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Analysis of Mathematical Critical Thinking Ability of Fourth Graders of Public Elementary School 001 Air Tiris

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ABSTRACT

This research is motivated by the low ability of students to think critically and mathematically when solving problems. The purpose of this study was to analyze the ability to think critically mathematically in fourth grade students at public elementary school 001 Air Tiris. This research uses descriptive and qualitative research methods. The participants in this study were all children enrolled in the fourth grade at 001 Air Tiris Public Elementary School. There are 24 fourth grade students in total. The data collected is in the form of written assessments, direct interviews, and mathematical calculations. Based on the results of the research, the level of mathematical critical thinking ability of the fourth grade students at public elementary school 001 Air Tiris is included in the medium category. The average achievement of the correct answer is 50.0%. Each student has unique abilities, so teachers should give them more critical thinking practice. Teachers can develop critical thinking strategies or learning models to improve students' mathematical thinking abilities.

1. Introduction

Learning arithmetic emphasizes higher-order thinking abilities, which challenge students to rearrange information and ideas to offer new meanings and consequences. Mathematics can improve thinking, debating, and problem-solving skills. This promise can only be fulfilled if mathematics instruction encourages higher-order thinking. Creative thinking is a high-level ability (Kurnia & Sunarno, 2021). High-level thinking abilities include being critical, logical, creative, introspective, and metacognitive (Herdiansyah, 2019). Mathematics is necessary because it is the basis for contemporary technology, which is very important in everyday life. Mathematics helps students think rationally, critically, and mathematically to solve problems (Nst, 2017; Suryani & Hendrayadi, 2016). At a basic level, the goal of mathematics is to be abstract; this is a major source of the difficulties mathematics teachers experience when teaching mathematics, which

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can lead to students underachievement in learning mathematics. The answer to this problem is that mathematics professors can concretize or simplify abstract mathematical things with the intention of making it easier for students to understand mathematics. This will allow more students to study mathematics. If activities like this are included in every mathematics lesson, students will not be intimidated by mathematics when they study it. In addition, it is very important for educators to emphasize the development of students' analytical and deductive reasoning skills, which are very useful for students pursuing mathematics education (Suryani et al., 2020). Critical thinking is a process of training cognitive skills in goal-setting. In the process of learning to think critically, it is necessary that students are not accustomed to just memorizing; in critical thinking, the students' brains are forced to remember various information. Learning that only emphasizes knowledge and understanding of the material will have an impact on low ability, especially in the cognitive aspect. If students' critical thinking skills have not been independently trained, they will have difficulty applying the knowledge they have in everyday life (Nasional, 2009).

Critical thinking abilities play an important role in the process of finding solutions to math problems. This is because critical thinking has the potential to affect the ability, speed, and efficiency of learning. Students who are used to thinking critically will show beneficial effects in the learning process. From this, we can conclude that the ability to think critically about arithmetic can inspire students to actively seek knowledge, face problems, and find answers. Identify problems, analyze actions, and accept responsibility. The more a person develops critical thinking, the better they can solve problems (Mahmudah et al., 2018; Sartika, 2019). Mathematical critical thinking is also a term. Every student must be able to assess math problems from several angles, develop answers, and generate innovative ideas (Hendriana, 2014; Munandar, 2012; T et al., 2020).

Low-level and high-level mathematical thinking are based on the difficulty of the math task. Understanding at a basic level, such as recognizing and remembering formulas and using them in routine or algorithmic calculations (understanding: mechanical, computational, instrumental, knowing how), falls under the scope of low-level mathematical thinking (Mulyaningsih & Ratu, 2018). High-level mathematical thinking consists of high-level knowledge (logical, relational, functional understanding, and knowing), critical mathematical thinking, creative and mathematical intuitive thinking, and mathematical problem solving (Abdullah, 2016). A learner can think critically if he can evaluate his understanding, check facts, and weigh arguments before adopting an explanation (Rokhimah & Rejeki, 2018).

