Proceedings of International Conference on Teacher Profession Education
Yogyakarta, 29 July 2023

ISSN: 3025-020X

Improving Collaboration through a Problem-Based Learning Model for Mathematics Content in the Elementary School III

Marbeta Dewi Ariyani[1], Istiqomah[2], Fitri Ardiyanti[3], Aprilita[4]

[1-2]Universitas Sarjanawiyata Tamansiswa, Indonesia
[3-4]Ngabean State Elementary School, Indonesia
**Corresponding Author e-mail:* marbetadewiaaa@gmail.com

1. Abstract

This study aims to determine the increase of students' cooperation through the application of problem-based learning models in elementary school mathematics content. This type of research is classroom action research using the Kemmis and Mc Tangart models. This research was conducted in the even semester of the 2022/2023 academic year, from April to June 2023. The research subjects were class III elementary school students, totaling 28 students. The independent variable in this study is the problem-based learning model, while the dependent variable is cooperation. The data collection used in this study is observation and documentation. Data analysis techniques used in this study is statistical data analysis techniques obtained through observation sheets of group cooperative attitudes in each cycle. The research results in the first cycle reached an average of 59% in the category of sufficient. While the average obtained in cycle II reached 87% in the category of good. Therefore, it can be concluded that the problem-based learning model can improve students' cooperation in mathematics content. This is evidenced by the results of observations that meet the indicators of success, which resulted exceeding 70% in cycle II.

Keywords: *collaboration, problem-based learning, mathematics*

2. Introduction

Education is one of the processes of improving the quality of human resources which is important in helping the development of the nation. Law Number 20 of 2003 Chapter I Article I paragraph 1 emphasizes that education is a conscious and planned

ISSN: 3025-020X

effort to create a learning atmosphere and learning process to make students actively develop their potential to have religious spiritual strength, self-control, personality, noble character, as well as the skills needed by themselves, the community, the nation and the state.

Elementary school is the level of education that underlies secondary education and higher education. The development of the education quality is inseparable from the development of the curriculum. The current curriculum is the 2013 curriculum and the Merdeka curriculum. Both curricula train students to construct their own knowledge. Setiawan, et al (2023: 32) states that the 21st century curriculum is a curriculum that builds students to achieve success at school and in society with the cooperation and social interaction ability.

Education can run well if there is cooperation from various parties, both the government, educators, students, parents, and the environment in which they live. This is in accordance with the teachings of Ki Hadjar Dewantara which are summarized in the Tri Education Center, which means that education can be obtained in three environments, namely the family, school and community (Trisharsiwi, et al, 2020: 38-39). Family environment can be obtained through parents and siblings. The school environment can be obtained through formal and non-formal schools. While the community environment can be obtained from the neighborhood and local residents.

Students are currently expected to master 21st century competencies which consist of four components including creative thinking skills, critical thinking and problem solving, communication, and collaboration. Based on these competencies, the learning process is more student centered to make students get meaningful experiences.

The efforts to achieve goals in learning activities require cooperation between existing components. The main collaboration in the world of education, especially

ISSN: 3025-020X

learning, is cooperation between teachers and students and students with students. This happens because in the educational component, teachers and students are the main components in learning activities. The establishment of good cooperation between these educational components can have a positive impact, including facilitating and assisting the learning process, and improve the quality of education. And vice versa if there is no good cooperation from one of these components, it will have a negative impact on learning such as cooperation between students is not optimal, it will affect learning activities when discussing or assigning in groups.

Kurniawan, et al (2019: 14) explain that teamwork is a form of cooperation in a group that involves each team member to contribute to each other before making decisions or solving problems. Khusna, et al (2020: 118) states that instilling the value of cooperative attitudes is a form of implementing character values in thematic learning. This is in line with the Pancasila Student Profile. Ibad (2022: 85) explains that the profile of Pancasila students consists of six dimensions, including 1) having faith, being pious to the Almighty God, and having noble character, 2) being independent, 3) working together, 4) global diversity, 5) critical reasoning, and 6) creative. These six dimensions need to be implemented to make students become lifelong learners, competent, having good character, and behaving according to Pancasila values.

