

Problem-Based Learning Model to Improve Critical Thinking in Mathematics for Third Grade Elementary School

Safira Tri Retnoasih¹, Widowati Pusporini², Sri Mulyaningsih³, Miftakhurrohmah⁴

¹⁻²*Universitas Sarjanawiyata Tamansiswa, Indonesia*

³⁻⁴*Elementary School of Grojogan, Indonesia*

*Corresponding Author e-mail: safiratriretnoasih09@gmail.com

1. Abstract

The research conducted was motivated by students' lack of critical thinking skills in learning activities. The purpose of this research is to improve critical thinking skills through the learning model of problem-based learning. The research method used was collaborative classroom action research (PTKK) with research subjects, namely elementary students in grade THIRD, a total of 22 students consisting of 10 male and 12 female students. Observation, interviews, documentation, questionnaires, and tests were used to collect data. Descriptive, qualitative and quantitative technique was used for data analysis. The results of the study included two cycles: the use of problem-based learning models can improve students' critical thinking skills. This is evident from the baseline conditions, which showed an average score of 60.2 with 36.4% of students graduating with the Less title. Cycle I had an average score of 63.0 with 69.1% of students meeting the minimum threshold with a Sufficient rating. In contrast, in the II cycle, an average score of 84 was achieved, with 93.2% of students completing with a rating of Very Good. It can be concluded that the PBL model can improve students' critical thinking skills in learning mathematics.

Keywords: *Problem Based Learning, Critical Thinking, Mathematics*

2. Introduction

Education is a conscious and planned effort to create an active learning atmosphere and process so that it can develop its potential. Through education we can teach competencies such as affective, cognitive and psychomotor. As emphasized in

(Sisdiknas, 2003), education is a basic and planned effort to create a learning atmosphere and process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and the skills that they themselves, society, and the state require.

In this regard, the government is making efforts or ways to improve the quality of education in Indonesia, including the creation of a curriculum. The current curriculum is the 2013 curriculum, and one of the goals of the 2013 curriculum is to improve students' skills to ask questions and answers, observe, and communicate their ideas (Rohman, et al., 2021). When using the 2013 curriculum, learning is done thematically or in an integrated fashion. Thematic learning is learning that is integrated between one lesson and another. Thematic learning consists of several subjects, including Indonesian, PPKn, SBdP, mathematics, and PJOK. This subject is a subject that must be taken in the third grade.

According to Rafianti, Y. (2018), the learning activities of the 2013 curriculum emphasize aspects of character strengthening, in addition, learning should be linked to the 4C (Creative, Critical Thinking, Communicative, Collaborative and HOTS). Learning that emphasizes critical thinking or critical and creative thinking allows students to keep up with the times. In learning that emphasizes critical thinking, a researcher not only transfers the knowledge he or she has, but also provides students with knowledge and understanding so that they can understand and apply the knowledge they have acquired.

Learning mathematics is one of the compulsory subjects in the learning activities provided in the implementation of the 2013 curriculum. In practice, mathematics is designed to enable students to think critically. Based on the results of the interviews conducted by the researchers with the third grade on April 12, 2023, it was found that critical thinking skills are still low among the students in the third grade. This was found

using several indicators of critical thinking, including the ability to express opinions, the ability to interact, the ability to identify information, and the ability to analyze problems. The low critical thinking ability is due to the way the researcher teaches with the lecture method and does not use interesting learning media. Therefore, a solution must be found to improve the critical thinking ability of the students in the third grade. The solution to overcome these problems is that a learning model is needed that can overcome these problems by using a problem-based learning model.

The problem-based learning (PBL) learning model can teach subject matter through problem solving. In problem solving, students are expected to be able to analyze the problems they face and find a solution to the problem. In this way, students can design their own learning experiences through problem solving and improve their critical thinking skills. PBL can be initiated by unstructured problems with an answer (Ghufron & Ermawati: 2018). According to Nurhayati (2021), the problem-based learning model is a model that proposes learning strategies by using real-world problems as a context for student learning. According to Novianti (2020), PBL is an effective model for teaching thinking processes. This learning helps students process preconceived information in their minds and assemble their own knowledge about the social world and their environment.

