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Identify Student Errors in Solving Story Problems on Fractions

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Abstract. The purpose of this research is to discover the errors made by students while working on story problems involving fractions. This study is a descriptive qualitative study. The subjects were fifth-grade students from State Elementary School 5 Kesu', a class of 13 students, and the student who made the most errors was chosen. Tests in the form of written questions, interviews, and documentation are used to collect data. The collected data is then analyzed by reducing it, presenting it, and drawing conclusions. According to the findings of this study, the research subjects made errors in each question, including reading errors 1 time, understanding the issue 21 times, transformation errors 10 times, calculation process 14 times, and writing answers errors 6 times.

Keywords: Student Errors, Story Problems, Fractions

INTRODUCTION

The basic knowledge obtained by students in elementary school becomes the basis of knowledge that will be developed at the next level. There are several subjects in elementary school that are listed in the 2013 curriculum, one of which is mathematics, which is separate in the high class in elementary school. Mathematics should be taught from elementary school level. This is because mathematics has the main benefits and roles in everyday life and is able to provide knowledge to students to think logically, analytically, systematically, critically, and creatively, as well as the ability to work together.

Mathematics learning is inextricably linked to arithmetic operations such as addition, subtraction, multiplication, and division, all of which are related to number material. Mathematics is the science of logic that deals with related forms, arrangements, quantities, and concepts [1];[2];[3];[4]. Students studying mathematics are expected not only to be able to count, but also to be able to reason logically and critically in order to solve problems that they face on a daily basis [5];[6].

Fractions are fundamental concepts that must be mastered before moving on to the next level of fractions, which includes material such as fraction simplifying, addition, subtraction, and mathematical problem-solving operations. As a result, it is critical for students to understand and master fractions while still in elementary school. Problems with students' low mathematics learning outcomes and their difficulties in solving math problems in the form of stories indicate an error in the teaching and learning process that must be repaired [7];[8];[9]. The story problem is a problem that raises several questions, has numerical data, and can be solved in a variety of ways [10];[11]. Solving mathematical problems, where the teacher's task is to assist students in solving problems across a broad spectrum,

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namely assisting students in understanding the problem, so that the ability to understand the context of the problem can continue to develop using inquiry skills in analyzing the reasons why the problem arises [12].

According to Safitri [13] are prerequisite topics or concepts in mathematics that serve as the foundation for understanding the next topic or concept. Learning mathematics requires students not only to master mathematical concepts, but also to be able to apply concepts in solving everyday problems. According to Hartini [14], story questions are a type of question that presents problems in everyday life in the form of stories. In reality, however, not all students can easily solve problems in the form of stories. According to Mustadi and Atmojo [15], student mistakes require further investigation in order to obtain a clear and detailed picture of students' weaknesses in solving story problems. Story questions are a type of narrative or story question in which problems in everyday life are investigated and solutions are sought using numeracy skills [16].

Fractions are numbers that can be represented by a/b, where an is known as the numerator and b is known as the denominator, a and b are integers, and b is zero. The form a/b can also be read as a: b. (a divided by b) [17].

Observations and interviews with fifth grade teachers at State Elementary School 5 Kesu' revealed that fifth grade students had difficulty understanding fractions, particularly story problems, and that students needed more time to complete them, making it difficult for the teacher to move on to the next material due to the difficulty of the students in understanding the material. Students believe that story problems on fractions material are extremely difficult. This is evident when students work on problems. Students cannot convert the results of their observations into mathematical form, they do not add it up correctly, and the answer is incorrect.

When solving math story problems, students make five mistakes: misunderstanding, errors in writing answers, reading errors, calculation process errors, and transformation errors [18]. As a result, it can be concluded that students continue to make numerous mistakes. These students' difficulties can be caused by a variety of factors, including internal factors from within the child and external factors from outside the child [19]. The differences in the types of errors and the cause students' errors in solving fraction story problems by male and female students in terms of Newman's theory [20].

Based on this description, the goal of this study is to learn more about the errors made by fifth graders when solving fraction math story problems.