Kurniasih, et al (2020: 26) states that cooperation is very important for students to make them socialize and interact well with others. Students must be able to work together therefore the learning activities can be carried out properly. Hadaina and I Gede Astawan (2021: 9) describe that the ability to cooperate needs to be stimulated from an early age because by working together, students are able to share, help each other, interact, and communicate with peers, solve problems in groups and take responsibility. Susanto (Novianti, 2019: 3) emphasizes that the characteristics of cooperation are

ISSN: 3025-020X

exchanging ideas, asking and answering questions, interactive communication between fellow students, solving problems, and doing assignments.

Based on observations done in April 2023, the learning process in class III has implemented a student center system, namely learning activities that place students at the center of the learning process. Teachers have used learning models that are varied, interactive, and use media that made students became active in learning. However, there were some students who experienced problems when carrying out group assignments. This happened because there were some students who paid less attention to the teacher's explanation, invited their friends to chat, played by themselves, and tended to be lazy to read or study. In addition, it happened because there are students who were still adjusting to the conditions of the learning environment since they came from outside the area so they need time and good communication with other students. This affected the students when they were asked to complete assignments in groups, students became less active and rely more on answers from friends or the help of others.

Related to these problems, it is necessary to improve the learning. The learning model is one of the way that can be used by teachers to improve the quality of learning and students' understanding. The learning model that can be used by teachers according to the problem is the problem-based learning model. Savery (Sulaiman and Siti Azizah, 2020: 112) states that problem-based learning is student-centered learning and confronts students with unstructured problems to encourage students to collaborate in building their knowledge.

Wulandari and Suparno (2020: 863) explain that problem based learning emphasize students to actively build knowledge in collaborative groups. The role of students and teachers is changed so that the teacher is no longer considered as the main storehouse of knowledge, but the teacher acts as a facilitator of collaborative learning.

ISSN: 3025-020X

One of the learning content that emphasizes problem-based learning is mathematics content. Setiawan and Monica (2022: 217) also emphasize that one of the lessons that often uses collaboration is mathematics.

Setiawan (Widayanti and Nur'aini, 2020: 13) suggests that learning mathematics should begin with the introduction of problems or posing real problems that is relating them to events that occur in the daily lives of students, then students are guided to master mathematical concepts by involving their active role in learning.

This statement is reinforced by Rahayu, et al (2019: 449) who argue that one of the goals of learning mathematics for students is to have problem-solving abilities. Learning mathematics in elementary schools plays an important role because mathematics is a calculating tool that is often used by humans in everyday life. Rahayu, et al (2019: 453) state that the problem-based learning model is a model that can be applied to learning mathematics in elementary schools because students are given a problem or statement about mathematics and ask students to find answers by themselves or in groups.

3. Methods

This research involves a type of action research class (PTK) using Kemmis and Mc. Taggart model. this research took place in the even semester of the 2022/2023 school year, from April to June. This research subject is that the participants educate the third grade, consisting of 28, such as 14 students boys and 14 students girls. Variable free to use in this research is a learning model problem-based learning (PBL), meanwhile variable bound is collaboration.

Data collection techniques used in this research is observation and documentation. Instrument research used measure ability work The same is sheet observation attitude

ISSN: 3025-020X

work The same in the group during the learning process goes on. Data analysis techniques used in this research technique analysis of statistical data obtained through leaf observation posture work The same in the group on each cycle. The data obtained is analyzed using the statistical description. Sugiyono (Lestari, 2020: 39) explained that descriptive statistics is used to analyze data with the description of the data obtained. Arikunto (Lestari, 2020: 40) explained that for counting mark setting ability work of the same participants educate during the learning process done in a way group use formula:

$$\text{Score} = \frac{\Sigma\ skor\ yang\ diperoleh}{\Sigma\ skor\ maksimal}\ x\ 100\%$$

