Implementation Of Problem-Based Learning In Mathematics Course To Improve Cooperation Ability In Class III-A SD Negeri Ngebel

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1.   Abstract

The background of this research is the low cooperative ability of class III-A students at SDN Ngebel, especially in learning mathematics. The purpose of this study was to make improvements in learning to improve the collaboration skills of class III-A students of SDN Ngebel in learning mathematics through the application of problem-based learning models. This research is a classroom action research (CAR) using the Kemmis and MC Taggart models, with the steps of planning, implementing action and observing, and reflecting. Data collection techniques using non-test techniques. The non-test instrument is in the form of a questionnaire to measure the level of cooperation between students. Based on the results of research in cycle I for the percentage of students' collaboration abilities based on indicators, the percentage value of indicator was 47.73%, indicator 2 was 52.21%, indicator 3 was 57.63% and indicator 4 was 49.21%. Whereas in cycle II it obtained a percentage equal to indicator 1 of 83.41%, Indicator 2 of 85.21%, Indicator 3 of 88.83% and indicator 4 of 90.21%. Judging from the comparison of the percentage of scores in cycles I and II there was an increase in the four indicators of the ability to cooperate between students. From the results of this study it was concluded that the application of the Problem Based Learning learning model.

2.   Introduction

Mathematics is a field of study that aims to improve the ability to think, give opinions, and solve problems that originate from real problems. Mathematics can support the development of science and technology (Rahmawati et al., 2023). The process of learning mathematics can develop the ability to think logically, scrutinized, structured, active, innovative and collaborative (Susanto, 2014). The process of learning mathematics at the elementary school level focuses on forming logic, attitudes, and skills (Sholehah et al., 2018). The abilities acquired on the basis of the development of mathematics are needed to be able to face life, so that these abilities are very important for elementary school students to have (Suwangsih et al., 2018).

One of the important abilities possessed by elementary school students is the ability to work together. The ability to cooperate is an ability to achieve common goals or interests (Abidah & Dewi, 2019). Cooperation can form students to be able to respect other people/friends (Prabandari et al., 2019).

If viewed based on the indicators of cooperation, it consists of 12 indicators including group goals, trust between members and the conflict that is created, response to a problem, leadership, control and procedures, use of resources, interpersonal communication, listening, communication flow, problem solving, experimentation and creativity and evaluation (Crebert et al, 2011). In this study only focused on 4 indicators including being willing to accept responsibility, being helpful in helping friends, respecting the opinions of others, and respecting the work of others.

Based on the results of observations at class III Ngebel Elementary School, it was concluded that students tend not to be involved and play an active role in group activities, students tend to disturb other groups and do not do group assignments that are their responsibility. Analysis of the problem of observation (pre-cycle) is based on the results of the ability to get results by (1) willing to accept responsibility 14.32%, helping friends 21.03%, respecting the opinions of others 11.84%, and respecting the work of others 19.09%. These results indicate that students' collaboration skills need to be improved.

The causes of these problems were identified based on teacher and student interviews due to the teacher's lack of habituation towards the use of group learning, especially in mathematics. Teachers as educators play an important role in being able to create learning to increase student interest and learning outcomes in mathematics (Ramadhianty et al., 2021). One solution is to develop learning with appropriate learning models according to the problems and needs of students (Hasanah et al, 2019).

The right learning model to be able to improve student collaboration skills is problem based learning. Problem-based learning that can provide opportunities for students to be able to solve various kinds of problems in groups with their friends (Ulfah, 2023). Problem Based Learning is a teaching approach that uses real world problems as a context for students to learn actively to solve problems, as well as to acquire essential knowledge and concepts from subject matter (Pramudya et al., 2019).

Indicators and steps in problem based learning are (1) student orientation towards problems; (2) organizing students to study; (3) guiding students individually/groups; (4) developing and presenting works; and (5) analyze and evaluate the problem solving process (Manobe & Wardani, 2018). The research aims to improve students' collaboration

skills in mathematics through the application of a problem-based learning model at SDN Ngebel class III-A in the 2022/2023 academic year.

