

ELEMENTARY SCHOOL STUDENTS' ERRORS IN SOLVING WORD PROBLEMS BASED ON NEWMAN ERROR ANALYSIS

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Received 29 June 2022; Received in revised form 10 August 2022; Accepted 08 August 2022

Abstract

Based on previous studies, elementary school students often experience errors in solving word problems on cube and block material. Confirmed Newman Error Analysis (NEA) can analyze the location of student errors in solving word problems. Hence, the purpose of this study was to analyze the errors made by students in solving word problems based on NEA. The type of research used is qualitative research with case studies. The research subjects were 34 students of grade five elementary students with data collection techniques, including tests, interview sheets, and documentation. Data analysis using NEA consists of five stages: reading, comprehension, transformation, process skills, and encoding. From the study results, reading errors were 12,74%, comprehension errors were 51,96%, transformation errors were 9,8%, process skills errors were 52,94%, and encoding errors were 67,64% of students. These errors are caused because students do not read and understand the questions, do not know the formulas and arithmetic operations model used, and count errors.

Keywords: Cubes and blocks; error; Newman; word problems.

Abstract

Berdasarkan penelitian sebelumnya, siswa sekolah dasar sering mengalami kesalahan dalam menyelesaikan soal cerita pada materi kubus dan balok. Dikonfirmasi *Newman Error Analysis* (NEA) dapat menganalisis lokasi kesalahan siswa dalam memecahkan masalah kata. Oleh karena itu, tujuan dari penelitian ini adalah untuk menganalisis kesalahan yang dilakukan siswa dalam menyelesaikan soal kata berdasarkan NEA. Jenis penelitian yang digunakan adalah penelitian kualitatif dengan studi kasus. Subjek penelitian adalah 34 siswa kelas lima sekolah dasar dengan teknik pengumpulan data meliputi tes, lembar wawancara, dan dokumentasi. Analisis data menggunakan NEA terdiri dari lima tahap: membaca, pemahaman, transformasi, keterampilan proses, dan pengkodean. Dari hasil belajar, kesalahan membaca siswa 12,74%, kesalahan pemahaman siswa 51,96%, kesalahan transformasi siswa 9,8%, kesalahan keterampilan proses sebanyak 52,94% siswa, dan kesalahan pengkodean sebanyak 67,64% siswa. Kesalahan tersebut disebabkan karena siswa tidak membaca dan memahami soal, tidak mengetahui rumus dan model operasi hitung yang digunakan, serta kesalahan menghitung.

Kata kunci: Kubus dan balok; kesalahan; Newman; *word problems*.



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INTRODUCTION

Mathematics is an important subject; this can be seen because mathematics has been taught from an early age to senior high school (Furner

& Worrell, 2017). Mathematics is an instrument for developing thinking skills (Abdullah, Abidin, & Ali, 2015). So that in evaluating mathematics learning activities in elementary

DOI: <https://doi.org/10.24127/ajpm.v11i3.5576>

schools, teachers have various ways to see learning outcomes from giving problem-solving-based questions that can develop students' thinking skills because word problems are an inseparable part of learning mathematics (Saygılı, 2017). Problem-solving in schools is usually manifested in the form of word problems. Students' skills in solving word problems, especially those related to problem-solving, are very useful in everyday life (Tong & Loc, 2017; Utari, Setia, & Tika, 2020). However, not all elementary school students can easily work on word problems. Troels' findings show that elementary school students who work on word problems find it difficult because students' reading skills are still low (Lange & Meaney, 2017). Even though the use of word problems since elementary school can help students solve word problems.