METHODS

This study employs a qualitative descriptive research design in accordance with the problem and research focus to gain an in-depth understanding of the errors made by fifth graders at the State Elementary School 5 Kesu' in solving math story problems with fractions. Using this method, the data will be collected naturally, resulting in results that are consistent with the conditions in the field. Descriptive research is research that focuses on a process for obtaining data through contact incentives and necessitates a significant amount of time spent interacting in the field to collect data, analyze data, and interpret it [21].

This study was carried out at the State Elementary School 5 Kesu', with a total of 13 class V students serving as research subjects, and several students were chosen to represent the errors in each item to serve as respondents or interview research subjects based on the criteria. The types of errors made in each item were used to determine the criteria for selecting interview subjects.

In this study, questions and interview guidelines were used as instruments. Questions are used to determine where students are going wrong when working on questions, whereas interviews are used to learn more about the factors that cause students to solve problems incorrectly. The interview results were then analyzed by reducing the data, presenting the data, and drawing conclusions.

RESULTS AND DISCUSSION

Reading errors, misunderstandings about questions, transformation errors, calculation errors, and writing errors in answers are all examples of errors based on Singh's theory [23];[24]. The table below summarizes student errors in solving fractional story problems.

Table 1. Examples of Student Errors in Problem Solving

Number of questions	Error In reading	Misunderstood the issue	Error in transformation	Error in calculation	Error in writing response
1	0	4	2	2	1
2	0	6	3	3	2
3	1	3	0	4	2
4	0	7	7	4	3
Σ	1	21	10	14	6

The errors made by students on each item are shown in the table above.

Error In Reading

Reading error occurs when students are unable to read the words or symbols in the questions. Reading errors occurred once in this study, in question number 3, causing students to write down things they knew were incorrect. Reading errors are the fewest because fifth-grade students have good reading abilities.

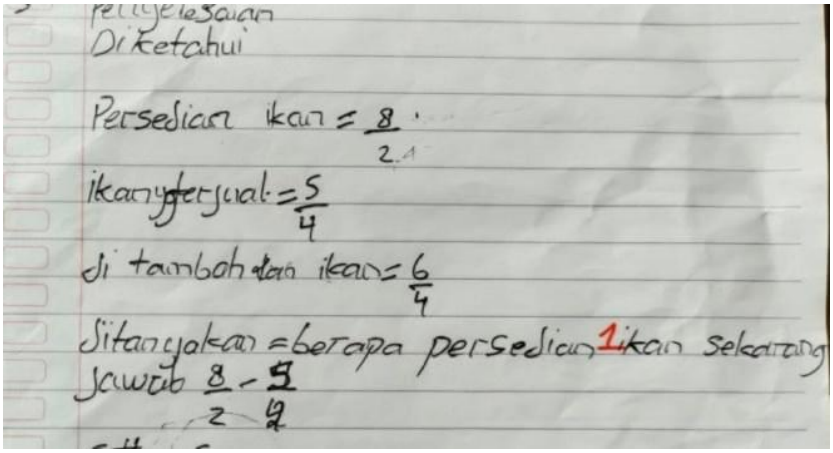

Figure 1. Error In Reading

Misunderstood the issue

Misunderstanding the problem is an error that occurs when students do not comprehend the overall meaning of a question. When students write and explain what they know about the problem, as well as write and explain what is being asked of the question, they can identify misinterpretation of the question. In other words, misunderstanding the problem occurs when students can read the problems in the problem but do not understand which problems they must solve.

There were as many as 21 errors in understanding the problem, with details of the error indicator not writing down things that were known to as many as 5 people, who did not write down things that were asked as many as 5 errors, did not write down things that were known and did not write down both things as many as 11 errors, and were the most common mistakes. In this study, a lot of things happened. This indicator is consistent with Asfar's steps for understanding the problem, which state that in order to understand the problem in question, students must be directed to know what is known and asked [25]. The image below depicts the students' misunderstanding of the problems

caused by each determined indicator.