3. Methods

3.1. Participants and context

This study used the Classroom Action Research method with a spiral model developed by Stephen Kemmis and Robin Mc Taggart. The classroom action research method aims to find the best teaching strategy in order to improve students' abilities and skills. Class action research consists of 2 cycles. Each cycle consists of four stages that must be passed, namely planning, implementing, observing and reflecting or often called planning, acting, observing, and reflecting (Manobe & Wardani, 2018). The subjects in this study consisted of 22 students including 11 male students and 11 female students in class III-A at SDN Ngebel for the 2022/2023 academic year.

3.2. Material

Based on the research objective, which is to improve students' collaboration skills in mathematics which focuses on the four indicators of collaboration, it is measured using a questionnaire. The instrument used in this study was a questionnaire that students had to fill out/answered/responded to (Sukmadinata, 2014). The questionnaire in this research consisted of 15 statements. The scale used in this questionnaire is a Likert scale 1-5 with details always, often, sometimes, rarely and never. Questionnaires are used to find out student responses regarding the application of problem based learning learning models in mathematics learning activities. Questionnaires were distributed to each student after all

stages of implementing the problem-based learning model had been completed. The questionnaire instruments in this study are listed in the table. 1 below.

Table 1. Questionnaire Instrument

Indicator	Statement
Willing to accept responsibility	My friend appreciates and approves of all division of tasks in group activities
	My friend does the task in accordance with the division of tasks that have been done
	My friends don't do other activities that hinder the course of group activities
	My friends rely heavily on other group friends
	My friend carried out all group activities according to the instructions given by the teacher and the group leader
	My friends participate in solving problems and finding solutions to problems
Hands helping friends	My friend is willing to help other group friends when asked to help with work outside of his duties
	My friend gives input/assistance to other group mates in doing their assignments
	My friends joined the discussion when the group discussed problems and solutions
	My friend is willing to accept help from other group mates in doing their work
Respect other people's opinions	My friend responded to the opinion given by another group of friends
	My friend responds well to differences of opinion that arise during discussions
	My friend expressed a different opinion in a good way
Appreciate other people's work	My friend interfered with the work of another group of friends

My friend appreciates the work of group mates in carrying out their duties

3.3. Data Collection and analysis

The research data is in the form of student questionnaire results on cooperation in the implementation of learning in applying the problem-based learning model. Data validation using method triangulation technique. The method triangulation technique is a technique for processing research data obtained by comparing various different methods to draw a conclusion (Mills, 2011). Data analysis used a qualitative descriptive technique which consisted of data reduction, data presentation, and drawing conclusions or verification.

The research data contained a questionnaire obtained from the results of student responses. Each student gives an assessment (fills out a questionnaire) as much as 3x the number of group members. So that each student must assess his classmates regarding cooperation in the group. The results will be analyzed and a percentage of conclusions will be drawn as follows.

$$X = \frac{The\ total\ value\ of\ the\ questionnaire \times the\ number\ of\ group\ members}{the\ number\ of\ group\ members} \times 100\% \quad (1)$$

3.4. Ethical Considerations

The ethical consideration in this study is not clearly stating the research subjects studied. This is one of the ethical codes in writing scientific papers. The researcher only describes the results in the form of an average percentage without mentioning the real results of student work.

3.5. Limitations to the Study

The limitation of this study is that there is no class observation related to the measurement of the ability of cooperation that exists between students. There is also no

study of cooperation between teachers and students. In addition, the study is still on affective abilities. While the ability to cooperate can also be seen from the point of view of the development of students' cognitive abilities. Thus, there will be completeness of supporting data to measure and describe the ability of collaboration between students.