Unfortunately, elementary schools do not emphasize critical and quantitative thinking. Research observations from November 14-18 2022 in fourth grade at Air Tiris 001 Public Elementary School prove this. When students work on practice questions, they do not understand the arithmetic problems or concepts needed to complete the activity. The practice questions confirm this. Many students have difficulty answering math problems, according to observers. This can be proven when students work on practice questions. When solving math problems, some

students do not take any implications from the answers they find and do not look for other ways to solve these difficulties. As a result, students cannot provide optimal conclusions and determine methods and techniques that can be applied to solve mathematical problems. Their math skills suffer. Against this background, it is important to evaluate the mathematical critical thinking abilities of fourth grade students at public elementary school 001 Air Tiris. Nurhalimah, Rahmi, and Mulia Suryani (2021) learn mathematical critical thinking abilities. This research is basically the same as the previous research; the only difference is that previous research discussed critical thinking abilities at the 1 Lembah Melintang State Senior High School, while this research was conducted at the elementary school level. In short, this study is almost the same as the previous research; the only difference is at the school level. This research will of course vary depending on the class level studied and various circumstances and circumstances.

Based on the background of the problems above, this study aims to test the mathematical critical thinking abilities of the fourth grade students of public elementary school 001 Air Tiris. This research teaches students to think critically about mathematics and solve problems. Students also learn to solve problems. This research helps educators develop their knowledge and understand how to improve students' critical thinking. Researchers can gain new insights, experiences, and critical thinking abilities from this research.

2. Methodology

This research is a qualitative descriptive study. Postpositivism underlies the qualitative research approach. This approach is used to investigate objects in natural settings, and the researcher is the main instrument in this kind of research (Sugiyono, 2019). This research involved 24 fourth graders from a public elementary school, 001 Air Tiris. This study uses interviews, math exams, and documents (Sugiyono, 2010). Three essays covering various aspects of mathematical critical thinking are required for the exam. The questions chosen were those that had been evaluated for their validity, reliability, level of difficulty, and ability to differentiate between groups. An analytical rubric with a scale of 4 is used in examining test findings. Scores for students can be calculated using the following formula:

$$\text{Critical Thinking Ability Score} = \frac{\text{Scores obtained by students}}{\text{Total Score}} \times 100$$

The following sources were consulted to ascertain the individual's level of capacity for mathematical critical thinking. Mathematical critical thinking is assessed beforehand. In order for the analysis to reflect the entire population, including various students' mathematical critical thinking abilities, this was done. Answer papers will be based on high, medium, and low mathematics critical thinking (Halimah et al., 2021).

Table 1. Critical Thinking Ability

Interpretation	Category
$80 \leq \text{skor} < 100$	High
$62 \leq \text{skor} < 80$	Medium
$0 \leq \text{skor} < 62$	Low

3. Results and Discussion

Students are given mathematically difficult essay questions to measure their critical thinking abilities. This test has three questions. The fourth grade students of Public Elementary School 001 Air Tiris demonstrated the ability to think critically in mathematics in the medium category. Table 2. shows how many students are included in each group of mathematical critical thinking.

Table 2. Mathematical Critical Thinking Ability

No	Category	The number of students	Percentage %
1	High	3	16.7 %
2	Medium	11	50.0 %
3	Low	7	33.3 %

Analysis of High Category Students' Mathematical Critical Thinking Ability

Students who are able to think critically mathematically are included in the high category, and among the students who take the test, there are as many as four who fall into this category. The following is an example of the results obtained from student responses that fall into the high category.

Question: Joko's mother gave him a total of IDR when he was young. 200,000.00 dollars to spend on shoes. It turned out that even after buying the shoes, the amount of money was still IDR 20,000.00. If the shoe store that Andi visited offers a 10% discount, the initial price of the shoes he bought was...

