

ANALYSIS OF STUDENTS' CRITICAL THINKING ABILITY IN SOLVING FRACTION PROBLEM AT 7 GRADE OF JUNIOR HIGH SCHOOL

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Abstrak

Penelitian ini adalah penelitian kualitatif yang bertujuan untuk menganalisis kemampuan berpikir kritis peserta didik dalam menyelesaikan soal cerita dengan subtopik pecahan pada kelas VII SMP. Standar berpikir kritis pada penelitian ini terdiri dari (1) clarity(kejelasan); (2) precision(presisi); (3) accuracy(akurat); (4) relevance (relevan); (5) consistency (konsisten); (6) logical correctness (kebenaran secara logis); (7) completeness (kelengkapan); (8) fairness (keadilan). Instrumen yang digunakan adalah tes, wawancara, dan angket. Subjek penelitian ini adalah siswa kelas VII dari SMP Salomo 3 Pringsurat dan SMP Pangudi Luhur 1 Klaten. Rata-rata kemampuan berpikir kritis peserta didik dalam menyelesaikan masalah pecahan bentuk soal cerita pada kelas VII SMP adalah 73,33. Pada standar berpikir kritis precision, relevance, logical correctness, completeness mencapai kategori sangat tinggi. Untuk standar berpikir kritis clarity, accuracy, consistency mencapai kategori tinggi, sedangkan untuk fairness pada kategori sangat rendah.

Kata kunci: Pecahan, Kemampuan Berpikir Kritis, Matematika

INTROSUCTION

Education in the current era is a life support for the nation and humans themselves, because with education humans get guidance to develop their potential. Education occurs because of the interaction between educators and students towards changes for the better, from things that are not understood to things that can be understood, and from things that have not been done to things that can be done. Education can also develop the potential of students to be of higher quality who have intelligence, noble character, and high skills.

Mathematics is one of the mandatory curriculum structures at the primary and secondary education levels. In Law Number 20 of 2003 concerning the National Education System Article 37 Paragraph 1 states that the primary and secondary education curriculum must include religious education, civic education, language, mathematics, natural sciences, social sciences, arts and culture, physical education and sports, skills/vocational, and local content. One element of mathematics is the ability to think critically. This study focuses on thinking patterns, this is because the development of critical thinking skills is one of the focuses of competency

achievement in learning mathematics. In accordance with the Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 21 of 2016 concerning Content Standards for Elementary and Secondary Education, which includes the achievement of mathematical competence is having a positive attitude in mathematics, namely being logical, critical, careful and thorough, honest, responsible, and not giving up easily in learning. solve the problem.

Mathematics learning can be carried out in an active, fun way, motivating students to continue to learn, creatively, and independently so that students can be independent in the learning process. In the learning process, of course, every student does thinking activities. The thinking process of students in solving math problems is closely related to the ability to remember, understand, reason, connect between mathematical concepts, and mental actions to find a way out according to the stages. According to Presseisen (in Rochaminah, 2008) thinking as a mental activity in an attempt to acquire knowledge. The notion of thinking in mathematics was put forward by Sumarmo to carry out mathematical activities or processes (doing math) or mathematical tasks (mathematical tasks). According to Kowiyah (2012), in doing mathematics, exercises are needed starting from critical thinking, how to formulate problems, planning solutions, reviewing completion steps, making assumptions if the data presented is incomplete, a thinking activity called critical thinking is needed. Critical thinking skills not only produce students able to solve mathematical problems, but can strengthen memories of what has been learned.

Each student has different critical thinking abilities. According to Anderson and Krathwohl (in Krisagotama, 2015) there are eight standards of critical thinking skills, namely: (1) clarity; (2) precision; (3) accuracy; (4) relevance; (5) consistency; (6) logical correctness; (7) completeness; and (8) fairness.

