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Analysis of Difficulty in Solving Story Problems Based on Newman Error Analysis on Flat Building Material in Grade IV Elementary School

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ABSTRAK

Penelitian ini bertujuan untuk menganalisis kesulitan yang dialami siswa berdasarkan kesalahan dalam menyelesaikan soal cerita tentang bangun datar dengan menggunakan prosedur Analisis Kesalahan Newman. Metode yang digunakan dalam penelitian ini adalah analisis deskriptif. Subjek penelitian adalah siswa kelas IV SDN Sindangkasih. Pengumpulan data dilakukan melalui tes dan wawancara. Hasil analisis data dengan menggunakan prosedur Newman diketahui bahwa kesalahan siswa meliputi kesalahan membaca sebesar 0,51%, kesalahan pemahaman sebesar 2,5%, kesalahan transformasi sebesar 16,24%, kesalahan keterampilan proses sebesar 39,5%, dan kesalahan penyandian sebesar 41,63%. Meningkatnya persentase kesalahan dari membaca ke penyandian disebabkan oleh ketidakmampuan siswa dalam menyelesaikan soal dengan benar setelah mengalami kesulitan pada tahap awal.

Kata Kunci: Analisis Kesalahan Newman (NEA), Soal Cerita, Gambar Dua Dimensi/bangun datar

ABSTRACT

This study aims to analyze the difficulties students experience based on errors in solving story problems related to flat shapes using Newman's Error Analysis procedure. The method used in this research is descriptive analysis. The subjects of the study are fourth-grade students at SDN Sindangkasih. Data was collected through tests and interviews. The results of the data analysis using the Newman procedure reveal that student errors include reading errors at 0.51%, comprehension errors at 2.5%, transformation errors at 16.24%, process skill errors at 39.5%, and encoding errors at 41.63%. The increase in the percentage of errors from reading to encoding is due to students' inability to solve problems correctly after encountering difficulties at the initial stage.

Keywords: *Newman Error Analysis (NEA), Word Problems, two-dimentional figure*

INTRODUCTION

Helping students in solving story-based math problems is influenced by various factors. One of the factors includes students' lack of ability to convert information from story problems into mathematical models and problem-solving skills (Suyati et al., 2018). To improve the mathematics teaching and learning process, these factors need to be analyzed in depth so that effective corrective measures can be identified and implemented.

Helping students can be explained using the Newmans Error Analysis (NEA) procedure. The results of the NEA analysis make it easier to identify problems in student

perception, thinking transformation, computational skills, skill application processes, and creation or application formulas (Seng, 2020). According to NEA (Sukestiyarno et al., 2021), there are five types of errors that may occur when students solve math story problems, namely reading errors, understanding errors, transformation errors, errors in the calculation process, and errors in writing answers.

The selection of the Newman procedure to analyze student errors in solving story problems about measuring flat and spatial shapes is expected to help identify variations in errors and the factors that cause these errors. By solving the difficulties faced by students in working on story-based math problems about flat shapes, it is expected that effective improvement steps can be found for the teaching and learning process. Based on this background, the author intends to conduct a study entitled "Juice Analysis in Solving Story Problems about Flat Shapes in Grade IV Elementary Schools.

METHODE

This research is included in the category of descriptive qualitative research. This research is descriptive because it aims to describe the difficulties made by students based on errors through the stages of Newman's analysis. It is qualitative because the researcher evaluates students' estimation abilities in solving mathematical problems in natural conditions, with the researcher himself as the main instrument. As the main instrument, the researcher directly interacts with the research subjects, adjusts, and observes the errors made by students based on Newman's stages. This research was conducted in class IV B SDN 1 Sindangkasih. The data collection techniques used in this study were test and interview methods. The test given consisted of 5 questions about the story of the circumference and area of flat shapes. The questions used are presented in Table 1.

Table 1. Test Instrument

Number	Questions
1	The terrace of my mother's house is rectangular with a side length of 6 meters and a width of 3 meters. If the terrace is to be installed with 30cm x 30cm ceramic tiles, how many tiles are needed?
2	Grandpa's square garden with a length of 95 meters will be fenced with bamboo. Each meter requires 3 bamboos. How many bamboos does Grandpa need to make the fence?
3	A rectangular field with a length of 50 meters and a width of 80 meters. Budi walks around the field 5 times. How many kilometers does Budi travel?
4	A square yard with a length of 48 meters. Banana trees will be planted around the yard with a distance of 2 meters between trees. How many banana trees are needed?
5	Wonu is making crafts from cardboard in the form of a square with a length of 90cm. On the cardboard, origami paper pieces measuring 5cm x 5cm will be attached. How many pieces of origami paper does Wonu need?

The next instrument used in this study is the NEA interview guideline. Examples of questions that can be used by interviewers to identify the types of errors made by students are presented in Table 2 below.