Based on the problems presented above, the author intends to solve learning problems through the model of problem-based learning. The formulation of the problem posed in this study is: "How can a "problem-based learning model for improving critical thinking in mathematics in the grade three elementary school students.

3. Methods

3.1. Participants and context

The applied research method belongs to the type of collaborative action research in the classroom (PTKK). Castro Garces and Granada's collaborative action research in the classroom (PTKK) is a research conducted by researchers by involving other people such as teachers, peers, and students in work teams and allowing them to reflect on their pedagogical practices (in Rasyimah & Sari, 2022). In this study, Kemmis and Mc Taggart's model was used, which consists of four phases, namely: planning, action, observation, and reflection (Asori & Rusman, 2020). The subjects of this study were elementary school students in third grade with a total of 22 students. This collaborative classroom action research was conducted in two cycles. Cycle I consisted of 2 sessions and Cycle II consisted of 2 sessions.

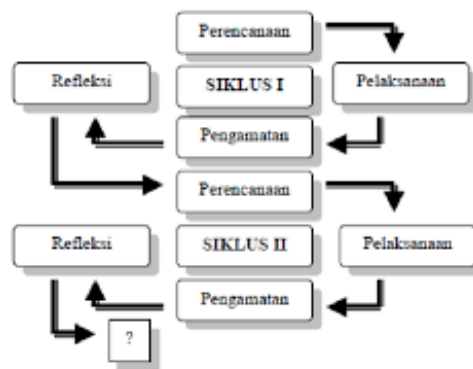


Figure 1. Spiral Model of Kemmis and McTaggart

3.2. Material

The research instruments used in this study were observation sheets, interviews, questionnaires, tests, and documentation. Observation sheets or observations in research are used to analyze data in the process of learning activities taking place. The

questionnaires were given to the students to find out the condition of the students in terms of their learning activities and knowledge. The test is used to measure the students' ability. Meanwhile, the documentation is used as supporting data for the activities.

3.3. Data Collection and analysis

Researchers use data collection techniques to obtain data. The data collection techniques used in this study are observation, questionnaires, interviews, tests, and documentation. Qualitative and quantitative descriptive data analysis techniques were used in data analysis. Qualitative data analysis in the research was conducted through observation or observation in the learning process using a problem-based learning model. In quantitative data analysis, the ability to answer questions was determined by a pretest and a posttest.

The formula proposed by Purwanto to calculate the percentage of students' critical thinking skills is as follows (Fahrnisa, 2019)

$$NP = \frac{R}{SM} \times 100$$

Information:

NP: the percent value sought or expected

R : value/raw score obtained (actual score)

SM : ideal maximum score of value/score (ideal score)

100 : fixed number

Based on the percentage obtained, it is interpreted and classified according to the following table:

Table 1. Categories of Students' Critical Thinking Ability

No.	Persentase	Kategori
1.	86%-100%	Very good
2.	76%-85%	Good
3.	60%-75%	Pretty good
4.	55%-59%	Not enough
5.	0%-54%	Less Once

3.4. Ethical Considerations

In the research conducted, humans are used as subjects. In addition, this research, which is collaborative action research in the classroom, requires other people as research subjects. The subjects of this research were students in the third grade. The research conducted applies the basic principles of research, including: first, respect for people, in this case, we need to respect and value students, where these students are research subjects, second, there are advantages, in this study, namely for students to add a rich learning experience fun with the Problem Based Learning model, so it can improve students' critical thinking skills.

3.5. Limitations to the Study

The research conducted has numerous limitations, including duration of activity, energy, conditioning of students, and cost. Researchers involved in using learning models of problem-based learning to improve critical thinking or critical thinking in mathematics in grade THIRD elementary students.

