

Elementary school students' mathematical creative thinking ability

Herman Syafri*

Universitas Pendidikan Indonesia, Tasikmalaya Campus, Tasikmalaya, Indonesia

Corresponding author: herman.syafri@upi.edu

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Abstract

Mathematical creative thinking is required to develop analytical, evaluative, problem-solving, and critical information connection abilities. Elementary school students will have a strong foundation for studying mathematics at a higher level and for facing daily challenges if they are encouraged to think creatively in mathematics. The present study aimed to determine the profile of elementary school student's ability to think creatively in mathematics. This study employed a quantitative descriptive survey with a sample size of 48 elementary school pupils aged 7 to 12. The instrument used was a 32-question test of mathematical creative thinking with a maximum score of 40 and three dimensions, namely fluency, variability, and novelty, with a 0.86 level of reliability. The results indicate that the average value of mathematical creative thinking in the "Fair" category is 71.61, with the lowest value being 67.5 and the highest value being 82.5. Regarding their ability to think creatively in mathematics, 92.80% of students fall into the "Fair" category, while 4.2% fall into the "Good" category. However, from the analysis results, the importance of mathematical creative thinking is still not included in the "Good" category. Consequently, there is a need for methods or media to enhance the ability of elementary school students to think creatively in mathematics or calculation.

Keywords: Creative thinking; Mathematics; Elementary school students

INTRODUCTION

Creative thinking in mathematics encourages students to understand mathematical concepts more deeply (Siregar et al., 2020). When they try different approaches and strategies, they will dig deeper and strengthen their understanding of the mathematical concept (Febriyanti & Irawan, 2017).

Creative thinking in mathematics entails students' ability to look for non-routine solutions and view problems from different angles. It helps them develop strong problem-solving skills, which can be applied in real-life situations outside the classroom (Huda et al., 2020).

However, many elementary school mathematics curricula focus on mastering basic concepts (Hernawan & Resmini, 2009; Lidinillah, 2011). Despite the fact that this is essential, a lack of emphasis on creative thinking and non-routine solutions can leave students unprepared to explore alternative approaches to solving mathematical problems.

Teacher-centered teaching methods that rely heavily on direct instruction frequently limit students' ability to think creatively (Mariyaningsih & Hidayati, 2018). Students who follow instructions and learn routines may miss the opportunity to develop critical and creative thinking skills.

Some students may fear or worry about making errors while solving math problems. This situation may inhibit their courage to attempt alternative approaches or think creatively. Fear of making errors can also develop when students are frequently evaluated based on the final correct answer rather than the thought process they employed (Lidia, 2020). Lack of practice in solving problems that require creative thinking can make students less skilled in facing new challenges that require different approaches (Saraswati & Agustika, 2020).

Although the development of creativity or creative thinking in mathematics is deemed essential by many researchers, there are obstacles to completing creative tasks, especially before secondary school (Bertoni &

Maffia, 2022). Current approaches in mathematics education promote the teaching of creative thinking to develop a profound conceptual understanding of mathematics, and many countries include explicit creative thinking learning objectives in their curricula (Hadar & Tirosh, 2019).

Identifying these issues and attempting to fix them is crucial by introducing teaching methods that stimulate creative thinking, provide diverse problem-solving exercises, and encourage students to try innovative and unconventional approaches to solving mathematical problems (Schoevers et al., 2019). According to a number of studies, mathematics instruction in elementary schools frequently focuses on solving routine, standard problems rather than fostering creative thinking (Amir, 2015; Lidinillah, 2011; Holisin & Kristanti, 2017; Yuniati et al., 2017). In addition, several other studies describe the significance of mathematical thinking in elementary school students (Anggoro, 2015; Febriyanti & Irawan, 2017; Marungung et al., 2020; Samsiyah & Rudyanto, 2015; Lesmanawati, 2020).

Hence, this study aimed to determine the extent of the profile of mathematical creative thinking ability in elementary school students.

RESEARCH METHODOLOGY

This study utilized a quantitative descriptive survey research design. This method is a problem-solving procedure that investigates a subject's condition by describing or depicting it. Descriptive research enables researchers to describe the information in numerous scores using just a few indexes, such as the mean, median, and mode (Fraenkel et al., 2012).

The study included a total of 48 elementary school students as samples. The cohort was selected from SDN 02 Batujaya, comprised of upper-grade students, specifically fourth-graders. The sample's age range was 10 to 12 years old, which is considered ideal for developing creative thinking skills.

The instrument employed tested mathematical thinking creativity developed by the researcher and comprised three dimensions: fluency, variability, and novelty (originality) (Yuliana, 2015). The

development of the test instrument for the dimensions of mathematical creative thinking and its corresponding indicators are detailed below.