Often students choose the wrong formula, make calculations, and translate mathematical symbols and arithmetic operations, resulting in some feeling pessimistic about solving the problems given (Elliyani, Setyawan, & Citrawati, 2020). This makes elementary school math skills on word problems still low. The difficulty factor for students working on word problems on flat-sided geometry includes low mathematical understanding abilities because students do not understand the problems and mathematical concepts being taught (Badraeni, Pamungkas, Hidayat, Rohaeti, & Wijaya, 2020; Große, 2014). In addition, students' difficulties can be divided into two factors: students have difficulty receiving the information conveyed by the teacher, and the second because the concept of spatial structure is considered difficult to learn (Juanti, Karolina, & Zanthly, 2021).

However, students often experience errors in solving word problems on cubes and blocks in practice. In several studies related to student errors in solving word problems, the topic of cubes and blocks shows the results of the analysis of student errors in terms of understanding and identifying the information in the questions. It becomes challenging to complete word problems (Putri & Pujiastuti, 2021). Student errors in writing down what is known and student errors in stating what is stated to be errors that often occur, as well as student errors in determining formulas, can cause student errors in determining mathematical models and errors in calculating (Juanti et al., 2021; Safitri & Setyawan, 2020).

The error in determining the formula until the error in working on the problem occurs because students have difficulty memorizing the geometric formula. Students dislike mathematics (Halimi, Wijonarko, & Agustini, 2021). Analysis results are categorized into several factors that cause students to make an error. Namely, students are unfamiliar with HOTS math problems; students do not write down what is known and asked from the questions correctly; lack mastery of volume material build space; and are less thorough in answering math problems (Kurniawati & Hadi, 2021). Due to the lack of understanding in determining answers with completion steps, it is necessary to read mathematical symbols and understand problems in questions, determine the formulas and mathematical models used, and correct or re-examine answers (Toha, Mirza, & Ahmad, 2018). So we need the proper method to analyze the students' errors.

DOI: <https://doi.org/10.24127/ajpm.v11i3.5576>

One method that can be used to assess and analyze student errors is NEA (Newman Error Analysis). Newman is a method used to analyze errors in detail regarding word problems (Darmawan, Kharismawati, Hendriana, & Purwasih, 2018). The NEA system has five stages: reading, comprehension, transformation, process skills, and Encoding (Lestari, Aripin, & Hendriana, 2018). So, it can be described if elementary school students' errors in solving word problems are reading keywords or key points in questions related to NEA. Errors in reading the contents of the questions or students misunderstanding some of the commands in the problem but cannot find the correct solution to solve the problem word problems. Transformation errors occur when students become aware of the problem they are looking for but do not have the proper ability to solve the problem. Process skills errors occur when students do not see the model or sequence of counting, and do not know the steps needed to solve the problem correctly. Encoding error occurs when the student is successful and has found a solution, but can not write the conclusion of the answer.

From the literature review results and the research findings above, elementary school students often make error in solving word problems on cubes and blocks. Error analysis using NEA on cubes and blocks identifies student constraints in solving word problems (Haerani, Novianingsih, & Turmudi, 2021). These obstacles occur because students fail to understand and explain what is meant (Abdullah et al., 2015). Meanwhile, research analyzing elementary school students' errors on cubes and blocks based on NEA is still limited. Thus, the purpose of this study

was to. Therefore, this study aimed to analyze students' errors in solving word problems on cubes and blocks.

METHOD

This study is a qualitative descriptive study that aims to analyze the errors made by students in solving word problems based on NEA. The stages of qualitative research are determining the focus of the study, determining the setting and study subjects, collecting and processing data, followed by the data analysis process based on the type and NEA indicators, and finally, presenting the data from the research results that have been analyzed.

This study was conducted at SDN Kenongo 1, Sidoarjo grade 5, with 34 students. Students were given a test consisting of three questions in the form of word problems on cubes and blocks. Determining the subject uses purposive sampling in qualitative research, namely, taking subjects with specific criteria per the research topic (Creswell, 2012). Eight students who met the NEA indicators were designated as research subjects. The results of student work on the test are then analyzed and categorized based on the type of error that refers to the NEA.