After obtaining a percentage that the observation of the results is categorized as follows:

Table 1

Category Evaluation Attitude Cooperation _

range mark	**Mark**	**Information**
100 – 90	A	Very good
89–70	B	Good
69–50	C	Enough
49 – 30	D	Not enough
29 – 10	E	Very less

Jihad and Abdul Haris (Lestari, 2020: 41)

The limitation of the problem discussed in this study is to determine the improvement of students' cooperative behaviour through the problem-based learning model of elementary school mathematics content III. Due to these limitations, this study

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only focuses on the improvement of students' cooperativeness. The improvement of the cooperativeness of the elementary school students in the class III has achieved a rating of 70% with a good category, so this action research in the classroom by using the model of problem-based learning through observation questionnaires on cooperativeness can be explained as successful.

4. Results and Discussion

This classroom action research, researchers conducted on the learning process as much as two cycles. Each cycle consists of two meetings, so there are four meetings in two cycles. Each meeting used a learning model of problem-based learning (PBL), which focused on mathematical content. The learning activities conducted include three activities, namely the introduction, core, and completion activities. The core activity uses the flow of the problem-based learning model to support the learning process and overcome problems encountered in the classroom using the group discussion method. The method is used to determine students' willingness to cooperate.

The following presents the results of research on student collaboration through the problem-based learning (PBL) model in the classroom III elementary students. Students' attitudes toward collaboration are focused on mathematical content. The data on cooperation attitude were obtained by observation and documentation techniques with 5 items of cooperation indicators. The indicators consist of 1) mutual contribution, i.e., contributing each other's energy and thoughts to create cooperation, 2) responsibility for completing the work together, 3) respect for the individual's opinion, 4) belonging to a work group during the activity, and 5) completing the tasks on time. Evaluation activities are conducted at the end of each session of the cycle.

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Cycle I

The implementation of Cycle I is a follow-up to the problems identified in the learning observation, through the application of the Problem-Based Learning (PBL) learning model as an attempt to improve the cooperation skills of elementary students in grade III. The learning method used in the implementation of this learning process is discussion according to the steps of the learning model. This group discussion activity is also the subject of observation of students' cooperation skills.

Table 2. Observation Results Ability Cycle I Collaboration _

No	Indicator	Meeting 1	Meeting 2
1.	Mutual contribution that is each other contribute Good power nor thinking will creation Work The same	54 %	63 %
2.	Not quite enough answer in a manner together finish work	49 %	69 %
3.	Honor opinion individual	43 %	66 %
4.	Is at in group Work moment activity going on	54 %	66 %
5.	Finish task appropriate time	54 %	74 %
Average		51 %	67 %
Category		Enough	

From the tabulated data of the observations, it appears that in the first cycle of session 1, an average of 51% was obtained. This figure is in the range of 50-69% with

ISSN: 3025-020X

the category "sufficient". Some indicators of the ability to collaborate are still placed in the "poor" category. This is because not all students are used to working with other students in a group. Some learners tend to work individually, do not participate in the action, play alone, and are rather passive, so collaboration in group discussions is still deficient. In addition, learners are not used to doing group work with random or heterogeneous group members. The learners are in the adaptation phase to the learning model used by the model teacher, so they are still in the initial phase of implementing the model.

While in the first cycle of session 2, an average of 67% was achieved. The average obtained falls in the "sufficient" category, but there is an increase compared to the previous session. This is due to the fact that students begin to follow the learning process according to the steps of the learning model. Despite the increase, it is necessary to improve several indicators of cooperation skills, which will be done in the next cycle.

Cycle II

The implementation of the cycle II is a continuation of the activities of cycle I as a form of follow-up of the identified problems. The planning used in Cycle II is the same as in Cycle I, namely through the use of problem-based learning models and group discussion methods to determine students' ability to collaborate. The implementation of Cycle II mirrors the implementation of Cycle I, so there must be improvements in several components, such as providing media and activities that meet needs.

