

## Student Errors In Solving Story Problems With Fraction Count Operations; Analysis On Class VII Students

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**Abstract.** Fraction is one of the materials in mathematics subject in class VII odd semester, which students must master well. Because this material continues from elementary school. Fraction is related to every day, and many problems use the concept of fractions. The research aims to describe the errors according to Newman's procedure, which students carry out to solve the issues. The methods used in data collection were tests and interviews. The written examination was given to class VII 15 students as the subject. The test questions consist of 4 item description questions, then from the results of the written test of 5 students who made mistakes according to the Newman procedure. The results of research that have been carried out on students according to Newman's approach in solving fractions questions as indicated by the results of their daily tests, the most frequent error is the process skill error and encoding error with a percentage of 58,33%, the transformation error is 51,66%, comprehension error 41,66% and the last percentage of reading error 25 %. The causes of student errors include being unable to read correctly, not understanding fractions, and being unable to determine the formula or steps to use, such as making mistakes in the calculation process and writing wrong information or answers.

**Keywords:** Error Analysis, Fraction, Newman's Procedure

**Abstrak.** Bilangan pecahan merupakan salah satu materi pada mata pelajaran matematika di kelas VII semester ganjil yang harus dikuasai dengan oleh siswa, karena materi ini merupakan lanjutan dari tingkat dasar. Pecahan berkaitan dengan kehidupan sehari-hari dan banyak permasalahan yang memanfaatkan konsep pecahan. Penelitian ini bertujuan untuk mendeskripsikan kesalahan menurut prosedur Newman yang dilakukan siswa dalam menyelesaikan soal. Metode yang digunakan dalam pengambilan data adalah tes tertulis dan wawancara. Tes tertulis diberikan kepada siswa kelas VII yang berjumlah 15 siswa sebagai subjek, soal tes terdiri dari 4 butir soal uraian, kemudian dari hasil tes tertulis diambil 5 siswa yang membuat kesalahan menurut prosedur Newman. Hasil penelitian yang telah dilakukan kepada siswa dalam menyelesaikan soal cerita terkait materi pecahan dengan menggunakan prosedur Newman yang ditunjukkan dengan hasil ulangan harian yaitu kesalahan proses penyelesaian dan penulisan jawaban akhir dengan persentase 58,33%, kesalahan transformasi 51,66%, kesalahan memahami 41,66% dan kesalahan membaca dengan persentase 25%. Adapun penyebab kesalahan siswa meliputi tidak dapat membaca dengan baik, kurang paham tentang pecahan, tidak dapat menentukan rumus atau tahap yang digunakan, kurang teliti seperti salah dalam proses perhitungan serta salah dalam menuliskan informasi atau jawaban.

**Kata kunci:** Analisis Kesalahan, Pecahan, Prosedur Newman.

## **INTRODUCTION**

As an integral part of the national education system, mathematics education plays a significant role in developing science and technology. Mathematics is essential for human life because, in daily activities, humans cannot be separated from mathematical things (Mulyadi, 2015; Mangelep, 2017; Runtu et al., 2023). Mathematics is not a subject that only teaches about numbers or how to count but also how to think, especially in the formation and development of analytical skills, synthesis, evaluation, and ability to solve a problem (Mangelep, 2017; Domu et al., 2023). This aligns with Abdullah's opinion (Mulyadi, 2015), who revealed that one of the main goals of learning mathematics is to provide students with an understanding to solve problems. The ability to solve a problem is a process of searching for information in the problem, analyzing and identifying the problems contained in the problem to decide on the actions or steps used to solve them so that they can achieve the goal of getting excellent and correct solutions and answers (Mangelep et al., 2013; Melani et al., 2016; Rompas et al., 2023).

A fraction is a term in mathematics that consists of a quantifier and a denominator. Bruce argues that fractions are mathematical material involving concepts that are difficult to learn and teach (Bruce, 2013; Manaming et al., 2018; Sulistyaningsih & Mangelep, 2019). Mega (2015) revealed that errors arise due to students' learning difficulties. So that these mistakes also have an impact on student learning outcomes (Mangelep, 2015).