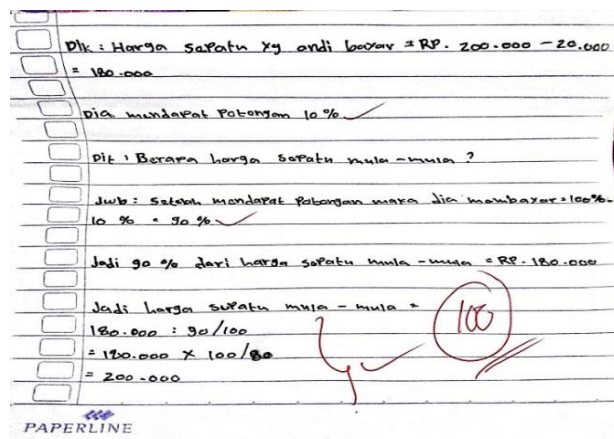


Figure 1. Answers of students in the high category

It can be seen in Figure 1. Students are able to answer the questions correctly. First analyze the problem, then write down what is known and asked in the question sequentially, precisely, and correctly. This helps students give simple explanations and solve problems correctly.

Analysis of students' mathematical critical thinking ability in the medium category

There were twelve students out of a total of twenty-four who took the exam and were in the medium category for their level of mathematical critical thinking ability. The responses of two students who are included in the medium category are depicted in Figures 2 and 3, respectively.

Question: Deo and his father went shopping at a shop that specializes in sporting goods. The following is a price list for these items: The price of soccer shoes is Rp. 167,000.00, the price of a swimsuit is Rp. 180,000.00, the price of a badminton racket is Rp. 221,000.00, and the price of a volleyball is Rp. 92,000.00. Consider the following scenario: Deo buys a pair of soccer shoes, two badminton rackets, three swimsuits, and two volleyballs. The amount of money Deo's father needed to get ready was approximately.

	No. _____
	Date: _____
<input type="checkbox"/>	Harga Baju Renang = Rp. 180.000
<input type="checkbox"/>	Harga bola voli = Rp. 92.000
<input type="checkbox"/>	Dik: Jika Dia membeli 1 sepatu bola, 2 Raket Bulu Tangkis, 3 Baju Renang, dan 2 Bola voli. maka uang yg harus disiapkan ayah deo adalah ?
<input type="checkbox"/>	
<input type="checkbox"/>	Jika Deo membeli 1 sepatu sepulc bola, 2 Raket bulu tangkis, 3 Baju Renang dan 2 bola voli. uang yang kira-kira harus disiapkan Ayah Deo adalah
<input type="checkbox"/>	Dik:
<input type="checkbox"/>	Harga sepatu sepulc bola = Rp. 167.000
<input type="checkbox"/>	Harga raket bulu tangkis = Rp. 221.000

Figure 2. Answers of students in the medium category

Jwb:

$$167.000 + (221.000 \times 2) + (180.000 \times 3) + (72.000 \times 2) = 167.000 + 442.000 + 540.000 + 144.000 = 1.333.000$$

maka uang yg harus disiplin ayah Dede adalah Rp. 1.333.000.

Figure 3. Student answers in the medium category are related to problem solving

Both Figure 2 and Figure 3 present components that aim to provide clear explanations, develop basic skills, and draw conclusions. Simple explanations focus on questions and argument analysis, which are basic skills. In this scenario, students must record information methodically, accurately, and precisely. In addition, students are expected to be able to solve problems using specific and methodical principles and draw conclusions about the results based on the questions asked. Students understand and answer what is understood and asked in the questions, and they are in the middle group in dealing with problems based on the concepts used, but their resolution is still poor. Figures 2 and 3 support this. Findings from interviews with students revealed that students had a good understanding of the questions presented to them; even so, students are less thorough in the completion process, which results in them achieving results that are not as good as they should be. The following are the findings from the interviews the researchers conducted with students.

P: Do you understand the questions asked of you?

S: Yes, I really understand the questions asked.

P: If I understand what you are saying correctly, what is the process involved in finding a solution to the problem?

S: I believe the first step in finding a solution to this problem is understanding the actual situation. If you already have an understanding of the problem, the next step is to reconstruct it as a math problem, which will make it easier for you to solve the problem.

P: Did you have trouble trying to solve the question?