Table 3. Observation Results Ability Cycle 2 Collaboration

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No	Indicator	Meeting 1	Meeting 2
1.	Mutual contribution that is each other contribute Good power nor thinking will creation Work The same	91 %	91 %
2.	Not quite enough answer in a manner together finish work	83 %	91 %
3.	Honor opinion individual	74 %	80%
4.	Is at in group Work moment activity going on	80%	91 %
5.	Finish task appropriate time	86 %	94 %
Average		83 %	90%
Category		Good	Very good

Based on the table, the results observability in cycle II session 1 of 83% with the category it show that the majority of participants to educate work in the group with ok. Whereas the results obtained in cycle II meeting 2 namely of 91% with very good category. Observation results meeting 1 and 2 in cycle II showed consists improvement. Majority of participants educate has activity discussion in the group with good, so a number of indicator ability work the same including in the category good and very good.

Based on the results of the implementation of cycles I and II with a problem-based learning model on mathematical content showed significant results. The comparison of the cooperation ability of students increased at each meeting in each cycle. Sukarti (2017: 4) explains that student collaboration is an activity that students

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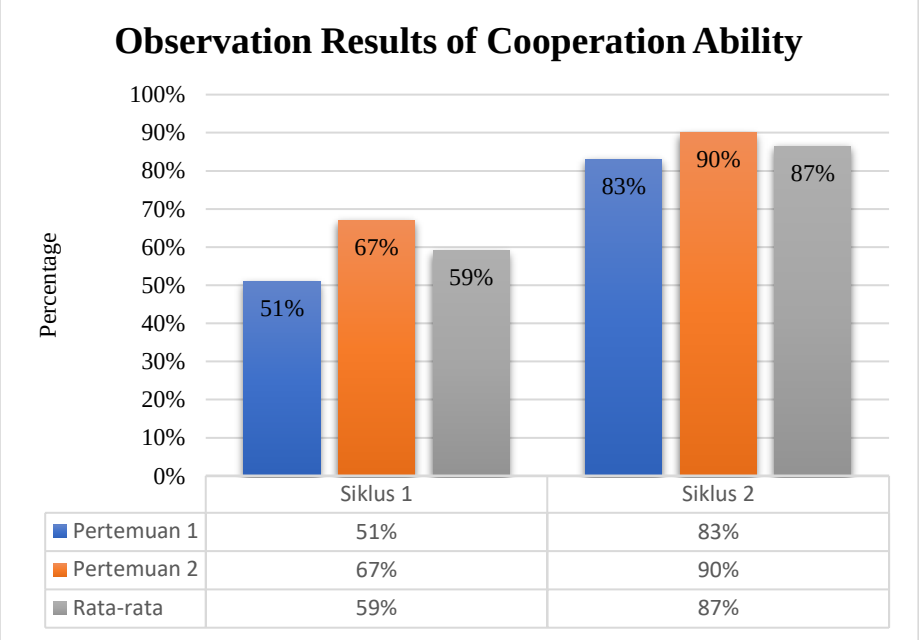
do together to achieve common goals. Based on this, student collaboration is carried out in discussion activities to achieve learning outcomes and a good understanding of the material. The percentage comparison of the results of the observations of cooperation skills in Cycle I and Cycle II is clearly shown in the following table.

Table 4. Recapitulation of Observation Results Ability Collaboration Through the Problem Based Learning Content Learning Model Mathematics in Cycles I and II

Observed aspect _	Cycle I			Cycle II		
	Meeting 1	Meeting 2	Average	Meeting 1	Meeting 2	Average
Ability Work The same participant educate	51 %	67 %	59 %	83 %	91 %	87 %

Comparison percentage ability work The same participants educate with learning models problem-based learning cycles I and II can be seen on the diagram after this.

