

An Analysis of Fifth-Grade Students' Difficulties in Solving Fraction Problems Based on Newman's Error Analysis

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ABSTRACT : This study aims to analyze the difficulties experienced by fifth-grade students at each stage of the Newman Procedure in solving fraction word problems and to identify the factors contributing to these difficulties. This study employed a qualitative approach with a descriptive research design. The research subjects consisted of 22 fifth-grade students who completed a written test. Five students were purposively selected as interview participants based on the variation in the difficulties they experienced, while one fifth-grade teacher served as a supporting informant. Data were collected through written tests, semi-structured interviews, and documentation. The data were analyzed using the Miles and Huberman interactive model, which includes data reduction, data display, and conclusion drawing and verification. Data validity was established through technical and source triangulation. The findings showed that students did not experience difficulties at the reading stage, but difficulties were identified at the comprehension, transformation, process skills, and encoding stages. The factors contributing to these difficulties included limited understanding of problem information, confusion in connecting problem information with appropriate mathematical operations, inadequate mastery of fraction calculation procedures, and hesitation in writing the final answer. These factors are interrelated and collectively affect the overall problem-solving process. The findings are expected to provide teachers with information for designing more effective mathematics instruction based on the stages of the Newman Procedure, particularly in helping elementary school students overcome difficulties in solving fraction word problems.

Keywords: Difficulty Analysis, Fraction Word Problems, Newman Procedure, Elementary School.

INTRODUCTION

Mathematics is a vital subject in education. Learning mathematics not only teaches students how to perform calculations but also trains logical, critical, and systematic thinking skills and develops problem-solving skills for everyday life. Therefore, mastery of mathematical concepts must be instilled from elementary school as a foundation for learning material at subsequent levels of education. These skills are essential for students to understand more complex mathematical concepts. In this context, mathematics learning should be supported by instructional strategies and learning resources that are able to facilitate students' conceptual understanding and numeracy development. Ekadayanti, Ili, Kadir, Yanti, and Hesti (2024) emphasized the importance of developing mathematics learning modules that are contextual and connected to students' cultural environments as an effort to strengthen numeracy literacy. Thus, mathematics learning at the elementary level needs to be designed not

only to emphasize procedural calculations but also to develop students' ability to understand, reason, and apply mathematical concepts in meaningful contexts.

However, Indonesian students' mathematical abilities still require attention. The 2022 Programme for International Student Assessment (PISA) results ranked Indonesia 70th out of 81 participating countries in the mathematics domain, with an average score of 366, still below the OECD average of 472 (OECD, 2023). Furthermore, data from the 2024 Indonesian Education Report Card show that only 67.94% of students achieve the minimum numeracy competency, leaving approximately 32% who have not yet met this minimum (Kemendikdasmen, 2025). These data indicate that mathematical abilities, particularly in solving various types of problems, still need to be improved through more effective learning processes. The improvement of mathematics learning also requires the availability of appropriate learning media and resources. Ekadayanti, Parisu, Yanti, Sisi, and Saputra (2024) demonstrated that the development of mathematics and science learning media can support the improvement of teachers' digital literacy, which is increasingly important in developing more innovative and accessible mathematics learning environments.

One type of math problem that often causes difficulty for students is the word problem. Solving a word problem requires not only the ability to perform arithmetic operations, but also the ability to understand the text, identify known and questionable information, and transform that information into an appropriate mathematical model. This process requires integrated reading, comprehension, and calculation skills, which often present a challenge, especially for elementary school students (Huljan et al., 2022). When one of these abilities is not well developed, students will have difficulty solving story problems even though they have studied the related material. The complexity of these difficulties demonstrates that mathematical problem-solving should be examined not only based on the correctness of the final answer but also based on the processes students undertake in reaching the answer.

The difficulty in solving word problems becomes increasingly complex when using fractions. Fractions are abstract material that requires a good conceptual understanding and the ability to apply arithmetic procedures correctly. Students' difficulties with fractions generally involve conceptual understanding, determining appropriate arithmetic operations, and implementing calculation procedures, which ultimately impact their ability to solve fraction story problems (Ulfa et al., 2021). Thus, fractions are among the topics that require special attention in elementary school mathematics. The importance of identifying errors in solving mathematical word problems is also emphasized by Ekadayanti, Saputra, Fista, and Yanti (2024), who analyzed elementary school students' errors in solving mathematical word problems based on Newman Error Analysis. Their research demonstrates that students' errors

can occur at several stages of the problem-solving process, indicating the importance of analyzing student responses systematically to identify the specific forms of errors experienced by students.