S: Yes.

P: What kinds of difficulties did you encounter in solving the questions and how did you overcome them?

S: There are times when I don't pay as much attention to the details of the questions as I should when working on them. As a result, when I answer questions, I get answers that are not optimal.

Analysis of students' mathematical critical thinking ability in the low category

Eight of the 24 test takers had low-level mathematical critical thinking abilities. The following is one of the responses from students in the low-mathematics critical thinking category:

Question: In the village of Tapus Dolok, the price of one hectare of land is IDR 5,000,000. Pak Zakaria sold $\frac{1}{2}$ hectare of land to Pak Joko. What is the price to be paid by Mr. Joko?

SOAL 3

Di kampung Tapus Dolok harga tanah satu hektar adalah
 Rp 5.000.000. Pak Yuni menjual tanah kepada Pak Joko $\frac{1}{2}$
 hektar, maka Pak Joko harus membayar ...?

$5.000.000 \times \frac{1}{2}$
 $= 5.000.000 : 0,5$
 $= 1250.000$

$5.000.000 \times \frac{1}{2}$
 $\frac{5.000.000}{2} = 2.500.000$

Figure 4. Answers of students in the low category in mathematical critical thinking

Figure 4 includes the construction of basic skills, giving direct explanations, and formulating plans and tactics. Activities for considering source credibility, activities for deciding on courses of action, and activities for devising strategies and tactics are all different forms of the same thing: Aspects of providing simple explanations include exercises for focusing questions and examining arguments, developing basic skills, and formulating plans and tactics to decide on an action. Students should record and solve the difficulties in this scenario. They must be able to methodically, accurately, and describe what is known and asked. In addition, students are expected to be able to solve problems using appropriate and methodical ideas and follow the necessary procedures to solve problems precisely and accurately. Figure 4 shows students do not understand what is known and asked in the questions, and the results of the interviews show students do not understand the questions and are often deceived by them, causing students to become confused when trying to solve them. The passages shown here are excerpts from interviews with students.

P : Do you understand the questions given?

S: No, I don't understand.

P: When you tried to find a solution to the problem, what were the obstacles?

S: The questions and answers in the book are confusing. I couldn't apply the problem information to the math form and didn't know the first step, so I guessed at a solution.

P: Why did it happen?

S: Because I am not used to working on the questions provided, the questions that are usually provided for them to work on are the same as the questions used in the previous examples. Then, as a result of my lack of understanding of the question, I ran into some confusion while trying to troubleshoot.

P: Apart from that, is there anything else that makes it difficult to solve the problem?

S: Yes, sir, when I'm working on a problem, I often forget the purpose of the problem, which results in me not being able to solve the problem to the best of my ability.

The critical thinking abilities of students with high, medium, and low abilities are not the same. Math skills and categories help with critical thinking exam questions. Those who have moderate abilities are not good at working on critical thinking test questions, but those who are in the low group are less successful according to many components of mathematical critical thinking skills. The critical thinking capacity associated with each field varies, with high, medium, and low capacity depending on the field (Crismasanti & Yuniarta, 2017). Students lack critical thinking skills such as presenting basic explanations, formulating strategies and tactics, and reaching meaningful conclusions. Students have difficulty associating information with the problem, so they don't know how to solve it. If students' critical thinking skills are inadequate, they must build them up through learning (Permata et al., 2019).

4. Conclusion

Based on the results of the findings and discussion, fourth grade students at public elementary school 001 Air Tiris have intermediate-level mathematical critical thinking abilities. The average percentage of correct student answers is 50.0%, as this shows at public elementary school 001 Air Tiris have intermediate-level mathematical critical thinking abilities. The average percentage of correct student answers is 50.0%, as this shows. When asked to make simple explanations, formulate strategies and tactics, and draw conclusions, students often make mistakes. Each student has unique abilities, so teachers should give them more critical thinking practice. Teachers can develop critical thinking strategies or learning models. Other researchers should be able to conduct in-depth research on students' mathematical critical thinking.

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