NEA is a method used to analyze errors in detail regarding word problems (Darmawan et al., 2018). NEA has five stages: reading, comprehension, transformation, process skills, and encoding (Lestari et al., 2018). After obtaining data on the types of errors made by students in solving existing word problems, several students were randomly selected to be interviewed. This interview aims to help students learn the causes of errors when solving word problems.

DOI: <https://doi.org/10.24127/ajpm.v11i3.5576>

Table 1. Error indicators based on NEA

Number	Newman Error Analysis	Code	Error Indicators	Code
1	Reading	R	Student cannot find the meaning of the mathematical symbols	R1
			Student cannot read the questions correctly or write the math numbers listed incorrectly	R2
2	Comprehension	C	Student do not understand the meaning of the identified questions	C1
			Student cannot write down what is known and asked	C2
3	Transformation	T	Student do not know the formula used	T1
			Student can write down what they know and are asked but do not know arithmetic operations	T2
4	Process skills	P	Student do not work perfectly	P1
			Student do not correctly apply the steps in detail and systematically	P2
5	Encoding	E	Student can not answer the question with the right conclusion	E1
			Student experience errors in the calculation process	E2

The error indicators based on the NEA in Table 1 are adapted from (Fitriati, 2019). Each errors on the student answer sheet will be given an errors code in Table 1 according to the type of error made and maintaining students' privacy or subjects in the study. The mention of students is made using the S1 code to declare the student with presence number 1. The S2 code to declare the student with presence number 2, and so on until the last attendance. Use code Q1 for question number 1, Q2 for question number 2, and Q3 for question number 3, as shown in Figure 1. The method of data collection uses the method of tests, interviews, and documentation. First, data reduction was analyzed in interviews and written test results. The second is the presentation of data in explicit explanations and tables to make it easier for researchers to understand

research data. The third is to conclude the form of new research findings that have never existed in previous research findings (Kurniawati & Hadi, 2021).

From the indicators stated above, it can be determined that the instrument used in data collection is in the form of a word problems test on the topic of cubes and blocks consisting of three questions, interview sheets, and documentation. This test method is used to determine the location of the errors made by students in solving word problems, while the interview method is used to determine the causes of student errors in solving word problems. The validity of the data used in this study was triangulation by comparing the results of tests conducted by students with the results of student interviews and picture evidence so that the causes of student errors were obtained.

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Questions in Indonesian	Questions in English	Code
Mayang mempunyai kotak mainan berbentuk balok yang berukuran 30 cm × 15 cm × 8 cm. Kotak tersebut akan diisi dengan kubus-kubus kecil yang berukuran 2 cm × 2 cm × 2 cm sampai penuh. Berapa banyak kubus kecil yang dapat dimuat pada kotak mainan tersebut sampai penuh?	Mayang has a toy box in the form of a block measuring 30 cm × 15 cm × 8 cm. The box will be filled with small cubes measuring 2 cm × 2 cm × 2 cm until they are full. How many small cubes can the toy box fill until it is full?	Q1
Pada wahana wisata terdapat 4 kolam renang berbentuk balok dengan ukuran yang sama. Panjang kolam tersebut adalah 10 m, lebar 8 m, dan kedalaman 2 m. Dua kolam diisi air hingga penuh dan dua kolam yang lainnya masing-masing diisi setengahnya. Berapakah liter air yang dibutuhkan untuk mengisi kolam renang tersebut?	There are 4 swimming pools in the form of blocks of the same size. The pool is 10 m long, 8 m wide, and 2 m deep. Two pools are filled with water, and the other two are half filled. How many liters of water are needed to fill the swimming pool?	Q2
Pak Doni sebuah kotak berbentuk balok dengan volume sebesar 1.500 dm ³ . Jika lebar dan tinggi kotak buah itu adalah 100 cm dan 125 cm. Berapa panjang kotak tersebut?	Mr. Doni is a box in the shape of a block with a volume of 1,500 dm ³ . Suppose the width and height of the fruit box are 100 cm and 125 cm. How long is the box?	Q3

