observations made in class III in one of the elementary schools in the city of Jogja show that students have relatively low numeracy literacy skills. This finding is proven by the test results of students when working on questions related to numeracy literacy which is 43.47%. The highest score on this test is 60 and the lowest score obtained is 20. Most students still have difficulty making statements or solving problems related to the field of mathematics. Basically, third-grade students have the ability to understand the material delivered by the teacher well. However, students experience difficulties when the questions given are in the form of problem-based story questions in everyday life.

To respond to these problems, the teacher needs to improve the learning concept in order to be able to improve students' numeracy literacy which is characterized by an increased ability to understand and solve problems. Teachers need to adapt mathematical concepts to actual conditions in everyday life. This meaning is intended so that students have a concrete picture and encourage learning motivation to be more positive (Sari, 2015). One way to facilitate students in improving numeracy literacy is to apply a problem-based learning model.

The problem-based learning model tends to emphasize the concept of problem solving which involves science as its basis. At the implementation stage, students will be faced with various contextual problems so that they can construct their knowledge. Students need to go through the process of solving problems in various contexts so that they are able to apply knowledge effectively. In addition, students can also connect between experience and knowledge of students so that they can obtain optimal results in increasing numeracy literacy skills.

3. Methods

This study uses a class action research method (classroom action research). The implementation of classroom action research was carried out in collaboration with a class III elementary school teacher at one of the elementary schools in Yogyakarta. The subjects of this study were 23 class III students. Researchers will observe the learning process taking place using the Problem-Based Learning model. To measure numeracy literacy skills, researchers use the following indicators.

Table 1. Numerical Literacy Ability Indicators

No	Numerical Literacy Ability Indicator
1	Apply mathematical concepts to solve practical problems in various life contexts
2	Analyze and interpret information presented in various forms (graphs, tables, charts, etc.)
3	Predict and make decisions from the results of the analysis

The classroom action research was carried out by adapting the Kemmis & Mc Taggart model which consisted of 4 stages, namely: (1) planning stage, (2) action, (3) observation, and (4) reflection (Sumarni et al., 2016). Implementation of classroom action research will be carried out in two cycles. The criteria used to determine the learning success of students in increasing numeracy literacy are if they obtain a 75% completeness criterion with a completeness criterion (KKM) of 70.

The process of collecting data is done through observation and tests. The test given is in the form of a subjective test to determine the numeracy literacy ability of each student. Data analysis techniques used are qualitative and quantitative. The limitation of this research is that the disciplines used to measure numeracy literacy skills are mathematics subjects on angle material.

4. Results and Discussion

The research results obtained from pre-cycle to cycle II obtained the results of students' numeracy literacy skills and the percentage of completeness as shown in table 1.

Table 1. Student Completeness Results

Information	Pre Cycle	Cycle I	Cycle II
The highest score	60	80	100
Lowest value	20	40	60
Average	43,47	61,73	80,86
Number of students who complete	-	9 people	20 people
Mastery learning	0%	39.13%	86.95%

Table 1 shows that there is an increase in students' numeracy literacy skills when applying the Problem-Based Learning model. In cycle I, students' numeracy literacy skills increased when compared to the results obtained in the pre-cycle. There was an increase in the ability of students from pre-cycle to cycle I because students slowly began to understand how to apply concepts, analyze information, and solve problems. However, the

number of those who obtained completeness in cycle I was not in accordance with the indicator of achieving success of 75%. Based on these results, the action needs to be continued to cycle II.

