Problem-Based Learning Model to Improve Second-Grade Mathematics Learning Results

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1.   Abstract

The background for the implementation of this research was that the results of learning mathematics in second grade at one of the public elementary schools in Yogyakarta were still low. This is because in delivering mathematics learning material, the teacher still uses the conventional method, namely the lecture method. Based on these problems, the teacher made improvements to learning by applying the *problem-based learning* (PBL) model to improve mathematics learning outcomes for second-grade elementary school students. The type of research conducted was Collaborative Classroom Action Research (PTK) with the Kemmis and McTaggart spiral model research design. According to the Kemmis and McTaggart spiral model, the stages of research design include the steps of planning, action, observation, and reflection. The subjects in this study were second-grade students, totaling 26. The object of this research is the result of learning mathematics by applying the *problem-based learning* (PBL) model. The data collection techniques used are observation, tests, and documentation. The instruments used in this study were observation sheets on the implementation of learning and mathematics learning outcomes tests. Data analysis techniques in this study used quantitative data analysis techniques. The results of this study indicate that the application of *the problem-based learning* (PBL) model can improve the learning outcomes of second-grade elementary school mathematics. This can be seen from the percentage of completeness with details at the pre-cycle stage; the percentage of completeness of 38.5% is in the less category. Then in cycle I, the percentage of completeness of 53.8% was included in the sufficient category. Furthermore, in cycle II, the percentage of completeness increased again, namely to 69.2 %, which was included in the very good category.
Keywords: *Learning Outcomes, Mathematics, Problem-Based Learning (PBL)*

2.   Introduction

Now the world has entered the era of globalization where the times have progressed so rapidly. The development of this era will affect aspects of human life order. This can be seen in the field of education. Education is one of the breakthroughs To use increase the quality of education in Indonesia (Ilyas Yasin, 2021: 242). Education can too be creating human beings with character, culture, quality, and intellectuality high, and avoid stupid things. Education is one thing That is absolutely for humans. With education, humans can have a lot of knowledge Skills, and attitudes That are polite And polite. In addition, education also creates people who are intelligent, creative, full of responsibility, have noble morals, and believe in and fear God Almighty (Muhammad Hasan, 2022: 26). Education that is identical to that of a school can make people have skills and innovation (Febby Pebrianti, 2019: 97). This can be realized from the learning system.

Learning is the process of conveying knowledge from teachers by applying models, methods, and learning strategies to convey knowledge to students (I Wayan Widiana, 2016: 148). If learning is considered a process, it is interpreted as a series of efforts or teacher activities to make students learn. So that the expected learning objectives can be achieved, the teacher applies models, models, methods, and learning strategies that are aligned with the needs and development of students. The majority of teachers still apply conventional learning models in the form of lecturing in delivering non-learning material except in learning mathematics.

The opinion of Ahmad Susanto (2015: 103) explains that mathematics is a field of study that students learn from elementary to university level. In the implementation of learning, mathematics can develop students' creative thinking (Ahmad Susanto, 2014:

186). In addition, mathematics also trains students to think logically, analytically, systematically, critically, and creatively, as well as to collaborate. These competencies are needed so that students can receive, process, and use the information for their survival which is full of change, uncertainty, and competition (Arfika Riestyan Rachmantika and Wardono, 2019: 440). Learning mathematics at the elementary school level focuses on forming logic, behavior, and skills. Learning mathematics is a learning activity in which students can use their existing abilities to solve problems. Mathematics learning has been seen by some students as a subject that is difficult and scary. It can be seen from the many students who do not like mathematics. Therefore, this causes students to tend to be less enthusiastic about carrying out learning activities so it can make student learning outcomes low.

The results of second-class observations of one of the public elementary schools in Yogyakarta show that the learning model used by the class 2B teacher is still characteristic conventional in that it only explains the material using the lecture and question and answer method. In addition, teachers do not use the facilities and infrastructure owned by the school. In practice, conventional learning is considered less effective because students are not actively involved enough. The matter is proven when students complete assignments from the teacher. Therefore, students feel bored and less interested in continuing learning activities so student learning outcomes are low. Based on the results of these observations and learning activities, teachers are required to apply innovative learning models.

Several learning models can be applied to overcome these problems, one of which is the *Problem-Based Learning model*. The PBL model was chosen because it can support teachers in developing their thinking skills and skills in solving student problems while

participating in learning activities. This can form a learning situation that is not boring, effective, and efficient compared to learning conventionally. In this model, students are trained to solve problems so that they can act as a magnet to attract students to implementation learning.

