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Analysis of students’ critical thinking skill of fractions on primary school

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Abstract. Mathematics is one of the most important subjects for students to learn and important as a guide to mindset as well as forming attitude [1]. Through mathematics, a student can develop his ability to become a person in a work spectrum [2]. Thus, the goal is the mastery and the creation of technology in the future where it can be realized through the mastery of mathematics early on [2]. In addition, mathematics can develop critical thinking skills that can ultimately be applied in solving problems in life [3].

The ability to think critically becomes an integral part in learning mathematics. Critical thinking skills are included in priority capabilities in 21st century learning [4] along with creative thinking, communication, and collaboration skills. Critical thinking skills include the capabilities one needs to have in facing globalization with increasingly complex challenges.

Society can develop themselves in making decisions, judgments, and solving problems through critical thinking and creative thinking [5]. Thus, a person who has been given education to develop critical thinking skills will be able to face his life in the future with various potential risks to be faced.

Mathematical learning should be able to be developed in an innovative way to achieve that goal. Such innovative learning is a lesson that can develop critical thinking as the basis for dealing with competition in the 21st century. The development of these capability, developed through the process of productive struggle as an important part in mathematics learning [6].

1. Introduction

Mathematics is one of the most important subjects for students to learn and important as a guide to mindset as well as forming attitude [1]. Through mathematics, a student can develop his ability to become a person in a work spectrum [2]. Thus, the goal is the mastery and the creation of technology in the future where it can be realized through the mastery of mathematics early on [2]. In addition, mathematics can develop critical thinking skills that can ultimately be applied in solving problems in life [3].

Mathematics is one of the most important subjects for students to learn and important as a guide to mindset as well as forming attitude [1]. Through mathematics, a student can develop his ability to become a person in a work spectrum [2]. Thus, the goal is the mastery and the creation of technology in the future where it can be realized through the mastery of mathematics early on [2]. In addition, mathematics can develop critical thinking skills that can ultimately be applied in solving problems in life [3].
One of the topics in mathematics learning is fractions. This material is taught in the fourth grade and becomes a much-needed material in a daily life. Fractions can be applied in life problems, such as: dividing food to have the same size or to understand the total number of parcels that are divided into sections.

Based on the above explanation, this research focuses on the critical thinking skill of students in fractions on primary school. The purpose of this research is to analyze critical thinking skill of students in fractions on primary school.

2. Experimental method
This research was conducted in elementary school located in Tasikmalaya, West Java. The research used descriptive-qualitative method with the research subjects were 25 students of grade fourth of elementary school. The research instruments that was used were tests and interview.

This research was carried out in the following four steps. Firstly, we made one task about fractional number. We used critical thinking skill indicators adapted from Ennis [7]. Secondly, we collected data from written tests and interview that were distributed to students. Thirdly, we analyzed data and compared it with the indicators. Finally, we made conclusions.

3. Result and discussion
The researcher prepared four tasks to be done by the students. Tasks that was used about fractions as in Figure 1 below.

1. Mom bought a cake. 5/12 part was given to Andi. 2/6 part was given to Asep. 1/4 part was given to Budi. a) write their name in order from least to greatest cake obtained. b) is there cake left? Explain.

2. Cecep and Asep each have a rope. Cecep’s rope has length 3/4 m. While Asep’s 1/2 meters. Show their ropes geometrically, whose rope is the longest? Explain.

3. Ema has a ribbon of 3/4 m. Some of the ribbon is given to Menik.
   Since some part of ribbon have been given to Menik, now the Length of Ema’s ribbon is 5/12 m. How much part of ribbon have Menik obtained?

4. Dani has a number of flat-shaped chocolates. There are 1 rhombic chocolate, 1 hexagon chocolate, two circle chocolates, and three triangle chocolates. Write down the fractions that indicate the amount of rhombic chocolate from Dani’s whole chocolates!

Figure 1. The task that was used about fractions.

The research found some of the students’ obstacle in critical thinking on fractions. The students’ obstacle which is appeared is adapted to critical thinking indicator of Ennis [7]. The obstacle which is found by researcher is related to fractions associated with the students’ critical thinking skill are: 1) Students have not been able to give a simple explanation, 2) The students have not been able to provide further explanation, 3) The student have not been able to arrange the strategy and tactic appropriately, 4) The students have not been able to conclude correctly.