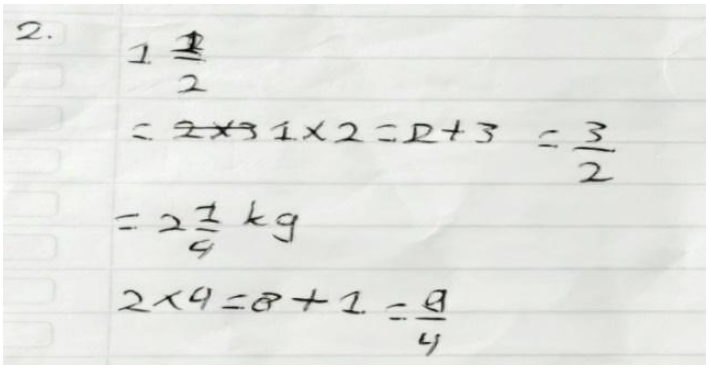

Figure 2. Failure To Record What Is Known

Figure 1 shows that the subject of S2 made a mistake in understanding the problem; the answer did not write down the information that was known and asked, so S2 could not determine the arithmetic operation used and did not continue to complete the problem.

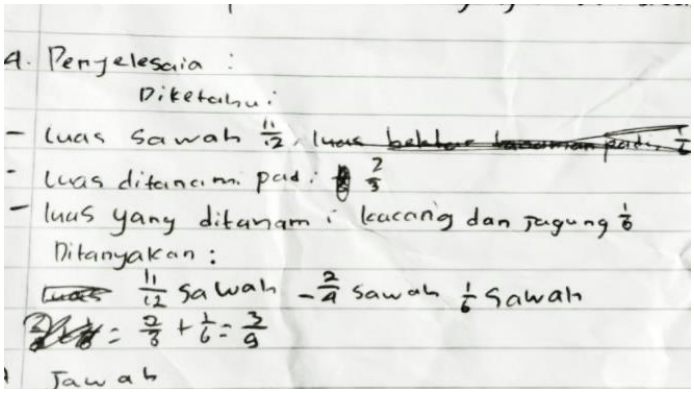

Figure 3. Failure To Record What Was Asked

In the image above, it can be seen that S9 already knows the information contained in the question, that S9 wrote down what he knew, but that S9 did not write down what was asked in the question, causing S9 to be incorrect in solving the problem.

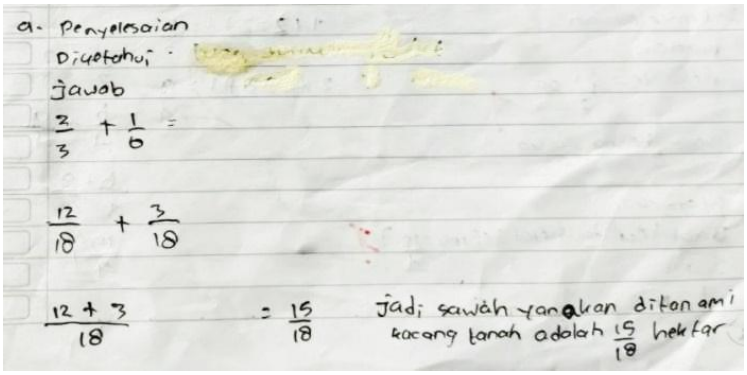

Figure 4. Failure To Write Both

When information is obtained in Figure S5, S5 immediately writes answers without writing down what is known in the problem and also does not write down what is known and asked, resulting in S5 being incorrect in solving the

problem and being unable to determine how many arithmetic operations are used.

Error in transformation

According to Singh, a transformation error occurs when students are unable to identify the arithmetic operation or formula that will be used to solve the problem (Singh et al., 2010). The transformation error occurred as many as ten times in this study, with details of the error appearing four times in question number two, twice in question number three, and four times in question number four. These student errors occur when students are unable to correctly determine arithmetic operations despite having understood all of the information contained in the questions. The image below is an example of a student's transformation error.

