



Mathematics Critical Thinking Skills for The Third Grade Elementary School Students on Fractions Material

Fildzah Fitriani^{1*}, Kowiyah² 

^{1,2} Pendidikan Guru Sekolah Dasar, Universitas Muhammadiyah Prof. Dr. Hamka, Jakarta, Indonesia

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ABSTRAK

Pada pembelajaran matematika, berpikir kritis diperlukan untuk memecahkan masalah dengan berbagai cara diantaranya menginterpretasi, menganalisa, dan mengevaluasi. Penelitian ini bertujuan untuk menganalisis berpikir kritis siswa kelas tiga SD dalam menyelesaikan soal pada pokok bahasan pecahan. Metode yang digunakan ialah metode kualitatif. Penelitian dilakukan di Sekolah Dasar dengan melibatkan 26 siswa sebagai subjek. Teknik pengumpulan data yang digunakan antara lain ialah tes uraian dan wawancara. Tes uraian yang ditinjau berdasarkan empat indikator berpikir kritis yaitu menginterpretasi, menganalisis, mengevaluasi dan inferensi. Teknik pengolahan data kualitatif ini yaitu mereduksi data, penyajian data dan penarikan kesimpulan. Validitas data dilakukan dengan teknik triangulasi, yaitu hasil tes uraian siswa dan wawancara ditriangulasikan sehingga didapatkan deskripsi mengenai kemampuan berpikir kritis siswa dalam menyelesaikan soal matematika materi pecahan. Hasil penelitian menunjukkan bahwa siswa yang berpikir kritis tinggi memenuhi empat indikator, siswa yang berpikir kritis sedang hanya memenuhi dua indikator, dan siswa yang berpikir kritis rendah tidak memenuhi keempat. Kesimpulannya, kemampuan berpikir kritis siswa rendah. Mereka tidak dapat memahami masalah dengan baik dan tidak menyelesaikannya dengan benar. Sedangkan siswa yang berpikir sangat kritis mampu memahami soal pecahan, menganalisis, memilih metode yang tepat, dan menyimpulkan dengan jelas dan logis.

ABSTRACT

In learning mathematics, critical thinking is needed to solve problems in various ways including interpreting, analyzing and evaluating. This study aims to analyze the critical thinking of third grade elementary school students in solving problems on the subject of fractions. The research was conducted at Elementary school by involving 26 students as the subject. This research used qualitative method. The data collection techniques used description tests and interviews. The description tests were reviewed based on four critical thinking indicators, namely interpreting, analyzing, evaluating and inference. This qualitative data processing technique is reducing data, presenting data, and drawing conclusions. The validity of the data was carried out using a triangulation technique, namely the results of student description tests, and interviews were triangulated to obtain a description of students' critical thinking skills in solving math problems with fractions. The results showed that students with high critical thinking met the four indicators, students who had moderate critical thinking only met two indicators, and students who had low critical thinking did not meet the four indicators. In conclusion, students' critical thinking skills were low. They could not understand the problem well and had not solved it properly. Meanwhile, students who think highly critically are able to understand questions about fractions, to analyze, to choose the right method, and to conclude clearly and logically.

1. INTRODUCTION

Education is an important activity in life. The purpose of this education is to grow and improve the behavior and potential of students, so they have the personality, skills, intelligence needed for themselves, society and their country in the future. Education is currently in the era of globalization where technological advances can be found in various aspects of life (Fatimah & Santiana, 2017; Malik, 2018; Pratiwi et al., 2019).

Educators and students must be able to face challenges and see opportunities in order to keep up with the times. Dealing with current technological advances, students are expected to have four competencies including creative thinking, critical thinking, communicating, and collaborating (Arifin & Retnawati, 2017; Hidayatullah et al., 2021; Nurtanto et al., 2019). Critical thinking must be possessed by students in providing an answer to problems based on evidence that is productive, academic, and evaluative (Hussin et al., 2019; Mitra & Purnawarman, 2019; van Laar et al., 2019). According to previous study human has basic abilities and potentials to think logically, dynamically, and conceptually which is called critical thinking skills (Fitzsimons, 2014). Critical thinking needs to be found in learning mathematics to solve problems in various ways, namely analyzing, evaluating and understanding problems to minimize errors that occur in doing them (Anazifa & Djukri, 2017; Davidi et al., 2021; Wati & Anggraini, 2019). In the process of learning mathematics, students are actively involved and confronted with something concrete related to everyday life. Then, it is processed through reasoning and formed into concepts that are easy to understand and operate correctly. The importance of mathematics lessons at the elementary school up to high school levels is to train students' mathematical thinking, and be able to use their reasoning well (Batubara, 2019; Dhayanti et al., 2018; Dolapcioglu & Doğanay, 2020). It can be concluded that basically mathematics is formed by logic.