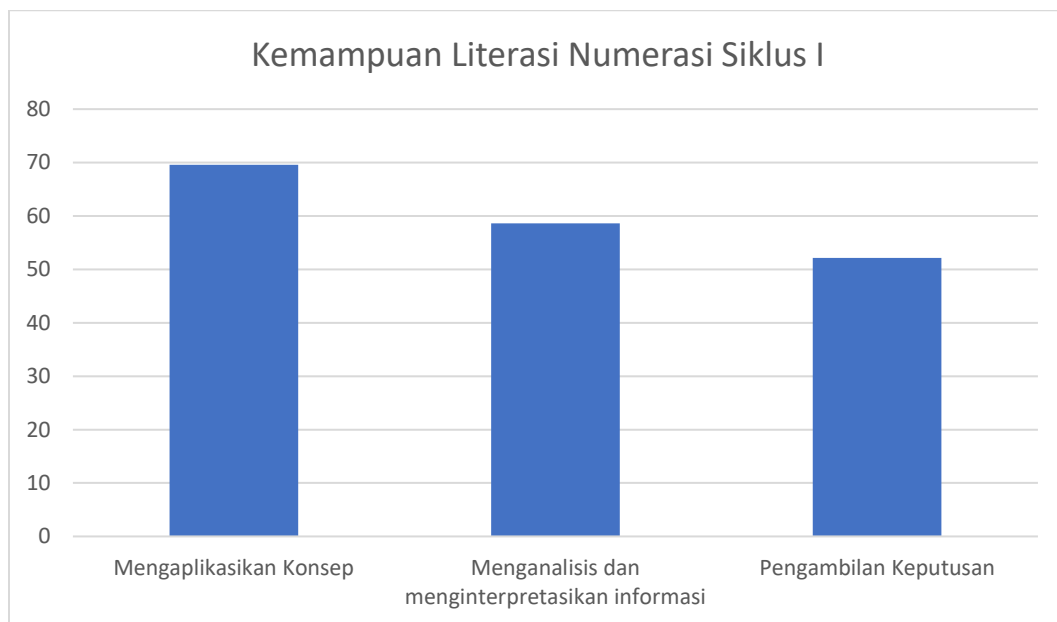


Figure 1. Average Numerical Literacy Ability Cycle I

From figure 1 it shows that the learning achievement obtained by students in cycle I based on numeracy literacy indicators cannot be categorized as good. The ability to apply mathematical concepts is the ability that is most mastered by students with a score of 69.56%. For the ability to analyze and interpret information, it obtains a score of 58.69% and the decision-making aspect obtains the lowest score of 52.17%

Students' numeracy literacy skills are still relatively low due to a lack of habituation to solving problems in learning, especially using numeracy concepts. What's more, the ability of students to analyze information still often makes mistakes. This condition is caused by the low interest in reading so students easily give up when understanding the questions. This condition is in line with the results of research conducted by Megawati & Sutarto (2021) that one of the factors that influence students' numeracy literacy skills is the ability to analyze and apply basic mathematical concepts. Another error that often occurs is incomplete student reasoning in relating information to mathematical concepts (Utari et al., 2019).

The advantages and disadvantages obtained in cycle I will be used as material for reflection as well as the basis for follow-up plans in cycle II. The follow-up design carried out in cycle II was in the form of (1) providing reinforcement of reasoning abilities in solving problems such as providing exercises in the form of case studies; (2) providing periodic directions to students on how to effectively understand the problem as a whole, and; (3) increase students' interest in reading.

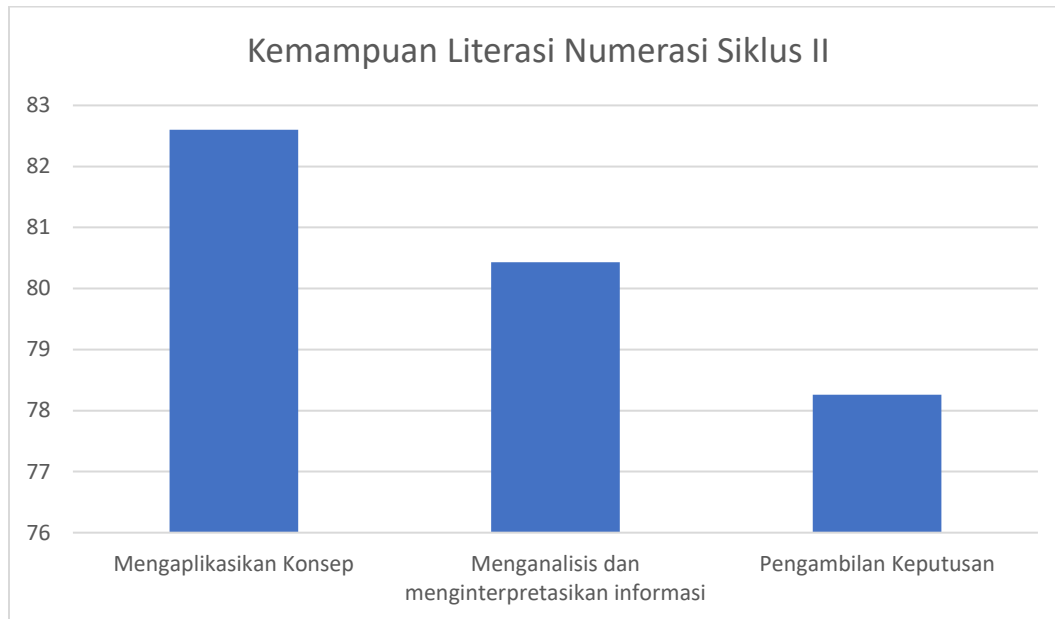


Figure 2. Average Numerical Literacy Ability Cycle II

The learning achievement of students in cycle II experienced a relatively good increase. The ability of students in the aspects of applying concepts, analyzing and interpreting information, and making decisions obtains an average score of ≥ 70 , namely 80,86%. This increase in learning achievement was influenced by the increased interest in reading students. Increased interest in reading has a positive impact on the ability to understand information. The ability to understand information in the form of recognizing this problem is the main key for students to reason so that they are able to interpret a problem (Rakhmawati & Mustadi, 2022). Research conducted by Nurjana et al. (2022) also shows that the ability of students to predict and draw conclusions is influenced by the