This situation was also found at SDN 7 Mowila. Based on initial observations and interviews with fifth-grade teachers, some students still had difficulty solving story problems involving fractions. These difficulties were evident when students were unable to understand the information in the problem, determine the correct arithmetic operations, equate the denominators, perform fraction calculations, and determine the steps to solve them sequentially. These initial findings indicate that students' difficulties were not only related to the final answer but also occurred at every stage of the problem-solving process. Therefore, a detailed analysis is needed to identify the specific stages at which students experience difficulties and the factors underlying those difficulties.

To better understand the difficulties experienced by students, an analysis procedure is needed that can identify obstacles at each stage of problem-solving. One widely used procedure is Newman's Error Analysis or Newman Procedure. This procedure divides the problem-solving process into five stages, namely reading, comprehension, transformation, process skills, and encoding. Through these five stages, students' difficulties can be identified more specifically so that teachers can determine appropriate learning efforts to overcome students' learning obstacles (Anggraeni & Ngazizah, 2025). Newman Error Analysis therefore provides a systematic framework for examining whether students' difficulties originate from reading and understanding the problem, transforming verbal information into mathematical operations, carrying out the required procedures, or writing the final answer correctly.

Several previous studies have shown that students' difficulty solving fraction story problems remains common. Firdaus et al. (2025) reported that elementary school students had difficulty understanding the concept of fractions, determining appropriate arithmetic operations, and completing calculation procedures for fraction story problems. Research by Ridhaningtya et al. (2025), who used the Newman Procedure, also showed that students' greatest difficulties occurred at the stages of understanding problems, transformation, and process skills. The results of both studies indicate that difficulty solving fraction story problems remains a consistent problem among elementary school students. These findings reinforce the importance of conducting systematic error analysis in mathematics learning, particularly because the forms of difficulty experienced by students may differ depending on the mathematical content, characteristics of the problems, and learning context.

However, these studies still have several limitations. Most studies focus on identifying the forms or types of students' difficulties in solving word problems, while

the factors that cause difficulties at each stage of the Newman Procedure have not been explained in depth. In addition, research on student difficulties in solving fraction story problems using the Newman Procedure among grade V students at SD Negeri 7 Mowila, Mowila District, South Konawe Regency has not been conducted. Therefore, this study was conducted to provide a more comprehensive picture of the forms of difficulties and the causal factors experienced by students in each stage of problem solving. The development of effective mathematics learning should also be supported by appropriate learning resources and media, as demonstrated by Ekadayanti, Parisu, Yanti, Sisi, and Saputra (2024), who highlighted the importance of developing mathematics learning media to support the improvement of learning competencies in elementary education.

Based on the description, this study aims to describe the difficulties fifth-grade students experience in solving fraction story problems at each stage of the Newman Procedure and to identify the factors causing these difficulties at SDN 7 Mowila. The results of the study are expected to provide useful information for teachers in designing more effective mathematics instruction, especially in fraction material, to minimize the difficulties students experience in the problem-solving process. In addition, the findings are expected to contribute to the development of mathematics learning that is more systematic, contextual, and responsive to students' specific learning difficulties.

METHODS

This study employed a qualitative descriptive research approach to examine the difficulties experienced by fifth-grade students in solving fraction problems based on the stages of the Newman Procedure. A qualitative approach was selected because the study sought to obtain an in-depth understanding of the difficulties experienced by students during the problem-solving process in natural classroom conditions. Meanwhile, the descriptive design was used to describe the phenomena identified in the field based on the data obtained, without administering specific treatment to the research subjects (Sugiyono, 2022). The research was conducted at SD Negeri 7 Mowila, Ranombayasa Village, Mowila District, South Konawe Regency, from March to April 2026 during the even semester of the 2025/2026 academic year.

The research subjects consisted of 22 fifth-grade students, comprising 11 boys and 11 girls. All students participated in a written test consisting of fraction word problems to identify difficulties at each stage of the Newman Procedure. Subsequently, five students were selected as interview participants using purposive sampling. The selection was based on the variation of difficulties identified in the students' written responses, allowing the researcher to obtain more detailed

information regarding the difficulties experienced at each stage of the Newman Procedure. In addition, the fifth-grade teacher served as a supporting informant who provided information regarding students' learning difficulties and the factors influencing their ability to solve fraction problems.