Table 2. Interview Instrument

Errors Type	Question
Readings error	• Can you read the questions fluently? If yes, please read the questions again on the number (pointing to one of the questions at random).
Mistake in understanding	• What information do you get after reading the question?
Transformation or shape change error	• Can you identify the formula that will be used to solve the problem that has been read? If yes, please write the formula that you will use. • Can you explain the steps you took to solve the problem? • Why did you choose the formula to solve the problem in the problem?
Skill Error process	• How do you solve a problem like this? (pointing to one of the problems) Can you explain how you solve that problem?
Final Answer Error or encoding	• Can you draw a conclusion from the results of solving the problem? (showing one of the problem numbers) If yes, try to draw a conclusion using your own words.

RESULTS AND DISCUSSION

Based on the analysis of students' answer sheets, various types of errors were found that students made according to the Newman procedure, namely reading errors, understanding errors, transformation errors, process skill errors, and encoding errors. The results of the recapitulation of students' errors in solving problems about sequences and series based on the Newman procedure are presented in Table 3.

Table 3. Percentage of student errors based on Newman's error analysis Percentage of Errors

NEA's Level	Amount	Percentage (%)
1	1	0,51
2	5	2,54
3	32	16,24
4	78	39,59
5	81	41,12
Total Number	**197**	**100**

Table 3 shows that the percentage of reading errors to encoding errors has increased. This is due to the inability of students to solve problems correctly after experiencing errors at the initial stage. The following is a discussion of each type of error based on the Newman procedure.

Reading Errors

The results of the data analysis show that the average percentage of reading errors is 0.51%, which indicates that reading errors are very low. This is because the questions given use everyday language and do not involve mathematical symbols that may not be familiar to students. Reading errors are caused by students' lack of accuracy in reading the questions. An example of a reading error can be seen in Subject 1 (S1) when working on question number 1, as shown in Figure 1.

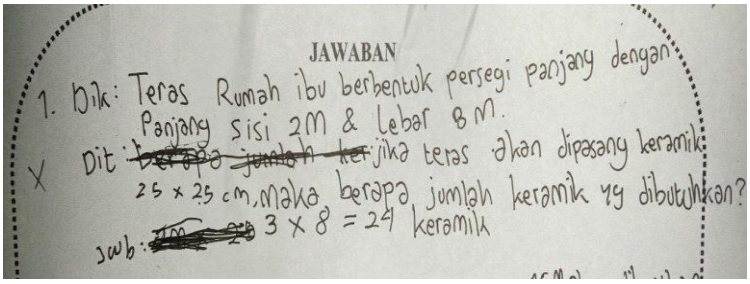

Figure 1. Reading Error Types

S1 made a reading error by not paying close attention to the information. In the given question, the width of the terrace is 3 meters long, while S1 wrote 8 meters.

Understanding Errors

The percentage of understanding errors reached 2.54%, which is higher than reading errors. Although students were able to read the questions correctly, some of them did not understand the intent of the questions, so they could not solve them.

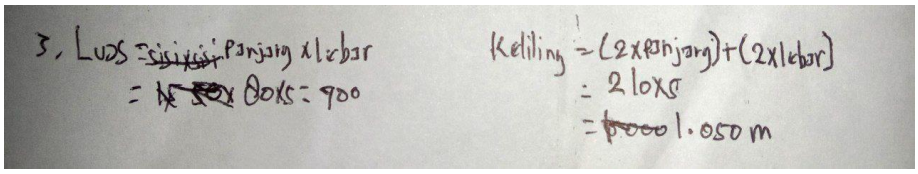

Figure 2. Understanding Errors

In Figure 2, Subject 2 (S2) shows a lack of understanding of the questions he will work on. In question number three, the student should only calculate the circumference and the total distance surrounded by Budi. However, the student calculates the area of the square. This shows that there is a misunderstanding of the student in question number three because the student does not understand that to solve this question, an analogy is needed in the story problem.

Transformation Errors

The percentage of transformation errors reached 16.24%, which is higher than reading and comprehension errors. This is caused by some students who, although they understand the meaning of the problem, cannot construct an appropriate mathematical model or do not know the correct formula.

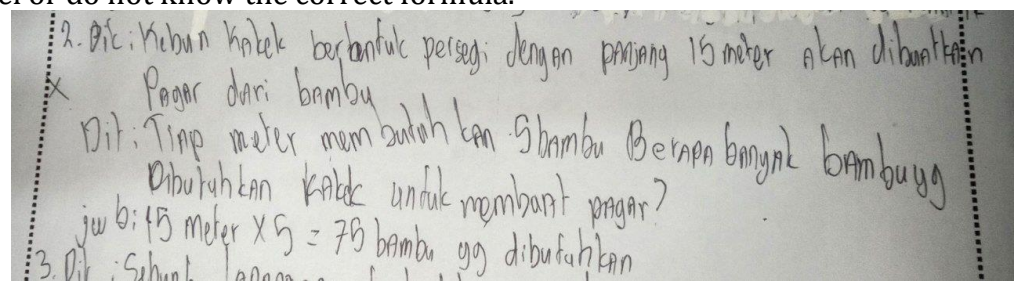

Figure 3. Transformations Errors

The transformation error made by Subject 3 (S3) was not using the correct formula to solve the problem. Based on his interview, he forgot the formula to use, so he wrote the formula he remembered without ensuring its accuracy.