ISSN: 3025-020X



Picture 1. Graph Recapitulation of Observation Results Ability Cooperation

From the above chart, the percentage of student collaboration observations using the problem-based learning model reached an average of 59% with sufficient category in the first cycle. In the second cycle, an average of 87% with good category was achieved. Therefore, it can be concluded that the problem-based learning model can improve students' cooperation ability in mathematical content. This is evidenced by the results of the observations that meet the indicators of success, which are over 70% in the cycle II.

5. Conclusion

Based on the results of the description and the discussion of the research findings, it can be concluded that the problem-based learning model can improve the cooperation ability of elementary students in grade III in terms of mathematical content. This is

ISSN: 3025-020X

evidenced by the research results, which increased in each cycle in accordance with the indicators of students' ability to cooperate. The first cycle research results showed scores of 51% at session 1 and 67% at session 2 with an average of 57%. These averages fall into the "adequate" category. Therefore, improvements are needed in the II cycle to achieve the success indicators. The results of the second research cycle showed 83% at session 1 and 91% at session 2 with an average of 87%. These averages fall into the "good" category. The results of the study have improved in each cycle and are in the "good" category. It also met the indicators of research success.

6. Acknowledgement

The author would like to thank Ms. Istiqomah, M.Sc., as a field supervisor and Ms. Fitri Ardiyanti, S.Pd., as a civil service teacher at SDN Ngabean, who guided and supported her until the completion of the preparation of this journal article. Another thank you goes to Mrs. Apriliana, S.Pd, as the class teacher and to the students of the class III, to Mr. and Mrs. teacher of SDN Ngabean, to the friends of PPL students of SDN Ngabean, to the parents who encouraged them, and to all the parties who cannot be named individually who assisted the author in conducting the research and preparing this article. The author hopes that this research can serve as a guide and be useful to improve the resources and quality of education.

References

Hadaina , N., & Astawan , G. (nd). Instrument Cooperation Ability of Group B Kindergarten Children. *Journal for Lesson and Learning Studies* , *4* (1), 2021–2029.

ISSN: 3025-020X

Ibad, W. (2022). Application Profile Pancasila Students at the Elementary School Level . *JIEES : Journal of Islamic Education at Elementary School JIEES* , *3* (2), 84–94. https://doi.org/10.47400/jiees.v3i2.47

Kurniawan, AR, Noviyanti , S., & Arsil , A. (2019). Optimization of Multimedia Assisted Problem Based Learning Models for Increase Skills Teamwork in Elementary School . *ELSE (Elementary School Education Journal): Journal of Education and Learning Elementary School* , *3* (2). https://doi.org/10.30651/else.v3i2.2800

Lestari, Rima. (2020). *IMPLEMENTATION OF SCRAMBLE STRATEGY TO IMPROVE STUDENT COOPERATION ABILITY ON THE THEME OF CARE FOR LIVING THINGS IN CLASS IV MADRASAH IBTIDAIYAH AL-IKHWAN PEKANBARU* . Thesis . Pekanbaru : State Islamic University of Sultan Syarif Kasim Riau.

IMPLEMENTATION OF PROBLEM BASED LEARNING (PBL) LEARNING MODEL TO COOPERATION ON THE ACTIVITY AND OUTCOMES OF BIOLOGICAL LEARNING MATERIALS IN HUMAN RESPIRATORY SYSTEM IN CLASS VIII STUDENTS OF SMP BHAKTI NUSA PLOSOCLATEN ACADEMIC YEAR 2016/2017 THE APPLIED LEARNING MODEL PROBLEM BASED LEARNING (PBL) AGAINST CO OPERATION LIVELINESS AND THE RESULTS OF STUDYING BIOLOGY ON THE MATERIALS HUMAN RESPIRATORY SYSTEM ON THE STUDENT CLASS VIII BHAKTI NUSA JUNIOR HIGH SCHOOL PLOSOKLATEN ACADEMIC YEAR . (2016).