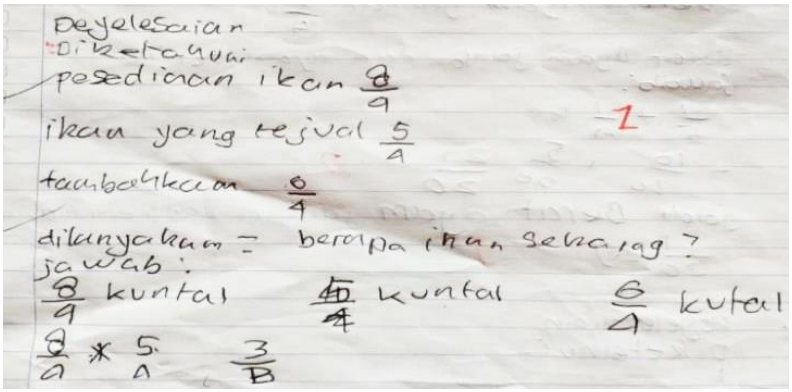

Figure 5. Error In Transformation

Problem transformation errors occur when students are unable to determine the arithmetic operation or formula to be used in solving the problem. For example, S12 can write down what is known correctly and what is asked correctly, but S12 is unable to determine what operation to use, and S12 is only able to get to the stage of understanding the problem because S12 was confused in determining the arithmetic operation to be used.

Error in calculation

An error in the calculation process occurs when students do not understand the algorithm process to solve the problem despite correctly determining the formula, and students also do not correctly carry out the procedure despite correctly determining the mathematical operations used. In this error, the student can usually choose which mathematical operation to use, but he cannot calculate it correctly.

In this study, the error in the calculation process is classified into three indicators: incorrectly operating numbers, incorrectly determining the denominator and numerator. According to the findings of the data in this study, the error in the first indicator occurred six times, the indicator could not determine the denominator six times, and the error in calculating the numerator two times, for a total error in the calculation process of fourteen times. The image below depicts errors made by students during the counting process.

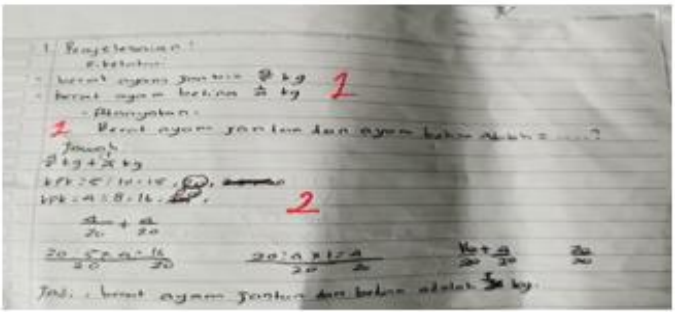

Figure 6. Errors in the calculation process

As can be seen in S9's answer, S9 was able to complete the transformation stage and also determine the arithmetic operation used, but S9 made a counting error. Based on the results of the tests and interviews, it can be stated that S9 correctly solved question number 1 from the stage of understanding the problem to the transformation of the problem, but at the stage of calculation it is less accurate in working on the problem when calculating 20: 4 x 1 = 4 which should be 5, causing S9 to be incorrect on the final result.

The second error indicator occurs when a student changes the denominator in a fraction operation, whether it is the same denominator or the wrong denominator in a different denominator operation. The following is an example of a mistake made by S12 in question 2.

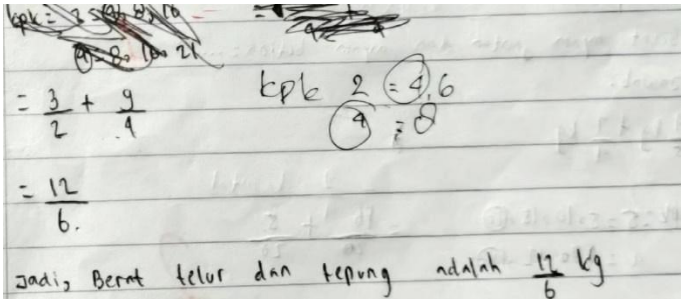

Figure 7. an error in determining the denominator

It is clear from S13's response that S13 made a mistake in determining the denominator. Based on the results of the tests and interviews, it is possible to conclude that S13 does not understand the concept of fractions and, as a result, immediately adds the numerators without first equating the denominators and also adds up the denominators and denominators, causing S13 to be incorrect when working on question number 2.