The findings of the preliminary study are elaborated in more detail as follows:

3.1. Students have not been able to give a simple explanation
Students who have not been able to provide a simple explanation were shown with answering an explanation or challenge. Students have not understood will give problems as well as the concept of fractions as part of the whole as in the following task number 1,
Dani has a number of flat-shaped chocolates. There are 1 rhombic chocolate, 1 hexagon chocolate, two circle chocolates, and three triangle chocolates. Write down the fractions that indicate the amount of rhombic chocolate from Dani’s whole chocolates!

Results of student work are shown in the following Figure 2.

![Figure 2](image)

**Figure 2.** Results of student work who have not been able to provide a simple explanation.

21 students gave answers with the concept of fractions that have not been correct. Students found it difficult to provide a simple explanation to solve math problem. Additionally, in Figure it can be identified that students guessed answer of given task. Students gave answers without the reasons or ways used to solve the problem as in the following task number 1,

Mom bought a cake. $\frac{5}{12}$ part was given to Andi. $\frac{2}{6}$ part was given to Asep. $\frac{1}{4}$ part was given to Budi. a) write their name in order from least to greatest cake obtained. b) is there cake left? Explain.

Results of student work are shown in the following Figure 3.

![Figure 3](image)

**Figure 3.** Students attempted to explain completion process.

Figure 3 shows that students attempted to explain completion process. However, students have not been able to use simple sentences or processes in solving given problem without based on the results of mathematical work.
3.2. Students have not been able to set the strategy and tactics appropriately
Students have not been able to devise appropriate strategies and tactics that indicated by answers that often appear without process of work as in the following task number 3.

_Ema has a ribbon of 3/4 m. Some of the ribbon is given to Menik. Since some part of ribbon have been given to Menik, now the Length of Ema’s ribbon is 5/12 m. How much part of ribbon have Menik obtained?_

Results of student work are shown in the following Figure 4.

**Figure 4.** Results of student work who have not been able to develop appropriate strategies and tactics.

Figure 4 shows that Fifteen students guessed answers of given questions in order that strategies and tactics were not used by students to find answers. It happened due to students have not understood about problems asked to students. Whereas, given problem was a matter of fractions. Seven students have attempted to formulate strategies and tactics. Students used subtraction to find answers to the problem that is done. However, the process of problem solving has not been accurate. Hence, result obtained has not been correct as well. As shown in the answer to the number 1 shown in Figure 5 below.

**Figure 5.** Students are asked about the answer.

Figure 5 shows that students are asked about the answer. Students revealed that given questions were not in common. Finally, students obtained confuse in determining strategies and techniques that will be used in completion of a math problems.

3.3. Students have not been able to conclude correctly
Obstacles found due to students have not understood level of problem and concept of fractions. Students conclusion influenced by lack of problem understanding. As shown in the answer to the number 3 shown in Figure 6 below.
Figure 6. Students have not been able to conclude correctly.

Figure 6 shows that the students revealed that Menik’s ribbon was ¾ meter. These results based on a fractional reduction process that inconsistent with the concept of fractional count operations.

3.4. Students have not been able to provide further explanation
Students found it difficult to provide further explanation of the answers obtained. Additionally, the student's further explanation has not been expected as in the following task number 2.

Cecep and Asep each have a rope. Cecep’s rope has length 3/4 m. While Asep's 1/2 meters. Show their ropes geometrically, whose rope is the longest? Explain.

The results are shown in Figure 7 below.

Figure 7. Students have not been able to provide further explanation.

Also, the study discovers that students felt it was difficult to provide further explanation of "where they got the results". What they said is "I can to answer it, but it's hard to explain with more sentences how to find results".

4. Conclusion
As a conclusion, The obstacle which is found by researcher is related to fractions associated with the students’ critical thinking skill are: 1) Students have not been able to give a simple explanation, 2) The
students have not been able to provide further explanation, 3) The student have not been able to arrange the strategy and tactic appropriately, 4) The students have not been able to conclude correctly.

This study showed that student’s critical thinking skills still are low. Non-routine tasks given still have not been able to resolve by most of students. The results of this research can be used to develop of students' critical thinking in the future.

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