4. Results and Discussion

The subjects were all third gradeA students, 22 students in total. Comparison of the results of critical thinking skills possessed by the students of third gradeA, starting from the initial conditions, cycle I and cycle II through the use of problem-based learning models. The following are the results of critical thinking skills in tabular form.

Table 2. Level of Critical Thinking Ability Third gradeA

Initial Conditions		Criteria	Cycle I		Criteria	Cycle II		Criteria
60,2	36,4%	Not enough	65,0	69,1%	Enough	81,5	93,2%	Very good

This critical thinking ability includes three indicators used in research, namely the ability to express opinions, the ability to interact, and the ability to identify information. In the study of critical thinking, students use observations and questionnaires.

The results of the three indicators obtained from the data of the initial and final conditions are an average of 60.2 in the initial conditions, with 36.4% of the students reaching the minimum threshold with the predicate "less". Cycle I obtained an average of 63.0 with 69.1% of students achieving the minimum cutoff with a satisfactory rating. Cycle II, on the other hand, received an average of 84.0 with 93.2% of students reaching the minimum threshold with a good predicate.

Table 3. Data Comparison of Critical Thinking Ability Cycles I and II

No	Indicator	Total Score of Cycle I	Total Score of Cycle II	Cycle I Results	Cycle II results
1.	Ask and answer	66	85	73,3%	94,4%
2.	Interact with others	68	87	75,5%	96,6%
3.	Identifying Information	53	80	58,8%	88,8%
Average student		63,0	84,0	69,1%	93,2%

The problem-based learning model is a learning model that is often used by researchers when conducting learning activities. The problem-based learning model has several advantages, including improving critical thinking skills, encouraging student initiative, and developing a cooperative attitude. However, in addition to the advantages, the PBL learning model also has weaknesses, such as the need for a guide to help students understand the learning activities. The problem-based learning model consists of various steps of the learning activity, including a) orientation to the problem, b) student organization, c) leading individual or group investigations, d) developing and presenting the work, e) analyzing and evaluating the problem-solving process.

The steps taken in learning activities are the first, the researcher conveys the learning objectives to be studied. By communicating the learning objectives, students become aware of the learning activities to be studied. In this step, the researcher presents a text and pictures that relate to the learning activities being investigated. Text and images can arouse learners' curiosity. The second step, orienting learners, is to show a picture of a swimming pool and a triggering question about the swimming pool. The learners look at the picture. The second step is for the researcher to organize learners to learn with their peers by forming research groups. Each group is given student

worksheets (LKPD). Students divide up tasks to find data and complete the tasks in the LKPD. The third step is for the researcher to guide the group investigation. A group formed consists of 4-5 students. Then, each group conducts a joint discussion with instructions on the student worksheet (LKPD). The students' task is to gather information from the other groups about the material they have worked out together. This method is a puzzle method. After acquiring the knowledge, they discuss it with their friends in their own group so that they can answer the given LKPD. The fourth step is that each group presents the results of the discussion conducted. The researchers estimate the results of the group work. The last step is to analyze and evaluate the problem solving process. In this step, the other groups are given the opportunity to respond to the presentation of the group reading the results and vice versa. The researchers equalize the opinions in order to avoid misunderstandings.

The use of problem-based learning models is suitable for curriculum-based learning in 2013 because it can make students think more critically when learning certain learning content. In 2013 curriculum, the learning contents are integrated with other learning contents. Therefore, the problem-based learning model is suitable for the 2013 curriculum. The PBL learning model is applied to everyday life or adapted to students' experiences so that students can think critically and develop problem-solving skills.

The use of problem-based learning models can improve students' critical thinking skills, as evidenced by an increase in each cycle. In the baseline, an average score of 60.2 was achieved, with 36.4% of students meeting the minimum threshold with a rating of "less critical." In Cycle I, an average score of 65.0 was achieved, with 69.1% of students meeting the minimum threshold with a less critical predicate. While in Cycle II, an average of 81.5 was achieved, with 93.2% of students achieving the minimum threshold with a critical predicate.