ability to analyze information. In other words, the higher the ability of students to understand information, the easier it is to face problems related to numeracy literacy.

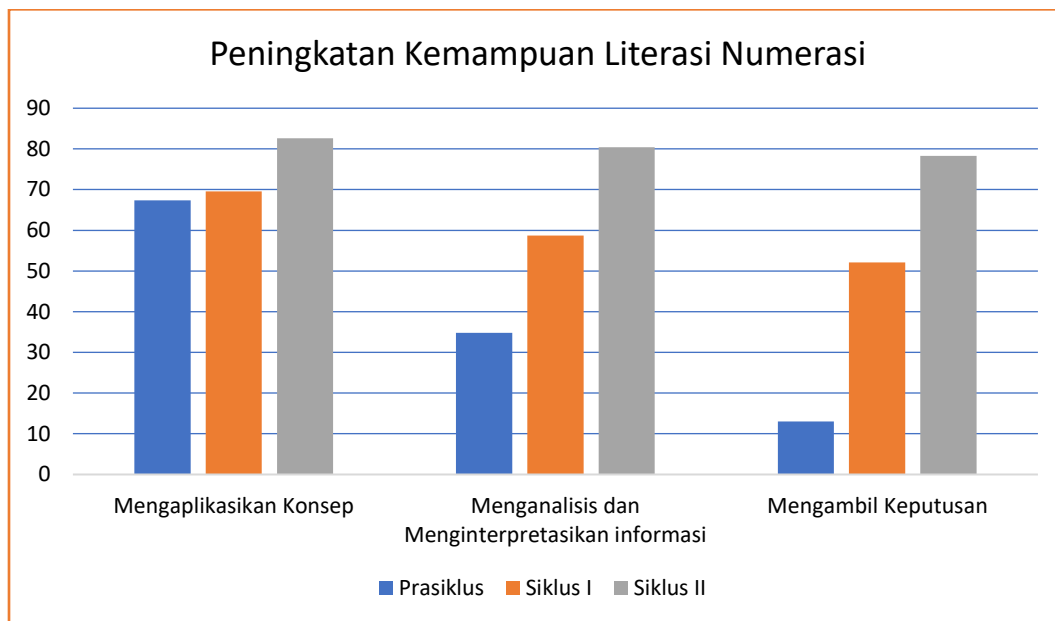


Figure 3. Improving Pre-cycle Numeracy Literacy Ability, Cycle I, and Cycle II

The application of the Problem-Based Learning model has a major influence on increasing students' numeracy literacy skills. Figure 3 shows that students have been able to achieve the expected criteria according to the numeracy literacy indicators. In cycle II the improvements occurred as follows: (1) it was easier for students to apply the concept of numeracy literacy in everyday life such as using tools to measure angles, as well as analyzing differences and types of angles on an object because students were already able to construct their own knowledge become a skill; (2) students are able to analyze and

interpret information well because they are influenced by the habit of working on HOTS-based questions, And; (3) students can make the right decisions because they are familiar with case studies so as to improve problem-solving skills.

Numerical literacy skills can be improved by providing a stimulus in the form of contextual-based problems. This stimulus can stimulate students' curiosity and then form critical thinking skills and be able to provide solutions in the form of ideas to solve problems (Masliah et al., 2023).

5. Conclusion

The application of problem-based learning models can be categorized as successful and effective in improving students' numeracy literacy skills. There was a significant increase in the learning completeness of students by 86.95% in cycle II. Success in achieving learning mastery is influenced by students' increased interest in reading which has a direct impact on student's ability to analyze and interpret information. When students have reached this stage, it will be easy for students to draw a conclusion on a problem.

Through the problem-based learning model, teachers can more easily provide stimulus to students. The stimulus in the form of numeracy literacy skills is compatible with the problem-based learning model because it focuses on the ability to solve problems. The main advantage of the problem-based learning model in improving numeracy literacy is that there is a phase where students must be able to build knowledge based on the problems given by the teacher.

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