The research data consisted of primary and secondary data. Primary data were obtained from students' written test results, semi-structured interviews with selected students, and interviews with the fifth-grade teacher. Secondary data were obtained from supporting documents relevant to the research, including school profiles, students' work, and documentation of research activities.

Data were collected through written tests, interviews, and documentation. The written test was administered to all 22 students and consisted of four fraction word problems covering addition, subtraction, multiplication, and division of fractions. The problems were prepared by the fifth-grade teacher based on the learning material that had been taught and were adapted to the students' learning context. The questions were designed in the form of fraction word problems to identify the stages at which students experienced difficulties in solving mathematical problems.

The students' written responses were analyzed using indicators based on the five stages of the Newman Procedure: reading, comprehension, transformation, process skills, and encoding. The reading stage refers to students' ability to read and recognize the information contained in the problem. The comprehension stage concerns students' ability to understand the meaning of the problem and identify the known and unknown information. The transformation stage refers to students' ability to determine the appropriate mathematical operation or strategy. The process skills stage involves students' ability to carry out mathematical procedures accurately. The encoding stage refers to students' ability to write the final answer correctly and provide an appropriate conclusion.

Semi-structured interviews were conducted with five selected students to obtain more in-depth information regarding the difficulties they experienced while solving the fraction problems and the factors that caused those difficulties. Interviews were also conducted with the fifth-grade teacher to confirm and enrich the findings obtained from the students' written tests and interviews. Documentation was used to complement the research data, including students' written work, photographs of research activities, and other relevant supporting documents.

The research instruments consisted of the researcher as the primary instrument, supported by written test instruments, student interview guidelines, teacher interview guidelines, and documentation sheets. The written test was used to identify the forms of student difficulties at each stage of the Newman Procedure. Student interviews were used to explore students' thought processes and the factors underlying their

difficulties. Teacher interviews and documentation were used to deepen, confirm, and support the research findings.

Data analysis employed the interactive model proposed by Miles and Huberman (2014), which consists of data reduction, data presentation, and conclusion drawing and verification. Data reduction was conducted by selecting, organizing, and focusing the data relevant to the research objectives. The reduced data were then presented in the form of descriptive narratives and categorized according to the five stages of the Newman Procedure. The final stage involved drawing conclusions and verifying the findings by comparing information from different data sources and data collection techniques. The analysis was conducted continuously throughout the research process, beginning with data collection and continuing until the findings were interpreted comprehensively.

The credibility of the research data was maintained through technical triangulation and source triangulation. Technical triangulation was conducted by comparing the results of written tests, interviews, and documentation. Source triangulation was conducted by comparing information obtained from students and the fifth-grade teacher. In addition, the researcher applied diligence during the data analysis process by repeatedly reviewing students' test results, interview transcripts, and documentation to ensure the consistency, accuracy, and credibility of the research findings.

RESULT AND DISCUSSION

RESULT

A. Students' Difficulties in Solving Fraction Problems Based on the Newman Procedure

This study aimed to describe the difficulties experienced by fifth-grade students in solving fraction word problems based on the stages of the Newman Procedure. The data were obtained from a written test administered to 22 students. The test consisted of four fraction word problems involving addition, subtraction, multiplication, and division. The students' responses were analyzed based on the five stages of the Newman Procedure: reading, comprehension, transformation, process skills, and encoding. Subsequently, five students were selected as interview participants through purposive sampling to obtain more detailed information regarding the difficulties identified from the written test results.

Table 1 presents the summary of the written test analysis based on the Newman Procedure.

Table 1. Summary of Written Test Analysis Results Based on the Newman Procedure

No.	Student Code	R	C	T	P	E
1	S01	8	12	10	5	0
2	S02	8	8	9	6	2
3	S03	8	9	12	9	3
4	S04	8	9	9	4	0
5	S05	8	4	12	12	4
6	S06	8	0	4	4	0
7	S07	8	0	5	4	0
8	S08	8	6	8	4	0
9	S09	8	4	12	12	4
10	S10	8	0	5	4	0
11	S11	8	4	12	10	3
12	S12	8	0	6	4	0
13	S13	8	0	7	6	1
14	S14	8	5	9	6	1
15	S15	8	4	12	10	4
16	S16	8	4	10	8	2
17	S17	8	4	12	12	4
18	S18	8	4	12	12	4
19	S19	8	0	8	7	1
20	S20	8	6	10	6	1
21	S21	8	4	12	12	4
22	S22	8	4	12	12	4

Note:

R = Reading;

C = Comprehension;

T = Transformation;

P = Process Skills;

E = Encoding.