(1) Clarity, a student who thinks critically must have clarity in thinking by providing information on conclusions and assumptions clearly so that accuracy and relevance are not in doubt. Clarity is important, because clarity of thought will determine how a student expresses and solves problems. (2) Precision, a student who thinks critically must have accuracy through the ability to organize and evaluate thoughts and not rush to conclude something. Accuracy is needed to be able to collect relevant and accurate information, make assumptions clearly, and provide information to the reader or teacher in detail. (3) Accuracy, accuracy or precision can be used to plan thoughts clearly. A critical thinker is able to find and check the accuracy of information and assumptions, and is able to verify or test that accuracy. (4) Relevance, a critical thinker must be able to relate all the knowledge and experience gained to solve problems. (5) Consistency, a person who thinks critically in seeking and defending the truth requires a consistent attitude, both in continuous efforts to solve problems and build arguments regarding knowledge (6) Logical correctness, a thinker Critical thinking must be able to think by developing and using the right concepts, having strong arguments, and not making things up. (7) Completeness, this critical thinking standard is related to the process of solving problems, which are required to have completeness in expressing the ideas obtained. And (8) Fairness, a

person who thinks critically can think rationally, one of which is honesty and fairness. Fair and honest thinking is thinking that can be accounted for by putting aside personal interest in an issue and being neutral.

Students with high critical thinking skills and some with low critical thinking skills. Higher order thinking skills in the types of: conceptual understanding, problem solving, reasoning and proof, communication, connection, and representation are included in the National Council of Teachers of Mathematics (NCTM, 2000) as school mathematics principles and standards.

One of the mathematics materials that need to be mastered by middle-level students is fractions. According to Wintarti (2008:27), fractional numbers are numbers that can be expressed in the form $\frac{a}{b}$ where a and b are integers, $b \neq 0$ and b are not factors of a . The number a is called the numerator, and b is called the denominator. The Center for Curriculum Development and Educational Facilities, Agency for Research and Development (Depdikbud 1999) in Heruman (2013:43) states that fractions are one of the difficult topics to teach. So that many students are constrained in understanding fractional material, as a result students feel burdened when faced with questions related to fractional material, especially story questions. The statement above is in accordance with research conducted by Iin Marsela (2017) that 65% of seventh grade students of SMP Negeri 5 Palopo in solving story-form fraction problems experienced errors which were mostly dominated by conceptual errors due to lack of understanding of the concept of fractional material. From these problems, fractional material has the potential to

develop critical thinking skills because it is related to everyday life. The main learning objectives for fractions are that students can solve story problems related to arithmetic operations of addition, subtraction, multiplication and division of fractions and can use them in problem solving.

Based on the results of interviews with the 7 grade mathematics teacher at Junior High School 1 Banyubiru, the fact that students' critical thinking skills are still not optimal. This can be seen when students work on story problems with fractional arithmetic operations. Many students are not careful and precise in understanding the story questions and the arithmetic operations to be used, how to equate the denominators, and do not understand correctly the steps in solving problems from the story questions given. In answering story questions, there are students who do not write down what they know, are asked according to what is desired from the question, and do not mention where the ideas and concepts used in solving problems come from.

This study aims to analyze the critical thinking skills of students in solving fractions problems in 7 grade junior high school. So that it raises the desire of researchers to choose the title "Analysis of Students' Critical Thinking Ability in Solving Fraction Problems at 7 grade Junior High School".

METHOD

The research method used in this research is qualitative research. Qualitative research is research that is naturalistic because the research is carried out in natural conditions (natural setting), and researchers do not make treatment because researchers in

collecting data are emic or based on views from data sources not from researchers. In this study, the researcher wanted to describe the critical thinking skills of class VII students in working on math story problems with fractions.

This research was conducted online. The subjects in this study were 7 grade students from Junior High School Solomon 3 Pringsurat and Pangudi Luhur 1 Klaten. In the selection of research subjects, the researchers chose 3 students with the same mathematical ability seen from the scores in the 80-85 interval in order to know the thinking patterns in solving math story problems on fractions.