In mathematics, fractions are quite important material to learn because there are many uses of fractions in life. Besides, fractions are the basis for students to study further mathematics such as percent, ratios, and algebra. Fractions are symbols of numbers which can be written $\frac{a}{b}$; a as the numerator and b as the denominator (Barnes, 2005; Nasution et al., 2018). Fractions are subsets of natural numbers. Fractions can be found in everyday life, but fractions are still considered complicated by some students, such as in adding fractions (Aminah & Kurniawati, 2018; Barnes, 2005; Deringöl, 2019). A lack of understanding of fractional material can make it difficult for students to solve other math problems. Many studies related to critical thinking have been carried out. There are previous studies that focus on research on mathematical critical thinking skills, but do not focus on fractional material (Ikhsan et al., 2017). There are indicators of mathematical ability, namely indicators of understanding mathematical problems, proposing logical concepts, and indicators of solving problems. Thus, this study has not reviewed how students think critically, especially on the subject of fractions. In addition, research has also not focused on solving fraction description problems but rather on the subject of flat shapes (Singh et al., 2021).

Initial research conducted by researchers found that the critical thinking third grade students of elementary school was low. As many as 72.41% who did not reach the minimum completeness criteria of the score (KKM), was seen from the achievement of critical thinking indicators. Students had just arrived at the first stage, which was to describe a simple explanation. The learning process that tends to explain does not emphasize on practice questions, making it difficult for students to work on questions. It can be concluded that the ability of students to think critically is less trained. In addition, they do not understand the mathematical concepts themselves, especially on the subject of fractions. Only 27.59% of students whose scores reach the KKM. This is one of the problems in the teaching and learning process that must be addressed and reviewed by the teacher. In addition, to the teaching and learning process, it is also necessary to do a lot of routine practice questions to improve students' mathematical critical thinking, precisely on the subject of fractions. Therefore, the purpose of this study is to analyze how the thinking ability of third grade elementary school students in solving math problems is precisely on the subject of fractions.

2. METHOD

The research used qualitative method in order to describe how students solve problems using critical thinking. The research was conducted at SDN Duren Sawit 07 Pagi. This research is limited to fractional material. The research subjects are third grade students with different abilities grouped into high, medium, and low critical thinking. The grouping of students is adjusted to the description test scores presented in Table 1.

Table 1. The Scoring Group of Critical Thinking Test

No	Range Score	Group
1.	85 – 100	High
2.	65 -80	Moderate
3.	< 64	Low

Base on Table 1, critical thinking essay tests and interviews were used as data processing instruments. The description test refers to the critical thinking indicators, namely (1) interpreting, (2) analyzing, (3) evaluating, and (4) making conclusions (inference). Interview guidelines are needed to determine the extent to which students' abilities in solving problems based on critical thinking indicators are needed. This qualitative data processing technique uses data reduction, data presentation, and drawing (Miles et al., 2014). Data reduction is summarizing, producing important things and focusing on problems which means simplifying the

data that has been obtained from the tests that have been done and interviews. Presentation of data is to reveal a data on the ability of students by describing it. The last is the stage of drawing conclusions from the data that has been collected. Validity was carried out using a triangulation technique, namely the results of student description tests and interviews were triangulated. A description of students' critical thinking skills was obtained in solving the subject matter of fractions.

3. RESULT AND DISCUSSION

Result

The ability of students in critical thinking is low. It can be seen from the results of the researchers' observations of third grade students in solving math problems on the subject of fractions that were done by 26 students. Students' critical thinking ability result is presented in [Figure 1](#).