Based on Table 1, all students obtained the same score at the reading stage, indicating that they were generally able to read the numbers, fraction symbols, and written information contained in the word problems. However, variations were observed in the comprehension, transformation, process skills, and encoding stages. These variations indicate that students' difficulties were not uniform and occurred at different stages of the problem-solving process.

The findings further indicate that the greatest difficulties were related to the process skills stage, particularly in performing fraction calculations. Difficulties were

also found at the transformation and comprehension stages, while some students experienced uncertainty when writing the final answer. These findings demonstrate that students' difficulties in solving fraction word problems were not limited to calculation errors but also involved understanding the problem and determining the appropriate mathematical strategy.

1. Difficulties at the Reading Stage

The written test results showed that all students were able to read the numbers, fraction symbols, and information contained in the word problems. No errors were identified that indicated difficulties at the reading stage.

Table 2. Summary of Interview Results at the Reading Stage

Informant	Code	Summary of Interview Results
Students	All students	Able to read the questions, numbers, and fraction symbols fluently
Fifth-grade teacher	GK01	Students' reading ability was generally adequate and did not constitute a significant obstacle in solving fraction word problems

The interview results showed that all students were able to read the fraction word problems fluently without experiencing difficulties in recognizing numbers or fraction symbols. This finding was reinforced by the statement of GK01:

"Students' reading ability in general is good enough so that students do not experience problems in reading fraction story problems" (GK01).

These findings indicate that the reading stage was not a source of difficulty for the students involved in this study. Therefore, no significant difficulties were identified at the reading stage of the Newman Procedure.

2. Difficulties at the Comprehension Stage

The written test results indicated that several students experienced difficulties in understanding the information presented in the problems. These difficulties were reflected in students' inability to distinguish between the information provided and the information being asked for. As a result, some students experienced difficulties in determining the appropriate steps for solving the problems.

Table 3. Summary of Interview Results at the Comprehension Stage

Informant	Code	Summary of Interview Results
Student	S10	Unable to explain the known and asked information and stated that the problem was not understood
Student	S12	Experienced difficulty identifying the information needed to solve the problem
Fifth-grade	GK01	Some students still experienced difficulty analyzing the

The findings presented in Table 3 indicate that S10 and S12 experienced difficulties in understanding the content of the fraction word problems. These difficulties were evident in their inability to identify the known information and the information required by the problem.

The interview results reinforced these findings. S10 stated:

"I don't understand" (S10).

Similarly, S12 stated:

"I don't understand" (S12).

These findings were further supported by the statement of GK01:

"The general difficulty for students is analyzing the story questions regarding what is known and what is asked in the question" (GK01).

Based on the written test and interview results, it can be concluded that difficulties in understanding the information presented in the problem constituted one of the main obstacles experienced by students before proceeding to the subsequent stages of problem solving. Students who were unable to identify the known and unknown information also experienced difficulty determining the appropriate strategy for solving the problem.

3. Difficulties at the Transformation Stage

The written test results showed that some students were unable to determine the appropriate arithmetic operation required to solve the fraction word problems. This difficulty occurred when students were unable to transform verbal information into an appropriate mathematical operation.

Table 4. Summary of Interview Results at the Transformation Stage

Informant	Code	Summary of Interview Results
Student	S10	Selected addition because it was considered the most appropriate operation
Student	S12	Selected addition even though the problem required multiplication
Fifth-grade teacher	GK01	Some students still experienced difficulty transforming word-problem information into mathematical operations

The findings in Table 4 indicate that S10 and S12 were not yet able to translate the information contained in the word problems into appropriate mathematical operations. S10 stated:

"The operation I use is addition, then the denominators are made the same first" (S10).

Meanwhile, S12 stated:

"Addition, but it should be multiplication" (S12).

This difficulty was also confirmed by GK01:

"Students still have difficulty converting story problem information into mathematical operations" (GK01).