The data collection technique in this study was using a written test of critical thinking skills and interviews. The main instrument in this research is the researcher himself. The researcher as the main instrument was assisted by other instruments, namely critical thinking mathematics questions, interview guidelines, and critical thinking skills standards. The written test used is in the form of story questions with a total of 3 questions that must be done by the subject

The data validation technique carried out in this study used a triangulation technique. Triangulation technique is to test the credibility of the data and ensure the validity of the data which is done by checking the data to the same source with different techniques. This technique is obtained by conducting observations, interviews and documentation (Sugiyono, 2010:373).

Data analysis in qualitative research is carried out since data collection takes place and after data collection for a certain period. Activities in data analysis are: 1) data reduction. Data reduction is

defined as the process of selecting, focusing on simplifying, abstracting, and transforming rough data that emerges from written notes in the field. Data reduction takes place continuously as long as a qualitative research-oriented project takes place. Data reduction is part of the analysis. Data reduction is a form of analysis that sharpens, categorizes, directs, discards unnecessary things, and organizes data in such a way that final conclusions can be drawn and verified; 2) data presentation. Miles & Huberman defines a presentation as an organized collection of information that provides the possibility of drawing conclusions and taking action. They believe that better representations are a key means of valid qualitative analysis, which includes a wide variety of matrices, graphs, networks and charts. Analysis of the data in this study required criteria that indicate that students have critical thinking skills in accordance with the percentage of achievement. Table 1 below shows the criteria for the percentage of students' critical thinking abilities.

Table 1. Criteria of students' critical thinking skill (Arikunto, 2001)

No	Percentage (%)	Classification
1	0 - 40	Very low
2	41 - 55	Low
3	56 - 65	Medium
4	66 - 80	High
5	81 - 100	Very High

The criteria for the percentage of students' critical thinking abilities above were obtained from the description test of critical thinking skills on fractional material. And then 3) drawing conclusions and verification. Drawing conclusions according to Miles &

Huberman is only part of an activity from a complete configuration. Conclusions were also verified during the course of the study. Miles and Huberman in Sugiyono (2010:337) suggest that activities in qualitative data analysis are carried out interactively and take place continuously until complete, so that the data is saturated. From the test results were analyzed based on the achievement of the subject in accordance with the indicators of critical thinking skills. Indicators of critical thinking skills include (1) clarity; (2) precision; (3) accuracy; (4) relevance; (5) consistency; (6) logical correctness; (7) completeness; and (8) fairness. Furthermore, from the results of the analysis that has been carried out, conclusions are then made from the results of the study to determine whether students have high critical thinking skills or not in fractional material.

RESULT AND DISCUSSION

Based on the test results of students' critical thinking skills in the fraction material, it was obtained a score of 80 for student 1, 55 for student 2, and 85 for student 3 according to the assessment of each number. In table 2 below, the test scores for students' critical thinking skills are presented.

Table 2. Score of Students' critical thinking skill

Student	Number				Total	Score
	1a	1b	2	3		
S1	4	4	4	4	16	80
S2	2	4	1	4	11	55
S3	4	4	4	5	17	85

Based on the table, it can be seen that S1 and S3 got a good score, while S2 got a moderate score. After analyzing the results of student work and conducting interviews with students, the following were obtained.

1. On the standard of critical thinking, clarification with indicators of writing down what is known on the problem, writing down what is being asked, and representing the problem in mathematical language, students achieve a percentage of 78%.

2. In the standard of thinking precision, which is to write down the method or strategy used in solving the problem, the students achieved a percentage of 100%.

3. On the standard of thinking accuracy, with indicators of correctly inputting information on math problems and solving problems correctly, the students achieved a percentage of 78%.

4. In the standard of relevance thinking with indicators, writing concepts according to problem solving correctly and writing down information related to problem solving correctly is achieved by students with a percentage of 89%.