IMPROVING STUDENT COOPERATION THROUGH INQUIRY BASED LEARNING IN SCIENCE LEARNING CONTENT ON LIVING THINGS IN CLASS III MIM BOLON . (n.d.).

ISSN: 3025-020X

Puji Dwi Kurniasih, A., & Nugroho. (n.d.). IMPROVING HIGHER ORDER THINKING SKILLS (HOTS) AND COOPERATION BETWEEN STUDENTS THROUGH THE PROBLEM BASED LEARNING (PBL) MODEL WITH KOKAMI MEDIA IN CLASS IV SD NEGERI 2 DUKUHWALUH. In *Sri Harmianto Attadib Journal Of Elementary Education* (Vol. 4, Issue 1). https://www.jurnalfai-uikabogor.org/index.php/attadib/issue/view/52

Rahayu, ST, Saputra, DS, & Susilo, SV (nd). *THE IMPORTANCE OF PROBLEM BASED LEARNING MODELS IN LEARNING MATHEMATICS ELEMENTARY SCHOOL STUDENTS* .

Rokhman , MK, Sucipto, S., & Masturi , M. (2020a). Overcome Through Academic Procrastination Counseling Behavioristic With the Behavior Contract Technique. *Journal of Prakarsa Paedagogia* , *2* (1). https://doi.org/10.24176/jpp.v2i1.4310

Rokhman , MK, Sucipto, S., & Masturi , M. (2020b). Overcome Through Academic Procrastination Counseling Behavioristic With the Behavior Contract Technique. *Journal of Prakarsa Paedagogia* , *2* (1). https://doi.org/10.24176/jpp.v2i1.4310

Setiawan, WA, Kusuma, YY, & Alim, ML (2023). Increase Cooperation Skills Through the Student Treasure Hunt Learning Model Elementary School . *Al-Madrasah: Journal of Madrasah Ibtidaiyah Education* , *7* (1), 31. https://doi.org/10.35931/am.v7i1.1447

Setiawan, Y., Synthia Oktaviani , M., & Satya Wacana Christian , U. (2022). *Proximal: Journal of Mathematics Research and Mathematics Education DEVELOPMENT OF MATHLITE TO IMPROVE THE COOPERATION OF 4th*

ISSN: 3025-020X

GRADE STUDENTS IN ELEMENTARY SCHOOL . 5 (2). https://doi.org/10.30605/proximal.v5i2.1859

Sulaiman, A., & Azizah, S. (2020). PROBLEM-BASED LEARNING TO IMPROVE CRITICAL THINKING ABILITY IN INDONESIA: A SYSTEMATIC LITERATURE REVIEW. *Journal Pedagogic , 07* (01). https://ejournal.unuja.ac.id/index.php/pedagogik

Trisharsiwi , H., Prihatni , Y., Wani, E., Endang, K., Yohana, H., Rusnoto , S., Iskandar, S., Zainnur , Y., Arya, W., Setiawan, D., Al, A., Taryatman , M., Ballerina, T., Kartikasari , E., & Suprih Sudrajat , I. (2020). STUDENT *RESPONSIBILITY Compiler* .

LAW OF THE REPUBLIC OF INDONESIA NUMBER 20 OF 2003 CONCERNING THE NATIONAL EDUCATION SYSTEM WITH THE GRACE OF GOD ALMIGHTY THE PRESIDENT OF THE REPUBLIC OF INDONESIA . (n.d.).

Widayanti , R., Dwi Nur, K., & YPPK Yoanes XXIII Merauke, S. (nd). Application of the Problem Based Learning Learning Model for Increase Performance Study Math and Activity student . In *MATHEMA JOURNAL E-ISSN* (Vol. 2, Issue 1).

Wulandari, A., & Suparno, S. (2020). Effect of Problem Based Learning Model on Ability The Character of Early Childhood Cooperation . *Journal Obsession : Journal of Early Childhood Education , 4* (2), 862. https://doi.org/10.31004/obsesi.v4i2.448