These findings indicate that difficulties at the transformation stage were characterized by students' inability to determine the appropriate arithmetic operation based on the context of the problem. Some students tended to select an operation based on estimation or superficial interpretation of the problem rather than on an understanding of the relationship between the information provided.

4. Difficulties at the Process Skills Stage

The written test results indicated that the process skills stage represented one of the most difficult stages for students. These difficulties were primarily related to performing fraction calculations, including finding common denominators, determining equivalent multiples, and carrying out fraction multiplication procedures.

Table 5. Summary of Interview Results at the Process Skills Stage

Informant	Code	Summary of Interview Results
Student	S01	Experienced difficulty finding common denominators
Student	03	Experienced difficulty determining common multiples
Student	04	Experienced difficulty performing fraction multiplication
Fifth-grade teacher	K01	Some students still made errors when finding common denominators before performing arithmetic operations

The findings in Table 5 demonstrate that students' difficulties occurred across several basic procedures for performing fraction operations. S01 stated:

"In equating denominators" (S01).

S03 stated:

"Yes, I had difficulty finding the same multiples" (S03).

Meanwhile, S04 stated:

"When it was multiplied" (S04).

These findings were reinforced by GK01:

"To equalize the denominators, there are still some students who are still making mistakes in equalizing the denominators" (GK01).

The findings indicate that students had not fully mastered the procedural aspects of fraction operations. Difficulties in determining common denominators, identifying equivalent multiples, and performing multiplication procedures resulted in errors in subsequent calculations. Therefore, the process skills stage was identified as one of the most significant sources of difficulty in solving fraction word problems.

5. Difficulties at the Encoding Stage

The written test results also showed that several students experienced difficulties in writing or expressing the final answer appropriately. These difficulties were associated with uncertainty regarding the accuracy of the answers obtained and the lack of a habit of checking the final answer against the original problem.

Table 6. Summary of Interview Results at the Encoding Stage

Informant	Code	Summary of Interview Results
Student	01	Felt uncertain about the correctness of the answer written
Fifth-grade teacher	K01	Some students were not accustomed to checking their answers after completing the calculation

The findings in Table 6 indicate that difficulties at the encoding stage were related to students' uncertainty about the results of their calculations. S01 stated:

"I'm sure the answer is wrong" (S01).

This statement was reinforced by GK01:

"Some students are not used to double-checking whether their answers match the questions in the exam" (GK01).

Based on the written test and interview results, it can be concluded that difficulties at the encoding stage were influenced by students' lack of confidence in their answers and their limited habit of reviewing the final solution. Consequently, some students were unable to provide a clear and confident final answer that was consistent with the context of the problem.

B. Factors Causing Students' Difficulties at Each Stage of the Newman Procedure

Based on interviews with five selected fifth-grade students and the fifth-grade teacher, four main factors were identified as contributing to students' difficulties in solving fraction word problems. These factors included difficulties in understanding the information contained in the problem, confusion in connecting the problem information with the appropriate mathematical operation, limited mastery of fraction calculation procedures, and uncertainty in writing the final answer.

Table 7. Summary of Interview Results on Factors Causing Student Difficulties

Causative Factor	Informant	Code	Summary of Interview Results
Lack of understanding of information in the problem	Student	S10	Experienced difficulty understanding information about the remaining cooking oil
	Student	S12	Experienced confusion regarding information related to a period of one week
	Teacher	GK01	Some students had difficulty

Confusion in determining mathematical operations	Student	S10	identifying the known and asked information Determined operations based on estimation rather than understanding relationships between information
	Student	S12	Experienced confusion in selecting the appropriate operation based on the context
	Teacher	K01	Students experienced difficulty transforming word-problem information into mathematical operations
Limited ability to perform fraction calculations	Student	S01	Experienced difficulty finding common denominators because the solution steps had been forgotten
	Student	03	Experienced difficulty determining common multiples
	Student	04	Experienced difficulty performing fraction multiplication
	Teacher	K01	Some students still made errors when finding common denominators
Uncertainty in writing the final answer	Student	S01	Felt uncertain about the correctness of the answer obtained
	Teacher	GK01	Some students were not accustomed to checking their written answers

1. Lack of Understanding of Information in the Problem

The interview results showed that several students experienced difficulties understanding the information presented in fraction word problems. This difficulty resulted in students being unable to identify the known information and the information being asked for, which subsequently affected their ability to determine the appropriate solution steps.