5. On the standard of thinking consistency with indicators of solving questions according to information, inputting related information to solve problems, and solving problems using other methods or alternative solutions achieved by students with a percentage of 70%.

6. On the standard of logical correctness thinking, namely connecting previous knowledge in solving problems, students achieved a percentage of 100%.

7. In the standard of thinking completeness with indicators, writing step by step problem solving and writing down things related to answers achieved by students with a percentage of 89%.

8. On the standard of fairness thinking, namely writing conclusions in accordance with the completion of the questions achieved by students with a percentage of 33%.

Based on the description, it can be seen that the critical thinking standards of precision, relevance, logical correctness, completeness reach very high categories. For critical thinking standards clarity, accuracy, consistency reached the high category, while for fairness in the very low category.

Based on the results of the analysis, S1 can understand the meaning of the three questions well, he can write things that are known, things are asked, and can represent problems in the language of mathematics correctly. This S1 conveys the steps for solving problems in a coherent manner and directly performs calculations. S1 can connect and input the information contained in the problem correctly to determine the relevant information needed in solving the problem and can connect previous knowledge to solve the problem. Figure 1 below is the result of S1's work.

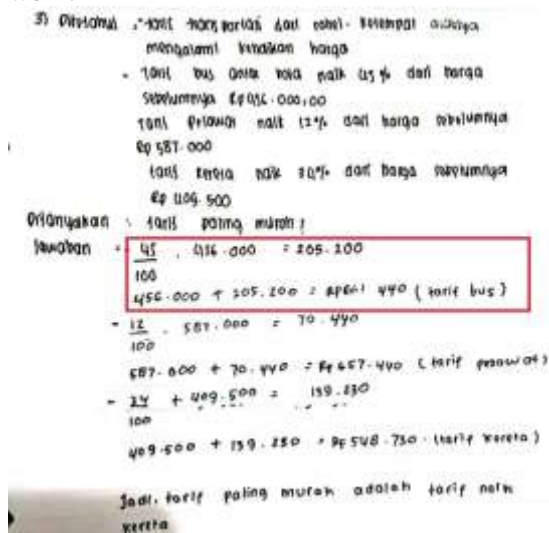


Figure 1. Student's answer (S1)

It can be seen in Figure 1 that the solution obtained from solving one of the questions is wrong due to inaccurate

calculations and both questions are also correct and the delivery of conclusions is also correct even though it is only entered in one question number, namely in question number 3.

S2 could not understand the meaning of the three questions well. Figure 2 below presents the results of the master's work.

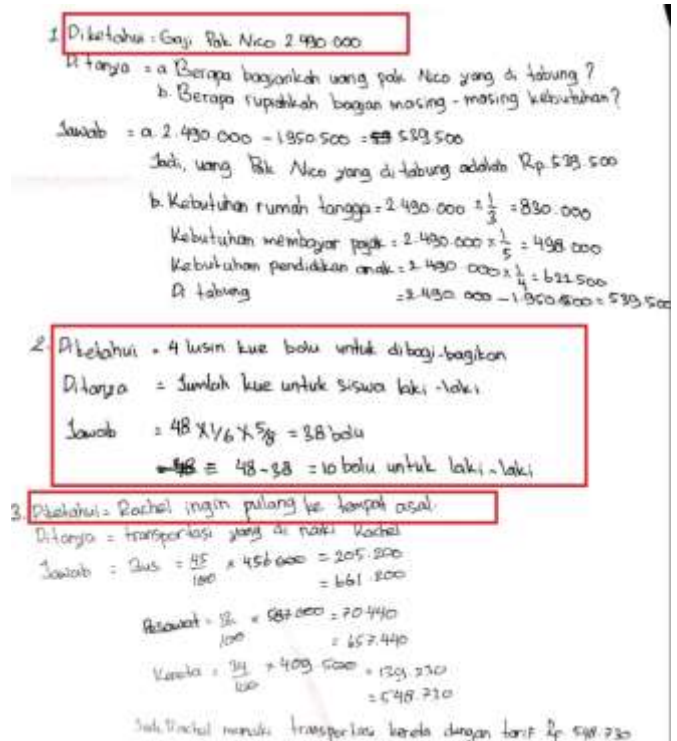


Figure 2. Student's answer (S2)