From the results of observations made by researchers and interviews with mathematics teachers at SMP Negeri 2 Tareran, it was found that many students still scored below the Minimum Completeness Criteria (KKM), especially for material on fractional operations. The KKM score was 70. Students who achieved KKM are only 40%, while students who did not reach KKM are 60%. According to the subject teacher, this is because, in the learning process, students still make many mistakes as the problem is that students cannot interpret the terms and symbols in the questions, students do not write down what is known and what is asked in the questions, students cannot make mathematical models of story problems given, students still make calculations wrong in solving fractional operations questions, and some students do not write down the conclusions of their answers at all related to the story questions on the given fraction material. To find out the cause of the decline in student learning outcomes by analyzing student learning outcomes errors in solving problems, especially questions in the form of stories.

To analyze these errors, the researcher used the Newman Procedure cited by White (Sugiyono, 2014; Mangelep et al., 2020; Tiwow et al., 2022), including the following: 1) reading error: not knowing the meaning of the symbol, keywords, and terms in the questions.

2) comprehension error: can read the problem well but cannot understand the meaning of words, symbols, or questions. 3) transformation error: unable to transform into a mathematical form. 4) processing skill error: can select the appropriate operation but cannot complete the operation accurately. 5) encoding error (error concluding): can show the correct operation but miswrite the answer. Newman's procedure was chosen because this procedure is a method developed by Newman to identify categories of errors in answers from an essay test (Amalia, 2017; Tiwow et al., 2022).

## **METHOD**

This type of research is descriptive research with a qualitative approach. The researcher is the key instrument, and the supporting instruments are tests and interviews. The data collection technique was triangulation (combined), data analysis was inductive/qualitative, and the results of qualitative research emphasized meaning rather than generalizations. The research subjects in this study were Class VII Students of SMP Negeri 2 Tareran in the odd semester of the 2021/2022 academic year. The researcher used several data collection procedures to obtain valid data for this study, namely tests as an assessment tool. According to Susetyo (2015), tests as an assessment tool are questions given to students to get answers from students in oral, written or in the form of actions and Interviews to communicate directly between researchers and respondents.

## **RESULT AND DISCUSSION**

This research was conducted at Tareran 2 Public Middle School in West Wuwuk Village, Tareran District, South Minahasa Regency, North Sulawesi Province. The research lasted for approximately 1 week and was attended by 15 students. In collecting research data, researchers used tests in the form of essay test questions to find out the mistakes made by students and interviews as a tool in completing research data collection. From the results of research at SMP Negeri 2 Tareran, researchers obtained the following results:

Table 1. Percentage of Error Types

<b>Problem</b>	<b>Reading Errors</b>	<b>Understanding Errors</b>	<b>Transformation Errors</b>	<b>Processing Skill Errors</b>	<b>Writing Final Answer</b>
<b>1</b>	5	7	8	8	8
<b>2</b>	2	3	5	7	7
<b>3</b>	3	8	8	9	9
<b>4</b>	5	17	10	11	11
<b>Total</b>	15	25	31	35	35
<b>Percentage</b>	25%	41,66%	51,66%	58,33%	58,33%

Reading errors are errors in finding keywords and reading the information and mathematical symbols in the questions thoroughly. An example of a reading error is an error made by AR. An example of this error can be seen in Figure 1 when working on question number 1 below