Process Skills Errors

In data analysis, the average percentage of process skills errors reached 39.59%. This shows that although some students managed to reach the transformation stage without errors, they were still less careful in the calculation process.

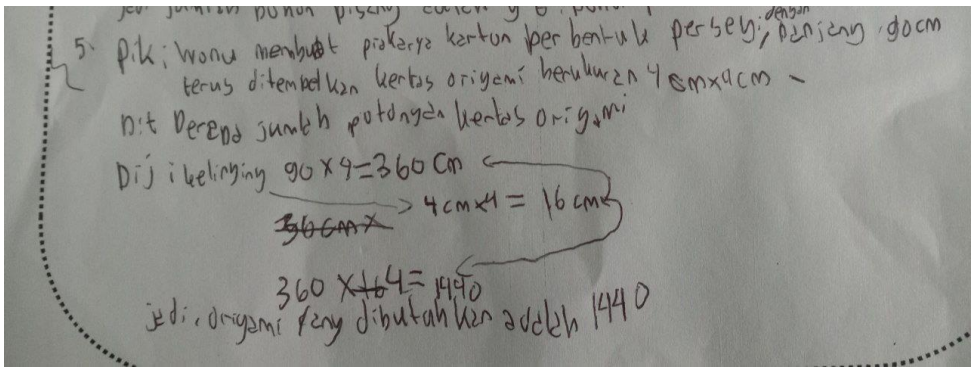

Figure 4. Process Skills Errors

An example of errors in process skills is shown in Figure 4. Subject 4 (S4) made a calculation error from the beginning. After the interview, S4 admitted that he felt confused in entering the understanding of the problem into the formula to be used, so he made mistakes from the beginning to the end.

Encoding Errors

The percentage of encoding errors is almost the same as process skills errors, which is 41.12%. This is due to the inability of students to find the correct results when errors occur in the process. In addition, if students do not understand the meaning of the problem from the beginning, they also cannot conclude correctly.

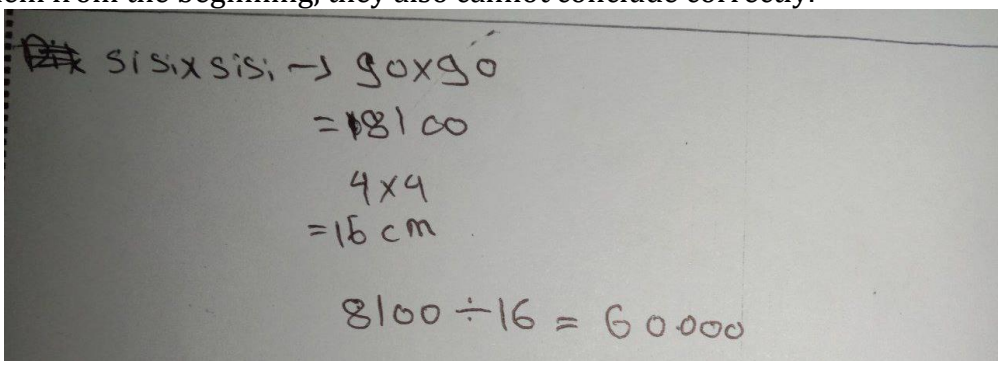

Figure 5 Encoding Error

Subject 5 (S5) produced a final answer that was less accurate. After the interview, it was discovered that S5 felt confused in doing the arithmetic operation of dividing by thousands. As a result, S5 felt less confident with the result he wrote.

CONCLUSION

Based on data analysis using Newman's error analysis procedure, the following error percentages were found: 0.51% for reading errors, 2.5% for comprehension errors, 16.24% for transformation errors, 39.59% for process skill errors, and 41.12% for encoding errors. Reading errors occur because students do not read the information in the questions carefully. Comprehension errors occur when students write down incorrect information or do not record the necessary information. Transformation errors are found when students use the wrong formula or do not write the formula correctly. Process skill errors arise from conceptual errors and incorrect calculations by students. While encoding errors occur when students cannot find the correct results. Analysis of

difficulties based on errors in working on story problems of the circumference and area of flat shapes can help students to be more reflective, so that they can read and understand questions better, model problems mathematically correctly, perform accurate calculations, and get the right answers. In addition, this analysis can also be used as a basis for teachers in designing learning strategies that can overcome student errors in solving story problems of the area and circumference of flat shapes.

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