4.   Results and Discussion

The results of this study are in the form of student cooperation abilities related to the four indicators which are the focus of the research including (1) willingness to accept responsibility; (2) helping friends; (3) respect the opinions of others; and (4) appreciate the work of others. Collaboration ability in this study was reviewed during the mathematics learning process which took place using the problem based learning model in class III-A.

4.1.   Cycle 1

The results of the research in cycle 1 were in the form of achievement indicators of students' problem solving abilities obtained from the results of the questionnaires carried out by students related to the assessment of the cooperation of their friends in groups. These results were obtained from the application of the problem-based learning model to mathematics in the context of group learning. The results of the analysis of students' abilities in cycle 1 are presented in Figure 1.
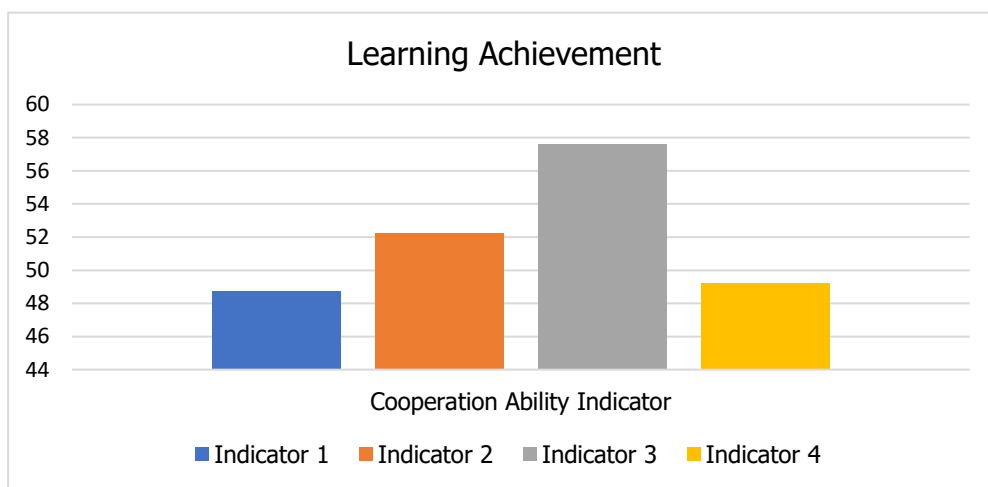
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Figure 1. Achievement Percentage of Collaboration Capability Indicators Cycle 1

Figure 1 shows that the results of the analysis of the results of each indicator of the ability of student collaboration which includes indicator 1, which is willing to accept responsibility by 47.73%, indicator 2, which is helping friends by 52.21%, indicator 3, namely respecting the opinions of others by 57.63% and indicator 4 namely appreciating the work of others by 49.21%.

4.2. Cycle 2

After obtaining the results of the acquisition of values based on indicators in cycle 1, the next cycle is carried out, namely cycle 2. The actions of cycle 2 are carried out because the ability of students' cooperation still needs to be improved and further developed. The results of the action in cycle 2 were in the form of achievement indicators of students' collaboration abilities obtained through the application of problem-based learning models in mathematics. The results of the analysis of students' cooperation abilities in group activities in cycle 2 are presented in Figure 2.
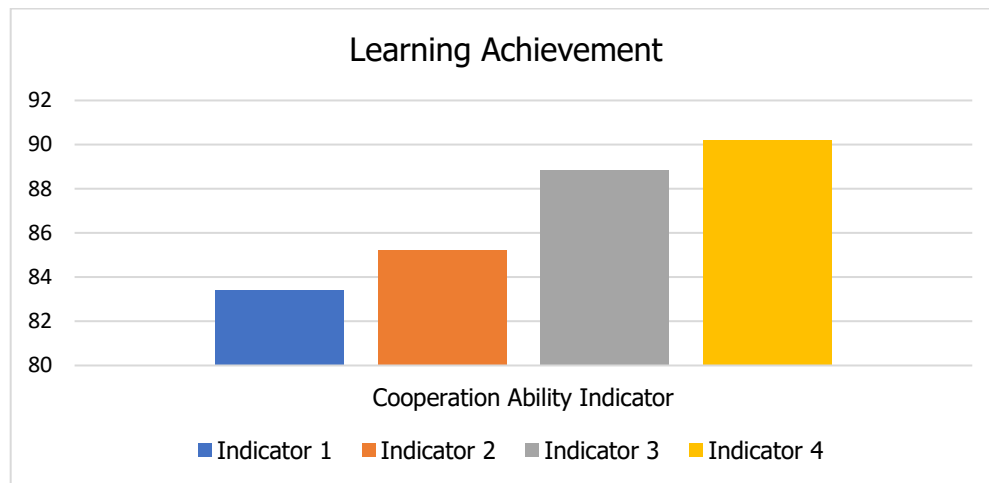
Figure 2. Achievement Percentage of Student Cooperation Ability Indicators in Cycle 2