From the presentation concerned, the author will raise the theme "Application Model *Problem-based Learning* (PBL) For Increase Results Study Second Grade Elementary Mathematics". The research subjects were second-grade students at one of the public elementary schools in Yogyakarta. This PTK aims to provide a description of learning using the PBL model so that second-grade elementary school mathematics learning outcomes are increasing.

3.   Methods

This research is included in the type of Classroom Action Research (CAR). The opinion of Syamsiarna Nappu, et al (2019:16) explains that in English PTK is said to be *Classroom Action Research*. PTK is carried out by the teacher to make the quality of learning and student learning outcomes which are usually carried out in class better and improve. Researchers apply second cycles of each cycle including second meetings. The research design is a Kemmis and Mc Taggart spiral model with several stages which includes the stages of planning, action, observer, and reflecting (Agung Prihantoro, 2019: 56). The researcher is domiciled as a researcher and teacher. In addition, researchers are also assisted by observers, namely colleagues who observe during the learning process.

3.1. Participants and Context

The research took place at a public elementary school in the city of Yogyakarta. The subject consisted of 26 class 2B students, namely 11 male students and 15 female students.

While the research object is the result of learning mathematics by applying the PBL model. Furthermore, the stages of this research are planning, implementing, observing, and reflecting on each cycle.

3.2. Material

This study will use an instrument in the form of student observation to see mathematics learning activities using the PBL model in unit-time learning materials. In addition, the instrument used is a test of learning outcomes. This test is useful for testing students' abilities and understanding of learning mathematics by applying the PBL model to learning material in a unit of time.

3.3. Data Collection and Analysis

Researchers collect data with observation techniques, tests, and documentation. This observation technique is used to see directly the implementation of learning carried out by teachers and students by applying the PBL model for the second-grade elementary school in mathematics with unit time learning material. This test technique is used to determine the achievement of students' abilities and understanding during teaching and learning activities. From these results, the teacher can measure the ability and understanding of students and whether progress is made in each cycle. Documentation techniques are used to document activities carried out by teachers and students during mathematics learning in unit time material by applying the PBL model.

In analyzing the research data, it will be done quantitatively. Quantitative data analysis techniques in the form of numbers obtained from assessment analysis or tests of

second-grade students' mathematics learning outcomes after applying the PBL model. The formula used to analyze the data is adjusted to what the researcher wants to test so that you will get the right results based on the formulation of the problem. The data analysis will be carried out quantitatively in the form of tests of student learning outcomes in learning mathematics, smallcap capllca$Nilai\ P$

Percentages are then categorized by classification based on the calculation of the following formula:

Table 1. Classification of Mastery Learning Outcomes

No	Mark	Information
1.	≥ 75	complete
2.	< 75	Complete follow up

3.4. Limitations to the Study

The limitation of the problem in this research is that the subject of this research is class 2B students of SD Negeri in the city of Yogyakarta, and the focus of the research is on the results of learning mathematics in second grade using *the problem-based learning* (PBL) learning model.

4. Results and Discussion

The results of the study show that student learning outcomes in learning mathematics subject to time units by applying the PBL model have increased. This is evident from the learning outcomes obtained by students. The analysis of mathematics learning outcomes by applying the PBL model to the unit time material is as follows.

At the pre-cycle stage, the teacher held a pretest. The results obtained from the pretest show that out of 26 students whose scores were ≥ 75 (KKM), 10 people with a completeness percentage of 38.5% are included in the complete category and as many as 16 people with a percentage of 61.5% are classified in the incomplete category. complete, namely getting a score under the KKM.

The step taken by the teacher after knowing the results of the pretest is that the teacher carries out improvements to the mathematics learning activities for the unit time material by applying the PBL model to the learning scenarios that have been made at the planning stage. In the first cycle, student learning outcomes show increased results. The test results are as below.

Table 2. Data on Mathematics Learning Outcomes with the PBL Cycle I Model

No	KKM score	The number of students	Percentage	Information
1.	≥ 75	14	53.8 %	complete
2.	< 75	12	46.2 %	Not finished

Based on the table above it is explained that of the 26 students who succeeded in achieving the KKM (i.e. ≥ 75) there were 14 students with a percentage of 53.8% and in the complete category then as many as 12 people with a percentage of 46.2% who were classified in the category of incomplete or not achieving grades KKM. The increase in cycle I is seen as still not optimal given that students still find difficulties in solving the problems presented by the teacher. So, the teacher made improvements to the learning activities that had been carried out in the second cycle. In the second cycle, second-grade

mathematics learning outcomes in unit time learning materials have increased. This can be seen in the table below.