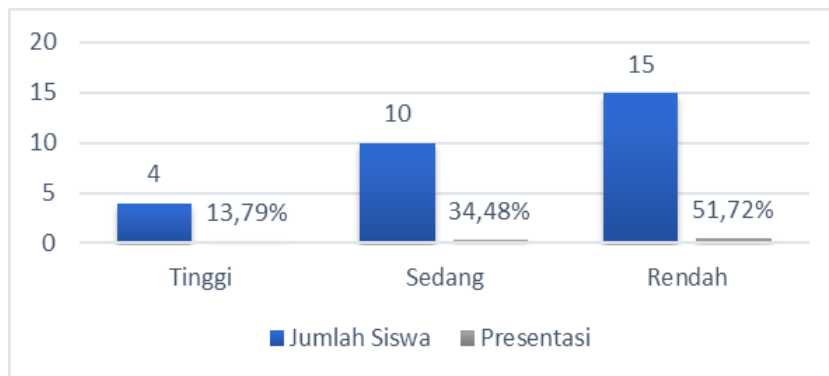


Figure 1. Students' Critical Thinking Ability Result

Base on [Figure 1](#), there are 13.79% of students who think highly critically in this category. They are able to understand questions about fractions, analyze, use strategies appropriately and conclude clearly and logically. Students who think critically are 34.48% in this ability category. They are able to understand fractions and can analyze correctly, but they have not been able to evaluate and conclude correctly. Students who think critically are low, namely 51.72% in this category. They are not able to understand the problem well and have not solved it correctly. After getting the results, the researchers selected one student from each of their mathematical abilities to be interviewed and described the three subjects classified as having high, moderate, and low critical thinking referring to the critical thinking indicators presented in [Table 2](#).

Table 2. The Description of Critical Thinking Skill's Indicator

Indicator of Critical Thinking Skills	Description
Interpretation	Writing what is known and asked in story problems about fractions.
Analysis	Turning words into mathematical concepts from problems with correct explanations.
Evaluation	Determining the appropriate way with problems regarding fractions and perform appropriate calculations.
Inference	Creating conclusion

Subject 1 is a student with high critical thinking ability. The first indicator is interpretation where the subject is able to understand the problem and arrange what he knows and what is asked about the fraction problem. Subject can write down what is known and asked which is obtained from story questions using their own words. In other words, subject can understand the problem very well. In short, the subject meets the first critical thinking indicator. The second indicator is analysis. The subject can write down the appropriate mathematical formula, which is known from the problem that the mother cuts the cake into 8 parts and cuts each part again into equal size to make her getting the result $\frac{1}{16}$. The subject can create a picture to make first example by drawing fractions $\frac{1}{8}$ and $\frac{1}{16}$ as well as being able to explain how to change story problems into simple fractions such as: (1) Father = $\frac{1}{16}$ part. (2) Nina = $\frac{5}{16}$, (3) Adi = $\frac{4}{16}$ part. In sum, the subject fulfilled the second indicator. The third indicator is evaluation. At this stage, the subject can use the appropriate strategy so that it is correct in calculating the sum of three fractions with the same denominator. Thus, fulfilling the third critical thinking indicator namely using the right way in solving problems. The fourth indicator is inference, where the subject is able to make correct conclusions, solve problems that have been presented with appropriate mathematical

models, and be able to provide conclusions from the questions provided with logical and appropriate reasons. Thus, fulfilling the fourth indicator, namely providing the correct conclusion from the fraction with logical and appropriate reasons.

Subject 2 is a student who thinks critically. At the interpretation stage, the subject can understand the questions given and write what is known and asked using the subject's own words correctly. Moreover, the subject understands the problem quite well. At the analysis stage, the subject can determine the mathematical model with an explanation, but it is not yet precise. Hence, at the evaluation stage, the subject can show the results of the addition of three fractions with the same denominator. However, it can be seen the results of the completion are not in accordance with the correct answer. At the stage of providing conclusions, the subject can describe the conclusions of the problem, but the subject cannot explain with the right reasons. It can be concluded that it only fulfills 2 indicators, namely interpreting and analyzing.

