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

ISSN: 3025-020X

Improving Mathematical Students' Creative Thinking Skill and Representation Through the PjBL Model

Nashri Maulidah[1], Esti Harini[2], Ardi Fajar Setyawan[3]

[1]*Universitas Sarjanawiyata Tamansiswa, Indonesia*
[2]*SD Negeri Yogyakarta, Indonesia*
**Coresponding author email:* nashrimaulidah57@gmail.com

1. Abstract

This study aims to analyze the increase of students' creative thinking skills and mathematical representation ability. Mathematical representation ability is the ability of students to transform notations, tables, diagrams, or other mathematical expressions into new forms. This skill helps students develop ideas for solving problems (creative thinking skills). Through the PjBL learning model, students can represent data in the form of bar and line graphs, which makes it easier for them to develop ideas for solving problems. This study was conducted in one of the public elementary schools in Yogyakarta. The subjects of this study were fifth grade students with a total of 26 children. The research method used in this study is classroom action research with an instrument in the form of a descriptive test. The results showed that students' creative thinking and mathematical representation skills improved by using the PjBL model. Students' ability to think mathematically creatively has an initial percentage of 49%, which increases to 56% in Cycle I and 75% in Cycle II. Students' ability to represent mathematically also increased from an initial classical percentage of 47% to 70% in Cycle I and 83% in Cycle II. Therefore, it can be concluded that the PjBL learning model can improve fifth graders' creative thinking and mathematical representation skills in learning mathematics.

Keywords: *creative thinking skills, mathematical representation skills, project-based learning (PjBL)*

2. Introduction

Mathematics learning in elementary school provides the foundation for applying mathematical concepts at the next level. Therefore, this learning is not only about teaching information such as rules, definitions, and procedures for students to memorize,

ISSN: 3025-020X

but the teacher must actively engage students in the learning process. By engaging students in the learning process, their understanding of mathematical concepts is strengthened.

According to the National Council of Teachers of Mathematics (NCTM, 2000: 4), students need to have five skills when learning mathematics: Problem Solving, Reasoning and proof, Communication, Corrections, and Representations. Representational ability is an important skill to develop students' thinking ability because with this skill, students can transfer mathematical ideas from the abstract to the concrete and thus understand them more easily (Sahendra et all in Farahhadi and Wardono, 2019).

Solving problems in daily life requires the ability to think creatively. The ability to think creatively in mathematics means the ability to find solutions to mathematical problems through alternative solutions. With the ability to think creatively, students can identify problems, identify relevant and irrelevant data, be productive, and develop many different ideas (Puccio and Mudock in La Monna, 2015).

Based on the results of observations conducted in one of the public elementary schools in Yogyakarta, it was found that learning there is still classical and focused on the teacher. In addition, the students' ability to present data is still low. This is evident from the initial research. The results showed that students' mathematical presentation skills and creative thinking skills are still low. Students still have difficulty understanding graphs, transforming data into graphs, and analyzing data from graphs. In addition, students' ability to answer questions with short answers and difficulty relating problems in

ISSN: 3025-020X

questions to understood concepts indicate that students' creative thinking skills are also still low.

These problems mean that the learning process is not optimal, so it needs to be improved to achieve the desired goals. Therefore, an appropriate learning model is needed to improve creative thinking and mathematical representation skills. There are many models for learning mathematics that can be applied to learning mathematics with this goal in mind, such as the Project-Based Learning (PjBL) learning model.

The PjBL learning model is one in which the project is at the core of learning. In this instruction, the teacher involves students in a project that includes complex tasks and the outcome is in the form of products, either written or oral reports, presentations, or recommendations (Nadea in Faradilla, Zainil, and Sumiati, 2021). By using this model, learning will be student-centered, because the teacher acts as a facilitator to guide students in constructing their learning as they complete a project. The sequence or syntax of the PjBL model is (1) establishing basic questions, (2) creating project plans, (3) creating timelines, (4) monitoring students and project progress, (5) reviewing results, (6) evaluating lessons learned (Kemdikbud, 2014: 47).