Table 3. Data on Mathematics Learning Outcomes with the PBL Cycle II Model

No	KKM score	The number of students	Percentage	Information
1.	≥ 75	18	69.2 %	complete
2.	< 75	8	30.7 %	Not finished

The table above shows that of the 26 students who succeeded in achieving the KKM (i.e. ≥ 75) as many as 18 people with a percentage of 69.2% and were in a complete category then as many as 8 people with a percentage of 30.7% who were classified in the incomplete category because their scores were less than the KKM. In this cycle, students are also increasingly proficient in solving the problems explained by the teacher.

The results of learning mathematics with the learning material for the unit of time can be described in the form of tables and diagrams. The tables and diagrams are used as a comparison. The following is a comparison of tables and diagrams before and after the application of the PBL model to the mathematics subject matter of time units for grade 2 of one of the public elementary schools in Yogyakarta. The comparison table is.
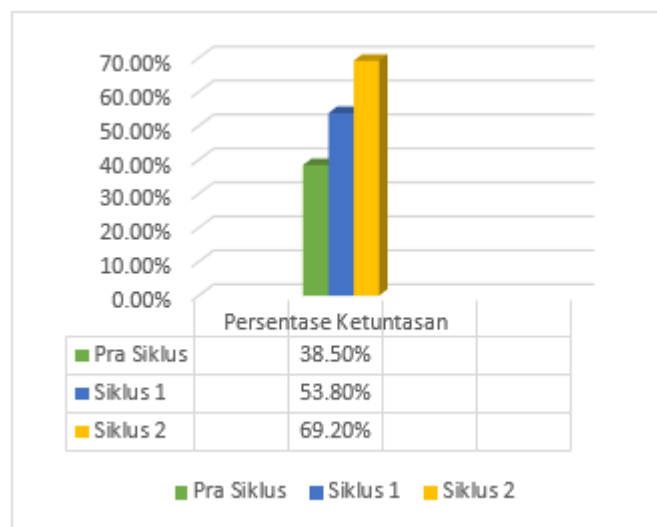
Table 4. Data on Mathematics Learning Outcomes with the PBL Model

No	Action Implementation	The number of students	Percentage	Information

1.	Pre cycle	10	38.5 %	Not enough
2.	Cycle I	14	53.8 %	Enough
3.	Cycle II	18	69.2 %	Very good

After being displayed in tabular form so that it is clearer in viewing the results of the research, it will also be presented in the form of a diagram. The comparison diagram is as follows.

Figure 1. Learning Outcomes of Mathematics with the PBL Model

Judging from the tables and comparison diagrams of mathematics learning activities using the PBL second class SD model, it is known that in the pre-cycle, first cycle, and second cycle stages, the mathematics learning outcomes in the unit of time material as seen from the percentage of completeness scores have increased. Where in the pre-cycle stage the level of completeness achieved was 38.5 % and was in the less category. In cycle I the

level of completeness achieved was 53.8 % and was in the sufficient category. Then in the second cycle, it increased again so that it became 69.2 % and was categorized as very good.

5.   Conclusion

From the results of this research and discussion, the conclusion that can be drawn is that the results of learning mathematics in the second grade of one of the SD Negeri in Yogyakarta which is carried out by applying the PBL learning model are increasing. This is evident from the value obtained by learning mathematics after receiving action in each cycle. The success of increasing second-grade mathematics learning outcomes of one of the public elementary schools in Yogyakarta can be seen from the pre-cycle activities which showed that only 10 students or 38.5% with fewer criteria, then increased to 14 students or 53.8% in the first cycle with criteria enough. Then it increased significantly, namely to 18 students or 69.2 % in the second cycle, and was categorized as very good.

The use of the PBL model was able to improve the mathematics learning outcomes of second-grade students at one of the public elementary schools in Yogyakarta. This is because the steps of the PBL model can be implemented properly, for example, 1) Students listen to the problems posed by the teacher and answer questions posed by the teacher; 2) Students form groups according to the provisions of the teacher and sit together with their groups; 3) Students get guidance from the teacher in solving problems; 4) Students compile reports and present their work in front of the class; 5) Together with the teacher students evaluate problem-solving.

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