S10 stated:

"I don't really understand the question" (S10).

Meanwhile, S12 stated:

"I'm confused by the word one week" (S12).

These statements indicate that students did not fully understand certain information contained in the problems. As a result, they experienced difficulties in identifying the mathematical relationships among the information presented.

The results of the interview with GK01 confirmed these findings:

"The general difficulty for students is analyzing the story questions regarding what is known and what is asked in the question" (GK01).

These findings demonstrate that limited comprehension of problem information was one of the primary factors contributing to students' difficulties in solving fraction word problems. Difficulties at this stage affected the subsequent transformation and calculation processes.

2. Confusion in Connecting Problem Information with Appropriate Mathematical Operations

The interview results also showed that some students experienced confusion when determining the appropriate mathematical operation. Students tended to choose an operation based on estimation or the perceived size of the numbers rather than on the relationship between the information presented in the problem.

S10 stated:

"I think if it's reduced, the results will be small" (S10).

Meanwhile, S12 stated:

"I'm confused about which operation to use for that week" (S12).

These statements demonstrate that students had not yet fully developed the ability to transform contextual information into an appropriate mathematical model. The students' choices of operations were not always based on an understanding of the problem's mathematical relationships.

This finding was reinforced by GK01:

"Students still have difficulty converting information in story problems into mathematical operations" (GK01).

Therefore, confusion in selecting mathematical operations was an important factor contributing to difficulties at the transformation stage.

3. Limited Ability to Perform Fraction Calculations

The interview results further indicated that some students had not yet mastered the procedures required to perform fraction calculations. The difficulties included finding common denominators, determining common multiples, and performing fraction multiplication.

S01 stated:

"I forgot how to do it" (S01).

S03 stated:

"Have to find out the same multiples" (S03).

Meanwhile, S04 stated:

"When it was multiplied" (S04).

These statements indicate that students had not fully mastered the procedural knowledge required to solve fraction operations. This finding was reinforced by GK01:

"To equalize the denominators, there are still some students who are still making mistakes in equalizing the denominators" (GK01).

Thus, limited mastery of fraction calculation procedures was a significant factor contributing to difficulties at the process skills stage.

4. Uncertainty in Writing the Final Answer

The interview results also showed that some students experienced uncertainty even after completing the calculation process. This uncertainty affected their confidence in writing the final answer.

S01 stated:

"I'm sure the answer is wrong" (S01).

This statement indicates that the student lacked confidence in the result obtained, even after completing the calculation. The finding was reinforced by GK01:

"Some students are not used to double-checking whether their answers match the questions in the exam" (GK01).

Based on these findings, uncertainty in writing the final answer was associated with students' lack of confidence and limited habits of checking their work. This factor contributed to difficulties at the encoding stage, particularly when students were required to provide a final answer that was consistent with the context of the original problem.

Overall, the findings indicate that students' difficulties in solving fraction word problems were concentrated primarily at the comprehension, transformation, and process skills stages, while difficulties at the reading stage were not identified. The process skills stage represented a particularly important obstacle because students experienced difficulties in performing basic fraction procedures. The findings also show that difficulties at one stage could affect subsequent stages. For example, students who did not fully understand the information in the problem were more likely to experience difficulties in selecting the appropriate operation, performing calculations, and writing the final answer. Thus, the Newman Procedure provides a systematic framework for identifying the specific stages and factors underlying students' difficulties in solving fraction word problems.

DISCUSSION

The results of the study showed that students' difficulties in solving fraction story problems at the elementary school level did not occur at every stage of the Newman Procedure. Difficulties were found at the comprehension, transformation,

process skills, and encoding stages, while no significant difficulties were identified at the reading stage. This finding indicates that students' ability to read mathematical symbols and the text of the problem was relatively adequate. However, difficulties emerged when students had to interpret the information, translate it into mathematical operations, perform fraction calculations, and formulate the final answer in accordance with the context of the problem. Therefore, the main obstacles were related not to students' ability to read the problem, but to their ability to process and apply the information mathematically.