Subject 3 is a student with low critical thinking. At the interpretation stage, the subject is unable to write what the subject knows and asks because of a lack of understanding of the problem. At the analysis stage, the subject is unable to analyze what is known and asked in the question. The answer can be seen in the following picture. The subject wrote that all the denominators were sixths, where the denominators should be sixteen because the mother had cut 2 parts each from each one-eighth part, and there was no one-sixth in the problem. Therefore, at the evaluation stage, the subject does not write down how to solve it as shown in Figure 8. The subject immediately writes down the results of the sum that are not correct. Furthermore, at the inference stage, the subject is unable to provide conclusions from the problems that are solved and do not explain the reasons. From the interview excerpt above, it can be seen that subject 3 does not meet one of the four indicators of critical thinking ability. The subject is unable to interpret, analyze, and evaluate the strategies used to solve problems in accordance with predetermined mathematical concepts and models. The subject was also unable to answer the question because the subject did not understand and only said the origin of the count while writing the answer.

Discussion

Based on data it can be seen that the students' ability to think critically is low. This is similar to several previous studies who found that students' critical thinking was low where the student could not understand the problem, could not write mathematical models or formulas, and could not give conclusions (Fitrianawati et al., 2020). In addition, other previous study mathematical critical thinking skills found that students' critical thinking was low, where students did not do the questions well at all (Fitrianawati et al., 2020; Hidayat & Sari, 2019). The three subjects described above have different critical thinking. Subject 1 has high critical thinking skills, where at the interpretation stage the subject can understand fraction problems, so he can write down the what is known and asked on the answer sheet. Thus, he is judged to have good reasoning, and at the analysis stage, the subject can identify the relationship between the questions and the mathematical model that fits the problem. At the evaluation stage, the subject solves the problem using the right way as well as performs calculations correctly, and at the inference stage, the subject can provide conclusions and reasons related to conclusions logically and correctly. Based on the exposure to the data above, the writers agree with previous study that state someone with critical abilities has the skills to analyze, interpret, and also evaluate (Soyadi & Birgili, 2015).

Medium critical thinking only fulfills two of the four indicators of critical thinking, namely interpreting and analyzing. From the results of the description test and interview excerpts, it was found that the subject was quite good at understanding the problem and could write down what was known and asked correctly. At the stage of analyzing, the subject can identify the relationship between the question and the mathematical concept although it is not yet precise. Therefore, at the evaluation stage, the subject correctly wrote down the completion steps, but the results were not correct. At the stage of providing conclusions, the subject cannot make conclusions. Low critical thinking ability, the subject cannot interpret correctly. At the stage of analyzing, the subject writes down the answer, but he was unable to make what was asked a question into a mathematical model. At the evaluation stage, the subject cannot explain the arrangement of problem solving, and at the inference stage the subject is unable to provide conclusions of what was asked in the question. Based on the description test and interview with low critical thinking skills, it is not in line with previous research statement that state a critical person has the ability to analyze, interpret, and evaluate (Fitrianawati et al., 2020).

Based on the analysis of the questions carried out by students, it proves that the ability of students to solve problem has not used critical thinking or the ability is relatively low, precisely on the indicators of interpreting and analyzing. Research that can strengthen the results of this study states that the critical thinking of class VII students in solving arithmetic problems is quite good (Fitria et al., 2020; Szabo et al., 2020). This ability is possessed by most students to make it easy in solving problems, and it has not been discussed how the ability of third graders in working on fraction problems (Copur-Gencturk & Doleck, 2021; Deringöl, 2019). Another finding also found that the critical thinking of fifth graders was high. Most of the students were able to solve critical thinking questions on the topic of flat shapes (Bulut et al., 2016). This study did not discuss fractions of the third grade elementary school

From the description of the previous research above, it can be seen that there are similarities as well as differences with this study. The similarity is that the three studies analyze how students' critical thinking in solving existing mathematical problems. The difference lies in the subjects of the research and course. The implication of this study emphasizes and provide information relate to critical thinking skills of third grade elementary school students in solving fractional problems. The limitation of this study lies in the limited research scope. The subject of this research only involved one school agency. It is hoped that future research will be able to deepen and broaden the scope of research related to students' critical thinking in solving existing mathematical problems.

4. CONCLUSION

In conclusion, students' critical thinking skills were low. They could not understand the problem well and had not solved it properly. Meanwhile, students who think highly critically are able to understand questions about fractions, to analyze, to choose the right method, and to conclude clearly and logically. They can understand fractions and analyze correctly, but they have not been able to evaluate and conclude properly. From the results of the research, it is hoped that students will continue to practice these abilities. It is also expected that educators make learning that does not tend to just explain, and put more emphasis on practice questions in order to hone students' critical thinking.

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