Pamungkas Dewi, et al. (2019) conducted an increase in critical thinking skills entitled Improving Critical Thinking Skills and Mathematics Learning Outcomes in Grade IV Students Through the Application of the Problem Based Learning Model. In this study, critical thinking skills were successfully improved through the application of the problem-based learning model in the grade IV Elementary School of Tingkir Tengah 02.

5. Conclusion

Based on the results of the research and discussion conducted by the researcher, it can be concluded as follows: Problem Based Learning Model Increases critical thinking in mathematical subjects in the grade three elementary students with steps carried out according to the learning model of problem-based learning, namely: orientation of students to problems (presents texts and images), organization of students Didik presents the work of LKPD), analysis and evaluation of the problem solving process (students do questions and answers with other groups).

The use of learning models of problem-based learning can improve students' critical thinking skills in Topic 7 Development of Technology Subtopic 4 Development of Learning Transportation Technology 3 Mathematical content has been shown to increase in each cycle. In the baseline conditions, an average score of 60.2 was achieved, with 36.4% of students meeting the minimum threshold with a rating of "less critical." In Cycle I, an average score of 63.0 was achieved, with 69.1% of students meeting the minimum threshold with a rating of "adequate." In the cycle II, on the other hand, an average score of 84 was achieved, with 93.2% of the students reaching the minimum threshold with a very good predicate.

6. References

- Asrori dan Rusman. (2020). Classroom Action Research: Pengembangan Kompetensi Guru. *Purwokerto: Pena Persada*
- Castro Garcés, A. Y., & Martínez Granada, L. (2016). The Role of Collaborative Action Research in Teachers' Professional Development. *PROFILE Issues in Teachers' Professional Development*, 18(1), 39-54. Dalman, H. (2014). Keterampilan Menulis. Jakarta: Raja Grafindo Persada
- Fahrnisa, A (2019). Penerapan Model PBL untuk Meningkatkan Kemampuan Berpikir Kritis Siswa. Universitas Negeri Yogyakarta
- Ghufron, M. Ali., Siti Ermawati. (2018). The Strengths and Weaknesses of Cooperative Learning and Problem based Learning in EFL Writing Class: Teachers and Students' Perspectives. *International Journal of Instruction*. Vol. 11 No. 4. E-ISSN 13081470 , P-ISSN 1694-609X.
- Nurhayati, et al., (2021). Penerapan Model Pembelajaran Berbasis Masalah *Problem Based Learning* (PBL) pada Pelajaran Bahasa Indonesia Guna Meningkatkan Terampil Membaca dan Menulis Lanjut di Kelas IV Sekolah Dasar. *Jurnal Pendidikan Dasar Setiabudhi*
- Pamungkas, Dewi.et al., (2019). Peningkatan Keterampilan Berpikir Kritis dan Hasil Belajar Matematika pada Siswa Kelas IV Melalui Penerapan Model Problem Based Learning. *Jurnal Ilmiah Sekolah Dasar*
- Permendikbud No.103 Tahun 2014 tentang Pembelajaran pada Pendidikan Dasar dan Pendidikan Menengah, Pasal 11.
- Rafianti, Yani, dan Novaliyosi. 2018. Profil Kemampuan Literasi Kuantitatif Calon Guru Matematika. *JPPM*, 11 (1): 63-74
- Rasyimah dan Sari, D.K (2022). Peningkatan Membaca Pemahaman Siswa pada Teks Deskripsi melalui Problem Based Learning. *Sinktaks Jurnal Bahasa & Sastra Indonesia*

Rohman, Syaifudin, & Astiswijaya, I (2021). Kemampuan Pemahaman Konsep Pada Pembelajaran Matematika Menggunakan Metode Penemuan Terbimbing di SMA Negeri 14 Palembang. *Jurnal Penelitian Pendidikan Matematika*

Undang-Undang Republik Indonesia Nomor 20 tahun 2003 tentang Sistem Pendidikan Nasional. 2003. Jakarta: Kemendiknas.