Figure 2 shows the results of the analysis of the achievements of each indicator of Cooperation capability which includes four indicators. Indicator 1 is willing to accept responsibility for obtaining a percentage of 83.41%. Indicator 2 is helping friends to get a percentage of 85.21%. Indicator 3, namely respecting the opinions of others, obtains a percentage of 88.83% and indicator 4, namely respecting the work of others, obtains a percentage of 90.21%.

4.3. Comparison of all cycles

Comparison of the results of the analysis of the indicators of students' cooperation ability from the pre-cycle stage, cycle 1 and cycle 2 experienced different improvements. The improvement achieved from the three stages is summarized and presented in Figure 3.
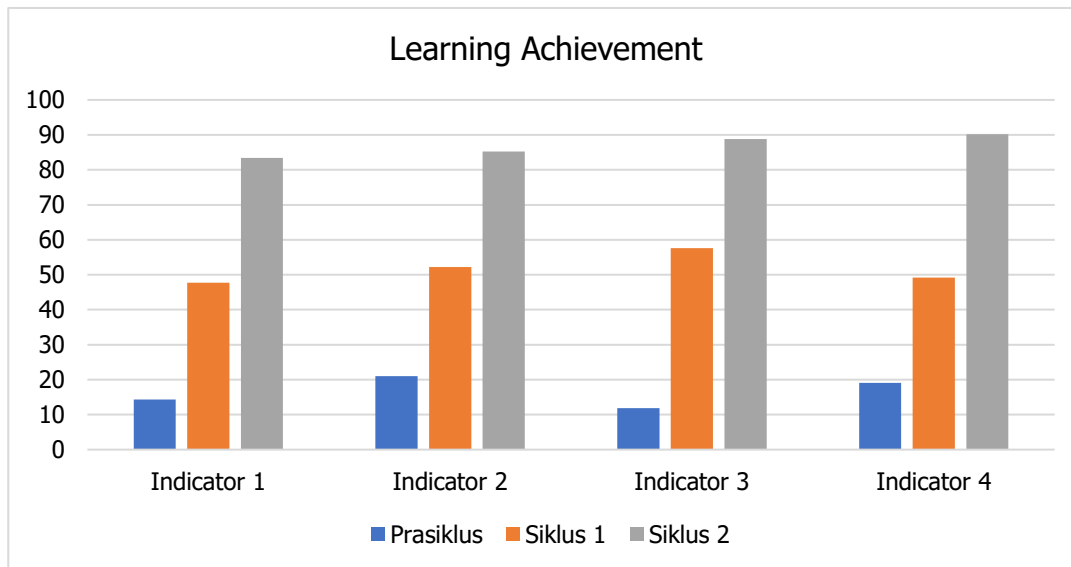
Each stage of this study experienced various and significant improvements leading to better indicators. This can be influenced by various things and factors. The use of problem-based learning learning models seems to be able to influence the improvement of students' collaboration abilities, especially in mathematics.