At the reading stage, all students were able to read numbers, fraction symbols, and the information contained in the story problems. This finding indicates that students had sufficient basic reading skills to recognize the mathematical symbols and words used in fraction problems. The results of this study are in line with Hadaming and Wahyudi (2022), who stated that reading ability is an important prerequisite in solving mathematical problems based on the Newman Procedure. Nevertheless, the ability to read a problem does not automatically guarantee that students understand its meaning. This is evident from the fact that although students were able to read the questions correctly, some of them still experienced difficulties at the comprehension stage. Thus, reading ability functions as an initial foundation, while problem comprehension determines whether the information can be processed effectively in the next stages of problem solving.

Difficulties began to emerge at the comprehension stage, particularly when students were required to identify the information known and the information being asked in the problem. Some students were unable to explain the meaning of the problem and did not fully understand the relationships among the information presented. As a result, students experienced difficulty determining the direction of the solution. This finding is consistent with Ekadayanti et al. (2024), who found that students' errors in solving mathematical story problems are closely related to difficulties in understanding the information contained in the problem. Similar findings were also reported by Riswandi and Rukli (2023), who explained that students who fail to understand the context of a problem tend to experience difficulties in determining appropriate solution strategies.

From a theoretical perspective, this condition can be explained through Bruner's theory of cognitive development, particularly the process of transforming information into meaningful representations. Students need to understand the verbal information in a story problem before they can represent it mathematically. When students are unable to identify what is known and what is being asked, they have not yet successfully transformed the verbal information into an appropriate mental or mathematical representation. Therefore, learning fractions should not focus solely on

calculation procedures but should also provide opportunities for students to identify, discuss, and represent information from story problems using words, pictures, tables, or mathematical expressions.

The transformation stage also presented difficulties for some students. At this stage, students were required to determine the appropriate mathematical operation based on the context of the problem. However, the interview results showed that some students selected operations based on guesses or superficial estimates rather than understanding the relationships among the quantities presented. For example, students tended to choose addition because they assumed that the numbers in the problem needed to be combined, even when the context required multiplication. This finding indicates that students had difficulty translating verbal information into a suitable mathematical model.

This finding supports Sari and Subekti (2023), who stated that the transformation of word problems into mathematical models remains a significant challenge for elementary school students, particularly when the problems involve fractions. The difficulty is not simply a matter of remembering mathematical operation symbols, but also involves understanding the relationships between quantities and the meaning of the situation described in the problem. From Piaget's perspective, fifth-grade students are generally still developing their logical reasoning abilities within the concrete operational stage. Consequently, students may require concrete representations, visual aids, contextual examples, and guided questions to help them connect the situation in a story problem with the appropriate mathematical operation.

The process skills stage was identified as one of the stages that caused the greatest difficulty. Students experienced problems in determining common multiples, equating denominators, and performing fraction operations. These difficulties appeared in addition and subtraction problems that required equivalent denominators, as well as in multiplication and other fraction calculations. The findings indicate that students' difficulties were not only related to understanding the problem but also to their mastery of basic fraction procedures.

The results of this study are consistent with Rahmawati et al. (2022), who stated that weak mastery of basic arithmetic procedures is one of the main causes of errors in solving fraction problems. Students who have not mastered multiplication facts or the procedures for finding equivalent fractions may experience difficulties even after successfully understanding the problem and selecting the correct operation. The teacher's explanation that some students still experience difficulties with multiplication tables further reinforces the finding that weaknesses in prerequisite skills can influence students' performance in fraction calculations.

According to Bruner's theory, the process skills stage is closely related to the development of symbolic representation. At this stage, students are expected to manipulate mathematical symbols and apply appropriate procedures. However, symbolic manipulation becomes difficult when the underlying concepts and prerequisite skills have not been sufficiently mastered. Therefore, mathematics learning needs to provide systematic reinforcement of prerequisite skills, such as multiplication facts, equivalent fractions, common multiples, and the relationship between fractions, before students are directed to solve more complex fraction story problems.

Difficulties were also found at the encoding stage, particularly in writing the final answer. Some students remained doubtful about the results they had obtained and were not accustomed to checking whether their answers were consistent with the context of the problem. This condition shows that problem solving does not end when students obtain a numerical result. Students must also interpret the result and communicate it in the form of a clear final answer.

This finding is consistent with Ramadayanti and Supiat (2024), who reported that students often write the result of their calculations without relating it back to the question being asked. In fraction story problems, students need to understand what the numerical result represents. For example, the answer should be expressed in accordance with the context of the problem and, when necessary, accompanied by an appropriate statement. The inability to conduct this final verification demonstrates that students still need to develop reflective habits in mathematics learning.