Previous research has shown that the PjBL model can improve the learning outcomes of students in class VI in SD Negeri 20 Indarung Padang City (Faradila, Zainil, and Sumiati, 2021). In line with this, Restu, Ruqoyyah, and Samsudin (2020) found that there was an impact on the representational skills of grade III in terms of fractional material after the PjBL model was introduced. Therefore, it can be concluded that the PjBL model can help students in overcoming the low ability of student's creative thinking and mathematical representation skills.

For the above reasons, the researcher is interested in conducting a study entitled

ISSN: 3025-020X

"Improving Students' Creative Thinking Ability and Mathematical Representation through the PjBL Model".

ISSN: 3025-020X

3. Methods

3.1. Participants and context

This study was conducted in one of the public elementary schools in Yogyakarta city in the school year 2022/2023 with 26 students in fifth grade. This study is a type of classroom action research (PTK) based on Kurt Lewin's model. Classroom action research is conducted by the teacher in the classroom to observe the actual effect of efforts to improve learning (Rochiati in Faradilla, Zainil and Sumiati, 2021). This research was conducted by the researchers in collaboration with colleagues, tutors and classroom teachers. The procedure of this research includes planning, implementation of actions, observation and reflection (Widihastrini dalam Zulham, 2022: 30). This research was conducted to improve students' creative thinking skills and mathematical representations through the PjBL model.

3.2. Material

The instrument used in this study is a description test. The test is used to measure the variables of creative thinking ability and mathematical representation ability. The number of questions for each variable is 4 questions.

3.3. Data Collection and analysis

The data collection technique in this study was a description test distributed to each student. The indicators used in this study are explained below. Indicators of creative thinking ability are fluency, flexibility, originality, and ellaboration.

Tabel 1. Indicator of Creative Thinking Skill

Variabel Aspect	Indicator
Fluency	Responds with a series of answers when there are questions, and expresses his ideas fluently
Flexibility	Suggesting different interpretations of a picture, story, or problem
Originality	
Ellaboration	

ISSN: 3025-020X

	Solving problems with their own ideas
	Searching for a deeper meaning of the answer or problem solution through detailed steps

ISSN: 3025-020X

~~The following are the indicators of mathematical representation skill examined in this~~ study:

Tabel 2. Indicator of Mathematical Representation Skill

Variable Aspect	Indicator
Visual Representation	Representing data or information from a representation in a chart, graph, or table
	Using visual representations to solve problems
Word Representation	Write an interpretation of a representation
	Answer questions using words or written text

(Lestari dan Yudhanegara, 2017)

Technique of data analysis with quantitative-descriptive method. This analysis is carried out by means of creative thinking tests and mathematical representations, which are carried out at the end of each cycle. The formula used to calculate the results of the creative thinking skills and mathematical representations tests is as follows:

$$\text{Persentase} = \frac{\text{Skor yang diperoleh}}{\text{Skor maksimal}} \times \text{Persentase maksimal}$$

(Kemdikbud, 2019: 44)

The success indicators in this study were based on the achievement of students' creative thinking skills and mathematical representations using the project-based learning (PjBL) model of > 70% of the students achieved a minimum score of 75, so the study was declared successful.

4. Results and Discussion

ISSN: 3025-020X

The results of the study conducted in Class V of one of the elementary schools in Yogyakarta show that the students' creative thinking and mathematical representation skills using the PjBL model are as follows:

ISSN: 3025-020X

Table 3 The Result of Creative Thinking Skill

Indicator	KKM	Total Students	Pre Cycle		Cycle 1		Cycle 2	
			Students complete	Criteria	Students complete	Criteria	Students complete	Criteria
Fluency	75	26	12	46%	11	42%	19	73%
Flexibility	75	26	17	65%	21	81%	24	92%
Originality	75	26	14	54%	15	58%	18	69%
Elaboration	75	26	8	31%	11	42%	17	65%
Average			59		64		77	
Percentage of Classical Mastery			49%		56%		75%	

From the above table, it can be seen that students' creative thinking skills improved in teaching mathematics about the presentation of individual data as measured by the indicators of fluency, flexibility, originality, and decoding. The average score of students' creative thinking skills increased from 59 to 64 in the first cycle and to 77 in the second cycle. The minimum score for the completeness criteria (KKM) in mathematics is 75. The percentage of students' classical mastery of creative thinking skills in this study also increased from 49% to 56% in the first cycle and to 75% in the second cycle.