In indicator 1, namely willing to accept responsibility, it has a percentage of 14.32% at the pre-cycle research stage and increases at the research stage of cycle 1 by 33.41% to 47.73% and then increases again by 35.68% to 83.41% at cycle 2 stage. The increase in this first indicator relating to students who can mutually accept the responsibilities given to students with regard to group activities including responsibility for completing tasks together or having a sense of leadership both for themselves and for fellow group members.

This is in line with research by Rao et al. (2002) which states that group learning can provide opportunities for students to be able to complete and give full responsibility for students' ability to work together and trust between the responsibilities of each and their friends. The increase in indicator 1 is also influenced by the application of the problem-based learning model. In learning problem based learning students are faced with learning situations in groups in solving various problems given by the teacher. In addition, this study agrees with Dutch opinion (Manobe & Wardani, 2018) stating that the problem-based learning model is an instructional method for students to strive to learn, work together with groups to find solutions to real problems. These problems are used so that students' curiosity and analytical skills and initiative on subject matter can develop.

In indicator 2, namely helping friends, it has a percentage of 21.03% at the pre-cycle research stage and has increased at the research stage of cycle 1 by 31.18% to 52.21% and then increased again by 33% to 85.21% at cycle 2 stage. This second indicator explains how Collaboration between students can be established to help each other. There is an increase because it is clear where the problem-based learning model makes students solve problems in groups or together.

In indicator 3, namely respecting the opinions of others, it has a percentage of 11.84% at the pre-cycle research stage and has increased at the research stage of cycle 1 by 45.79% to 57.63% then increased again by 31.2% to 88.83% at cycle 2 stage. An increase in indicator 3 occurred because students can respect the opinions of others so that there will be a conclusion. Learning activities become more effective because students interact with a group of friends to jointly seek information, unite differences of opinion, and solve a problem (Reychav & Wu, 2015). In addition, in the opinion of (Reychav & Wu,

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2015) who stated that group learning requires the involvement of students in small groups to express ideas or opinions.

This is in line with (Isjoni, 2020) which states that students are required to create a democratic atmosphere by listening to the opinions expressed by other members in the group when group activities are carried out. From this theory the application of Problem-based learning can spur student learning creativity. This is in accordance with the characteristics of a creative individual, namely having a strong imagination, initiative, having a wild interest, being free in thinking, having a sense of curiosity, always getting new experiences, confident, full of enthusiasm, daring to take risks, and daring to argue (Widyaningrum & Rahmanumeta, 2016).

In indicator 4, namely appreciating the work of others, it has a percentage of 19.09% at the pre-cycle research stage and an increase in the research stage cycle 1 of 30.12% to 49.21% and then increases again by 33% to 90.21% at the cycle 2 stage. This increase in cooperation indicators is supported by the opinion of Laal & Ghodsi (2012) stating that group learning is able to create an environment that supports students to find solutions to a problem without any competition between individuals or between groups because students are required to take responsibility accountable to every other member of the group. Being responsible for other members is one of the forms of appreciating every job or thing that other members do for the group.

The problem-based learning model emphasizes active learning (Pramudya et al., 2019). The material is packaged in the form of cases, and students are divided into groups to find solutions to these problems. In group work time is limited and after finishing group work students continue to present the results of their group work and other groups

respond/ask questions. Through the application of the Problem Based Learning model, students can be more active and creative.

5. Conclusion

Based on the results of the research, it can be concluded that the application of the problem-based learning model can improve the ability of collaboration between students in mathematics class III-A at Ngebel Public Elementary School in the 2022/2023 academic year. It can be seen that the increase in the average score on each indicator. This increase can occur due to the use of problem-based learning learning models where this learning model allows students to carry out and analyze problems based on groups. Then there is interaction between students and group interaction so that it will have a significant impact on the ability of collaboration between students.

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