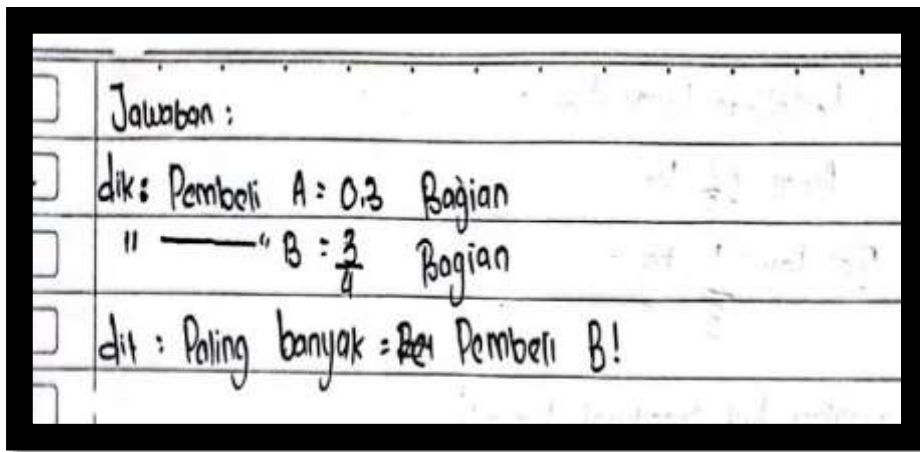


Figure 1. Students' Answers to Reading Errors

#### Results of interviews with AR students

- Researcher : Good morning  
AR : Good morning, teacher  
Researcher : (Gives a question sheet). Try reading the numbers  
AR : (silence)  
Researcher : Why are you silent? Come on, try to read it loudly so the teacher can hear it."  
AR : (shakes)  
Researcher : Why? Do you not want to read it? We will replace it. Try reading this question (shows question number 2)  
AR : (silence)

From the results of the interview, it can be seen that AR made a reading error. This was proven by the researcher's request to AR to read the questions repeatedly, but AR remained silent and was reluctant to read them. After being confirmed with the math teacher, it was found that AR was not fluent in reading, so AR could not solve the questions given.

Understanding errors (Comprehension errors) is a lack of understanding of the problem so that students cannot determine what is known or what is being asked from the problem. An

example of a misunderstanding is a mistake made by PW. An example of this error can be seen in Figure 2 when working on question number 1 below.

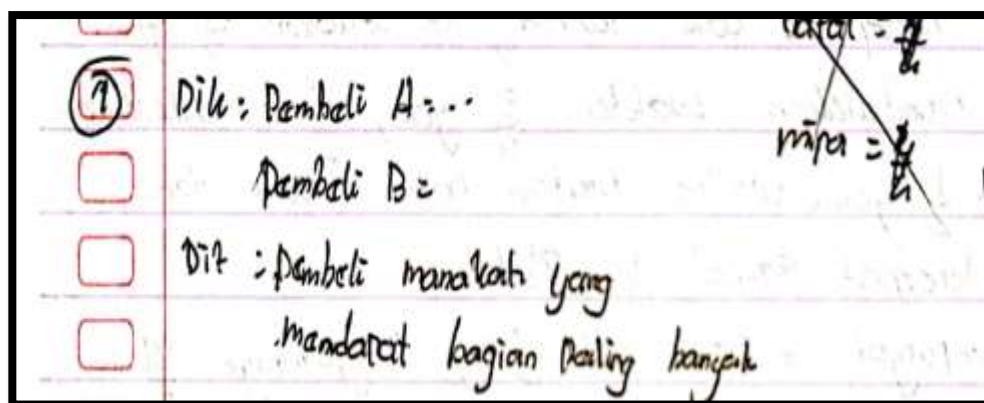


Figure 2. Students' Answers to Understanding Errors

#### Results of interviews with PW

- Researcher : In your opinion, what is known about the problem?  
 PW : Madam teacher, Mrs Rina, sells 0.3 parts to Buyers A and B, a total of 0.3 parts.  
 Researcher : So, you know. So, what difference did you make on your answer sheet?  
 PW : Sorry, teacher. Little is known. I did not read that again.  
 Researcher : All right, next time, be more careful. Then what do you think is being asked from the question?  
 PW : The buyer who gets the most share is the teacher.  
 Researcher : Why don't you write it down here (pointing to PW's answer sheet)  
 PW : Sorry, I forgot, teacher.

From the interview excerpts, the researcher concluded that this comprehension error occurred due to the PW's lack of thoroughness. Evidenced by when asked what is known and asked questions, PW can answer them smoothly and well. This proves that PW can understand the problem given but is not thorough in answering it and writing it down on the answer sheet.

Transformation errors are errors in determining the formula used in the steps to solve the problem. An example of a transformation error is an error made by MP. An example of an error can be seen in Figure 3 when working on question number 2 below.