Table 1.
Mathematical Creative Thinking Test Instrument

Dimension	Indicators
Fluency	1. Determine the result of a calculation quickly
	2. Determine the counting operation of a given number
Variability	1. Determine different counting operations using the commutative property
	2. Determine different counting operations using the distributive property
	3. Determine different counting operations using the associative property
	4. Determine different counting operations using the compensatory property
	5. Determine different counting operations using the <i>Vinakle loop</i> property (<i>aha experience</i>)
Novelty	1. Determine multiple different arithmetic operations from a given arithmetic operation
	2. Determine multiple counting operations that are different from a given number
	3. Determine one solution to an <i>open-ended</i> question

This instrument had been tested for validity and reliability with a reliability coefficient of 0.86 consisting of 32 questions using two different forms of scores, namely dichotomous items and polytomous items, with a maximum score of 40. The score would be converted into a final score with the following formula:

$$\text{Final score} = \text{Raw score} : \text{Ideal score} \times 100$$

The score categories on the mathematical creative thinking test can be seen in Table 2.

Table 2
Assessment Category

Score Range	Category
90 – 100	Very Good
70 – 89	Good
60 – 69	Fair
45 – 59	Poor
<44	Very Poor

RESULTS AND DISCUSSION

The results of the research involving 48 elementary school students on mathematical creative thinking are shown below:

Table 3
Descriptive Statistics

N	48
Mean	71.61
SD	3.52
Min.	67.5
Max.	82.5

The average mathematical creative thinking score of 48 elementary school students is 71.61, with a standard deviation of 3.52. In addition, the lowest score is 67.5, while the highest score is 82.5.

According to Table 2, the results indicate that the average mathematical creative thinking ability of elementary school students falls into the "Fair" category, with the lowest student ability falling into the "Fair" category and the highest student ability falling into the "Good" category.

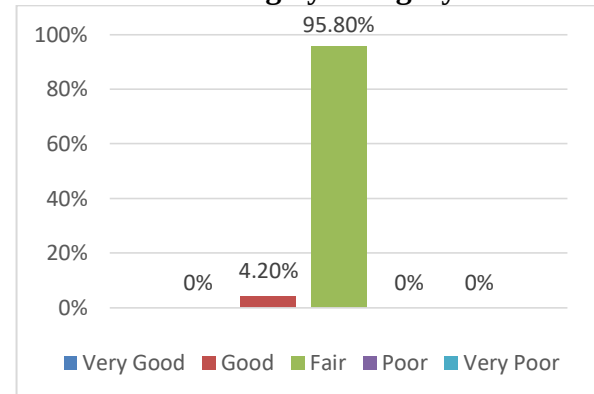
Table 4.
Number of Students Based on Mathematical Creative Thinking Category

Category	Total number of students
Very Good	0
Good	2
Fair	46
Poor	0
Very Poor	0
Total	48

The majority of students' ability to think creatively in mathematics falls into the "Fair" category, with 46 students falling into this category. "Fair," "Poor," and "Very Poor"

each represent 0 students. According to categories, the percentage of mathematical creativity is as follows:

Graph 1
Percentage of Mathematical Creative Thinking by Category



The results mentioned above illustrate a problem associated with elementary school students' lack of mathematical creative thinking ability. Meanwhile, this ability is necessary for fostering creativity. When given the freedom to seek innovative and alternative solutions, they learn to think outside the boundaries and develop a broader mathematical imagination (Siregar, 2019). In addition, another study explained that creative thinking skills in mathematics are precious in today's digital era (Ayu, 2019). In fact, technological developments such as artificial intelligence and data analysis require creative thinking skills in solving complex mathematical problems.

Creative thinking involves students' ability to critically analyze, evaluate and connect information (Siswono, 2016). It helps them develop essential critical thinking skills for solving mathematical problems and other aspects of life.

There are several factors that can contribute to the lack of creative thinking in mathematics among elementary school students, such as a curriculum that emphasizes on mastering concepts (Agustina, 2020); limited teaching methods (Anggoro, 2015); and evaluation demands that focus on results (Widana & Septiari, 2021).

By promoting creative thinking in mathematics, elementary school students will have a solid foundation for learning more advanced mathematics at higher levels and facing everyday challenges (Perkasa et al., 2022).

CONCLUSIONS

The general description of students' ability to think creatively in mathematics indicates that most students fall into the "Fair" category with 46 students. The average score for the "Good" category is 71.61, with the lowest score being 67.5 and the highest score being 82.5.

Mathematical creative thinking is needed to improve the ability to analyze, evaluate, have strong problem-solving skills, and connect information critically. Nevertheless, the significance of creative thinking in mathematics is not yet in the "Good" category. Therefore, a method or tool is required to enhance the mathematical creativity of elementary school students.

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