In Figure 2, S2 can mention things that are known but not complete. The things that were asked were conveyed quite well. It does not represent the problems that exist in the problem in the desired mathematical language. He can determine how to solve problems and is only able to input information for one question, so he cannot determine the relevant information used to solve problems and he can apply the concept of fractional arithmetic operations to solve problems quite well. S2 is quite good at connecting with previous knowledge to

solve problems, but he can't apply the concept of counting fractions to solve this problem because S2's understanding of fractional number material is still lacking. This is related to the results of interviews, S2 still has difficulties because the teacher when the online class situation only provides material and assignments without any reciprocal explanations to students. He can write down things related to the answers to solving problems, but can't write down the steps of completion correctly.

S2 also in working on the problem in number 2 can use a different alternative way to solve the problem but the delivery is not clearly meant. And S2 only gave a conclusion on the completion of one question, namely on question number 3 because he was not used to giving conclusions.

S3 understands the meaning of the two questions well. He can mention what is known and what is asked correctly. He can represent the problems on the three questions in the language of mathematics by using language that students understand. S3 is able to determine the initial to final steps in solving problems. He can input information on the problem correctly and solve it correctly by writing down step by step problem solving according to the relationship in the problem. Students' understanding of the material concepts of fractional arithmetic operations is good. S3 is able to connect previous knowledge to solve problems correctly. However, S3 writes a conclusion according to the problem solving only on question number 3.

Based on the results of data analysis that has been carried out previously, students' critical thinking skills in completing the fractional material story

test consisting of 3 students and 3 questions can meet the classification of critical thinking according to the criteria. In the range of 0% - 40% of students are said to not have the ability to think critically (very low), especially in the standard of ability of Fairness. There are no students who meet the classification of low critical and medium critical in solving story problems because there is no standard of critical thinking ability which is in the range of 41% - 55% and 56% - 65%. Most students can meet the standard of critical thinking skills on high critical to very high critical classification. Students' critical thinking ability can be classified as high critical because the range of 66% - 80% is met, namely the standard ability of Clarity, Accuracy, and Consistency. The three students mostly have very high critical thinking skills in the range of 81% - 100% which are met are the standards of Precision, Relevance, Completeness, and Logical Correctness.

In a study conducted by Kristagotama, et al (2015) with the title Profile of Critical Thinking of Class VII Students at Junior High School Jember 1 in Solving Problems with Operations to Count Fractions Based on Gender which discusses whether students can think critically in solving arithmetic operations on fractions based on gender. The results obtained are female students do not meet the standards of precision, accuracy, logical correctness, relevance, consistency, and completeness. Female students tend to meet two critical thinking standards, namely clarity and fairness, while male students do not meet all critical thinking skills standards.

Based on the research that has been done and previous studies that both discuss students' critical thinking skills in solving fractional arithmetic operations,

the results are quite different because the critical thinking abilities of each student cannot be generalized. It can be seen from the results of these two studies, that only the clarity standard of critical thinking skills is met and other critical thinking standards are not met. So the standard of critical thinking ability of clarity can be owned and fulfilled by students in solving story problems with arithmetic operations on fractions..

CONCLUSION

Based on the results of the analysis and discussion that has been carried out, the conclusion of this study is that the average critical thinking ability of students in solving fractional problems in 7 grade Junior High School is 73.33. On the standard of critical thinking precision, relevance, logical correctness, completeness reach very high category. For critical thinking standards clarity, accuracy, consistency reached the high category, while for fairness in the very low category.

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