The following error occurs when the student correctly determines the denominator but fails to correctly determine the numerator.

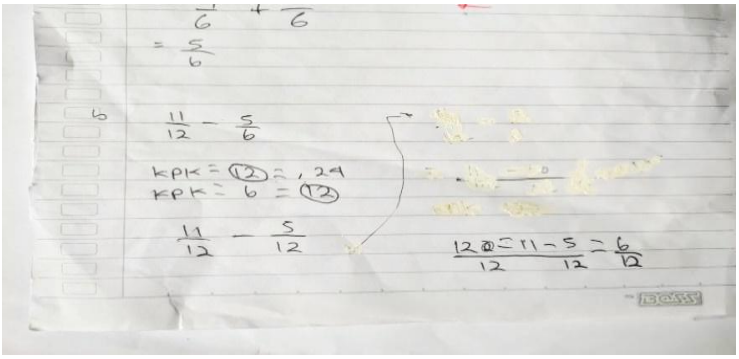

Figure 8. Error In Calculating the Numerator

It is clear from S3's response that S3 can correctly determine the denominator. However, in calculating S3, he made an error in determining the numerator in part b of question number 4. According to the results of the tests and interviews, S3 was incorrect in the calculation process of determining the numerator in answer number 4-part b because S3 was not careful in working on the questions and was also affected by the first answer which was immediately rewritten because the number that divided it was 12 so it was directly written 11/12 and in the next division just written 5/12 does not change the numerator.

Error in writing response

The error in writing the conclusion of the final answer is a type of error that occurs when a student is able to perform the calculation process well but is unable to write the final result in a sentence, but there are also those who

have written it in a sentence but wrote the incorrect number for the final result (Jha, 2012). The image below depicts writing errors in student responses to fractional story problems.

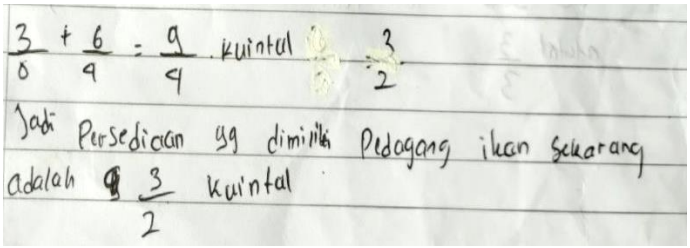

Figure 9. Errors In the Final Answer

Based on S8's response, it is clear that S8 followed the 9/4 calculation process correctly. However, when writing the final answer, S8 entered a different number, 3/2, which did not match the final answer.

Based on the results of the above tests and interviews, it is possible to conclude that S8 was incorrect in answering question number 3 at the stage of writing the final answer. S8 performed the calculations correctly; however, when writing the final answer, S8 actually wrote numbers that did not correspond to the final results obtained because S3 simplified the final results obtained by dividing by different numbers despite the fact that it was in the concept of fractions. If two fractions are divisible by the same number, they can be simplified.

In this study, there were six errors in writing the final answer, which occurred because students did not write the conclusion of the final answer and also did not write the final answer in context. This is consistent with the study's findings, which show that students made errors in writing the final answer despite being able to calculate correctly. In question 3, one student writes different numbers in the final answer with the calculation results, despite the fact that the calculation results and the sentence editorial are correct. There were also students who did not write down the final answer at all, and there were 5 errors on this indicator.

CONCLUSION

Based on the findings of the research and discussion about fifth grade students' errors in solving fraction story problems at State Elementary School 5 Kesu', it is possible to conclude that the errors made by students when working on fraction story problems are reading errors, understanding problems, transforming, calculating, and making errors. response writing, with the fewest number of errors made by students, namely one reading error, because fifth-grade students can read in general, the greatest number of errors, namely understanding the question as many as 21 errors, there are 10 errors in problem transformation, 14 errors in counting, and 6 errors in writing the final answer.

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