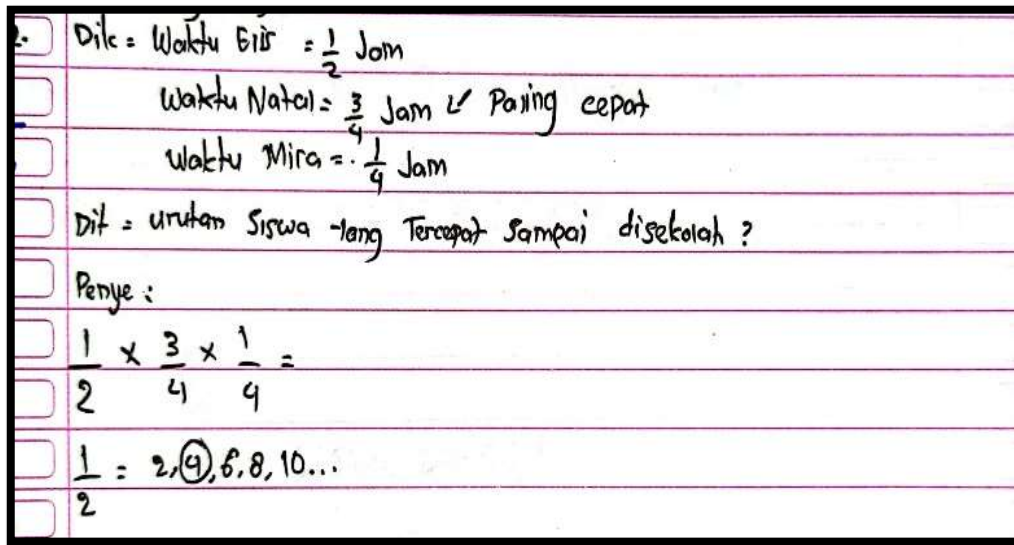


Figure 3. Student's Answers to Transformation Errors

Interview results with MP:

- Researcher : How did you do question number 2?  
 MP : (pause) (smile)
- Researcher : Why are you silent? Try to explain. You have learned about fractions. Well, now the teacher wants to know what method you think can be used to solve this problem" (pointing to question number 2)
- MP : I do not know, teacher. It is so difficult.
- Researcher : Why is it difficult? Then try to explain your answer to the teacher you wrote earlier." (Submit MP's answer sheet to MP.)
- MP : I just answered the teacher
- Researcher : Yes, explain your answer.
- MP : So, Elis was the fastest to reach Miss School. Then the second is Christmas, and the longest is Nira.
- Researcher : So, the fastest names to reach school are Elis, Natal, and Nira.
- MP : Yes, teacher.
- Researcher : Explain why the order is Elis, Natal, and Nira.
- MP : In the question, it is known that the time Elis gets to school is the same as the clock. Then Christmas time to school is hours. Moreover, Nira is a clock. So, because Christmas time is a clock, Elis is the fastest. Because the fraction is more minor. Then the following Christmas, with a higher number than Elis but smaller than Nira, it was the second fastest Christmas. Moreover, Nira took the longest to get to school because her grades were bigger than Elis and Natal's.
- Researcher : So, in your opinion, the fastest is determined from the numerator and denominator of a minuscule fraction?
- MP : Yes, teacher. I do not understand—demanding teacher.
- Researcher : Have you never learned about the order of fractions?
- MP : It looks like you are a teacher
- Researcher : So how come the answer is wrong?
- MP : I do not understand.
- Researcher : Did you not notice the teacher when he was teaching?

- MP : (Silence and smile). However, the problem is complicated, teacher.  
 Researcher : The questions are tricky because you rarely practice and repeat the lessons you have learned. Because we can understand and understand if we practice a lot. So, there is a lot more to do.  
 MP : All right, teacher  
 Researcher : A lot - much studying at home, huh?

Based on the results of the researcher's interview with MP, it can be concluded that the cause of the processing errors carried out by MP is a complex problem because students do not understand the topic of fractional material in order of fractions.

Process skill errors are errors in determining the systematics of solving word problems and errors in operating calculations. An example of a skill error is a mistake made by JW. An example of an error can be seen in Figure 4 when working on question number 4 below.

Figure 4 Student Answers Process Skills

Interview results with JW:

- Researcher : Can you mention the steps you used to solve this problem?  
 JW : Mixed fractions are first made into common fractions, teacher. Then I count. I added  $\frac{13}{6}$  and  $\frac{1}{3}$  to get  $\frac{15}{6}$  then subtracted by  $\frac{7}{6}$  and got the result  $\frac{8}{6}$ .  
 Researcher : Yes, your steps are correct. But your answer is still wrong  
 JW : All right, teacher.