From the perspective of Piaget's theory, checking and evaluating answers require reflective thinking. Although elementary school students are capable of logical reasoning in concrete situations, they still need consistent practice to develop the habit of reviewing their problem-solving process. Teachers can therefore encourage students to use simple checking questions, such as: *What information was asked in the problem? Is my answer reasonable? Does my answer match the context of the question?* These questions can help students develop a more systematic approach to evaluating their solutions.

In addition to identifying difficulties at each stage of the Newman Procedure, this study also identified four main factors that contributed to students' difficulties in solving fraction story problems. The first factor was the lack of understanding of information contained in the problem. Students who could not identify the known and unknown information had difficulty determining the direction of the solution. This initial difficulty then affected the next stages of problem solving.

The second factor was confusion in determining the appropriate mathematical operation. Students tended to select operations based on estimates or certain

keywords without fully understanding the relationships among the quantities in the problem. This finding demonstrates the importance of developing conceptual understanding rather than merely teaching students to associate particular words with particular arithmetic operations.

The third factor was the limited ability to perform fraction calculations. Difficulties in finding common multiples, equating denominators, and performing fraction operations indicate that students' procedural knowledge still requires reinforcement. This factor is particularly important because errors in calculation may occur even when students have correctly understood the problem and selected the appropriate operation.

The fourth factor was students' hesitation in writing the final answer. Some students lacked confidence in the results of their calculations and were not accustomed to checking their answers. This finding indicates that affective factors, particularly confidence and learning habits, also influence students' mathematical problem-solving performance.

The four factors are interrelated and form a continuous chain of difficulties in solving fraction story problems. When students fail to understand the information in the problem, they are more likely to select an inappropriate mathematical operation. Incorrect transformation can then lead to errors in the calculation process, which ultimately affects the final answer. Therefore, mathematics learning on fractions should be designed systematically by integrating problem comprehension, mathematical modelling, procedural skills, and answer verification.

The findings of this study also have important implications for mathematics instruction. Teachers need to provide learning activities that guide students through each stage of the Newman Procedure. At the comprehension stage, students can be trained to identify the known and unknown information. At the transformation stage, teachers can encourage students to explain the reason for selecting a particular operation. At the process skills stage, students need repeated practice with fraction concepts and procedures. Finally, at the encoding stage, students should be trained to write complete answers and recheck their solutions.

Overall, the results of this study confirm that students' difficulties in solving fraction story problems are multidimensional. These difficulties are not solely caused by weaknesses in calculation skills but also involve comprehension, mathematical representation, procedural mastery, and reflective evaluation. The use of the Newman Procedure provides a comprehensive framework for identifying these difficulties at each stage of problem solving. Thus, the results of this study reinforce the importance of implementing mathematics learning that is gradual, contextual, and focused not

only on obtaining the correct answer but also on developing a complete and meaningful problem-solving process.

CONCLUSION

This study concludes that fifth-grade students' difficulties in solving fraction word problems based on the Newman Procedure were not identified at the reading stage, as all students were able to read numbers, fraction symbols, and information contained in the problems. However, difficulties were identified at the comprehension, transformation, process skills, and encoding stages. At the comprehension stage, students experienced difficulty identifying the known and required information. At the transformation stage, students had difficulty determining the appropriate arithmetic operations based on the context of the problem. At the process skills stage, students encountered difficulties in finding common denominators, determining common multiples, and performing fraction calculations. Meanwhile, at the encoding stage, some students had difficulty expressing the final answer in accordance with the context of the problem and lacked confidence in the results obtained.

The findings further indicate that students' difficulties were influenced by four interrelated factors: limited understanding of problem information, confusion in connecting problem information with appropriate mathematical operations, inadequate mastery of fraction calculation procedures, and hesitation in writing the final answer. These findings imply that mathematics instruction on fraction word problems should emphasize the entire problem-solving process rather than focusing solely on the correctness of the final answer. Teachers are therefore encouraged to provide systematic guidance at each stage of the Newman Procedure, particularly in understanding problem information, translating verbal information into mathematical operations, strengthening fraction calculation skills, and developing students' habits of checking and interpreting their final answers. Further research may explore instructional interventions designed to overcome specific difficulties identified at each stage of the Newman Procedure.

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