Table 4 The Result of Mathematical Representation Skill

Indicator	KKM	Total Student	Pre Cycle		Cycle 1		Cycle 2	
			Student complete	Criteria	student complete	criteria	student complete	Criteria
Visual Representation	75	26	12	46%	18	69%	21	79%
Word Representation	75	26	13	48%	19	71%	23	87%
Average			58		72		77	
Percentage of Classical Mastery			47%		70%		83%	

From the above table, it can be seen that students' mathematical representation skills increased when learning mathematics about the presentation of individual data, as measured by the indicators: visual representation and word representation. The average

ISSN: 3025-020X

score of students' mathematical representation skills has increased from 58 to 72 in the first cycle and 77 in the second cycle. The minimum score for the completeness criteria

ISSN: 3025-020X

(KKM) in mathematics is 75. The percentage of classical mastery of mathematical presentation skills also increased from 47% to 70% in the first cycle and to 83% in the second cycle.

5. Conclusion

Based on the results and discussion of the classroom action research on the improvement of students' creative thinking skills and mathematical representations in grade V learning mathematics through the PjBL model, it can be concluded that fifth grade students' creative thinking skills and mathematical representations have increased. Students' creative mathematical thinking ability has an initial percentage of 49%, which increases to 56% in Cycle I and 75% in Cycle II. Students' ability to represent mathematically also increased from an initial percentage of 47% to 70% in Cycle I and 83% in Cycle II.

6. Acknowledgement

I would like to thank the supervising lecturers, tutors, class teachers and all the students who supported me in this research. In addition, I would also like to thank my friends in the group who helped me complete this assignment.

7. References

Faradilla, A., Zainil, M., & Sumiati, C. (2021). Peningkatan Hasil Belajar Penyajian Data Menggunakan Model Project Based Learning (PJBL) di Kelas IV SD Negeri 20 Indarung Kota Padang. Jurnal Pendidikan Tambusai, 5(2), 3255-3267.

Farahhadi, S. D., & Wardono, W. (2019, February). Representasi matematis dalam pemecahan masalah. In PRISMA, Prosiding Seminar Nasional Matematika (Vol. 2, pp. 606-610).

Kemdikbud. (2019). Panduan Penilaian Tes Tertulis. Jakarta: Pusat Penilaian Pendidikan

Kurniawan, W. J., & Prasetyo, Z. K. (2019). The Effect of the Surrounding Environment As a Learning Resource on the Mastery Concept and Creative Thinking on Elementary School. KnE Social Sciences, 3(17), 599–609.

ISSN: 3025-020X

Lestari, K.E. (2017). Penelitian Pendidikan Matematika. Bandung: PT Refika Aditama

NCTM–NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS. (2000). Executive Summary: Principles and Standards for School Mathematics. Principles and Standards for School Mathematics, 1-6.

Restu, N. K., Ruqoyyah, S., & Samsudin, A. (2020). Kemampuan Representasi Matematis Bilangan Pecahan Pada Siswa Kelas III SD dengan Menggunakan Model Project Based Learning. COLLASE (Creative of Learning Students Elementary Education), 3(3), 73-81.

Zulham. F. (2022). Skripsi Peningkatan Prestasi Belajar Muatan Ilmu Pengetahuan Sosial melalui Mdel Problem Based Learning pada Siswa Kelas IV B SD Negeri Borobudur I. Fakultas Keguruan dan Ilmu Pendidikan: Universitas Sarjanawiyata Tamansiswa Yogyakarta