Based on the interview above, the cause of the process error that JW made can be seen because he was wrong from the start in solving question number 4, even though the steps were correct. So, the researcher concluded that JW made a processing error because he was wrong in reading the available information, which caused errors to occur later, including in the problem-solving process.

Errors in Writing Final Answers (Encoding errors) are errors in determining the final answer or not writing the final answer. An example of a mistake in writing the final answer is

a mistake made by CM. An example of an error can be seen in Figure 5 when working on question number 3 below.

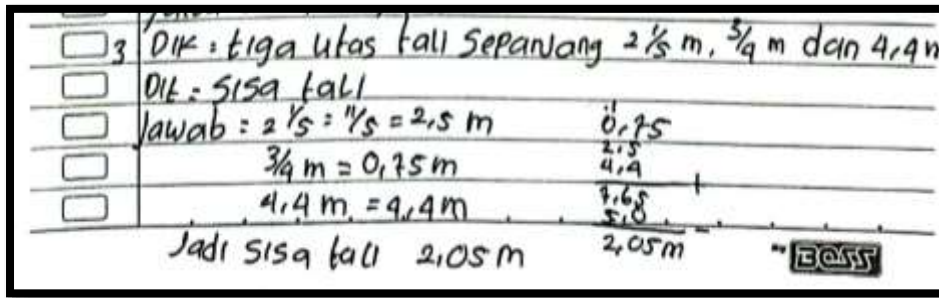


Figure 5 Student Answers Writing Errors in Final Answers

Interview results with CM:

- Researcher : How did you do it?  
 CM : Equalize all the fractions first. First, I changed  $2\frac{1}{5}$  to  $\frac{11}{5}$ , right, so it's an ordinary fraction.  
 Researcher : After that, what are the next steps?  
 CM : Then I changed it to a decimal fraction and got 2.5. After that,  $\frac{3}{4}$  is also changed to decimal, 0.75.  
 Researcher : Are you sure your answer is correct?  
 CM : Hmm. Yes, teacher.  
 Researcher : Does 11 divided by 5 get 2.5? Try now to share. Let the teacher see how you divide it. (Hands over paper)  
 CM : (Writing) Oh, wrong teacher. Got 2,2  
 Researcher : Why is it wrong?  
 CM : Hurry up, teacher.  
 Researcher : Next time, count again. Because if you miscalculate in the middle of the road, the next one will be wrong. So, it is confirmed again, counted slowly, so that the next one is not wrong.  
 CM : All right, teacher.

Based on the interview results above, it is known that CM has miscalculated the result of the fraction  $\frac{11}{5}$  to become 2.5. Because the completion stage for CM was wrong, it was also wrong for the next stage. This affects the final answer that CM gets when solving the problem. CM writes that the remainder of Dwi's rope is 2.05 m, and the answer is wrong because it is the process or steps in solving the problem that will determine the right or wrong final answer or conclusion.



## **CONCLUSION**

Based on the results of research that has been conducted on class VII students of SMP Negeri 2 Tareran in the odd semester of the 2021/2022 academic year, it can be concluded as follows: Of the five types of errors according to Newman's procedure in solving fraction material problems, the most frequent error is the completion process error 58.33% and writing the final answer with a percentage of 58.33%, the transformation error is 51.66%, then the error in understanding is 41.66%, and the error in reading is 25%. The mistakes made by students when solving fractional material questions were that students were still wrong in reading the story questions given, then did not write down what was known and asked related to the questions given, students did not understand fractional material, students could not determine the formula or stage that used for problem-solving, students' lack of accuracy such as being wrong in the calculation process, so that students are wrong in determining or writing the final answer.

From the results of the research and conclusions, the researchers suggest: Teachers should ensure that students have mastered the prerequisite material and the basic concepts of operating fractions so that there are no mistakes when solving fraction material problems. Students are advised to recheck the results of calculations for each solving problem to ensure that the results are correct and get used to rechecking answers and adjusting them to existing concepts to determine whether the answers and steps used are appropriate. Researchers can add insight and skills in describing and disclosing the causes of errors students make in solving a mathematical problem based on the Newman procedure.

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