Figure 1. Instrument test

RESULTS AND DISCUSSION

According to the NEA procedure, students might make errors in solving math problems, including reading problems, comprehension errors, transformation errors, process skills errors, and encoding errors. Each students' error on the answer sheet is assigned an error code. Based on the NEA criteria itself, the types of student

errors in this criterion are divided into five categories, namely: (1) Reading errors (Code R), (2) Comprehension errors (Code C), (3) Transformation errors (Code T), (4) Process skills errors (Code P), and (5) encoding errors (Code E) (Suratih & Pujiastuti, 2020). The recapitulation of student errors in solving word problems on cubes and block is in Table 2.

Table 2. Recapitulation of types of errors made by students

Error Type	Code	Question 1		Question 2		Question 3		Average (%)
		n	%	n	%	n	%	
Reading	R	11	32,35	0	0	2	5,88	12,74
Comprehension	C	20	58,82	15	44,11	18	52,94	51,96
Transformation	T	5	14,70	5	14,70	0	0	9,8
Process skills	P	6	17,64	24	70,58	24	70,58	52,94
Encoding	E	21	61,76	24	70,58	24	70,58	67,64

Table 2 shows that most of the errors made by students are encoding errors, namely 67,64%. Students' answers in problem-solving and interviews can be concluded that the encoding errors are because there are still many students who do not write

down the conclusions from the calculations that have been done (Rr Chusnul C, Mardiyana, & S, 2017). In this study, students' error in writing answers were not writing conclusions, writing wrong, conclusions incorrectly, and not writing variables or units. The

DOI: <https://doi.org/10.24127/ajpm.v11i3.5576>

minimum error for students is transformation errors of 9.8%, followed by other errors, namely reading errors of 12.74%, comprehension errors of 51.96%, and process skills errors of 52.94%. Incomprehension errors,

questions, and process skills errors have a percentage difference that is not too far away. While in Table 3, it can be seen in detail if student errors are categorized based on the indicators.

Table 3. Recapitulation of NEA error indicators made by students

Error Type	Question 1		Question 2		Question 3		Average (%)
	n	%	n	%	n	%	
R1	11	27,37	0	0	2	3,92	38,23
R2	2	4,97	0	0	1	1,96	8,82
C1	16	44,81	11	28,54	15	43,3	123,52
C2	5	14,1	6	15,56	3	8,66	41,17
T1	1	3,67	4	7,35	0	0	14,70
T2	3	11,02	4	7,35	0	0	20,58
P1	5	11,02	21	49,40	23	55,97	144,11
P2	3	6,61	9	21,17	6	14,60	52,94
E1	8	24,70	9	24,43	9	24,43	76,47
E2	12	37,05	17	46,14	17	46,14	135,29

So that any error made by students under the NEA procedure will be discussed in more detail as follows.

1. Reading Errors

There are reading errors experienced by 13 students when working on the questions, with 12.74%. The numbers are not too large, so some students will not read the questions. Reading errors occur when students fail to interpret the sentences they read. In this study, on average, students experienced reading errors in spelling the questions correctly, finding information in the questions, and modeling mathematical language to display mathematical symbols examples of reading errors made by S26 students when solving Q1 questions. An example of this error is shown in (Figure 2).

$p = 30 \text{ cm}$
 $l = 15 \text{ cm}$
 $t = 80 \text{ cm}$
 Balok = $30 \times 15 \times 80$
 $= 36000$
 Kubus = $2 \times 2 \times 2$
 $= 8$
 $\frac{3600}{8} = 450 \text{ kubus}$

Figure 2. Reading errors

(Figure 2) shows that S26 made reading errors and did not read the question information carefully. In this case, it is known that "Mayang has a toy box in the form of a block measuring 30 cm × 15 cm × 8 c". However, because S26 cannot be read carefully, S26 has an error in the R2 indicator, which is given a green box when writing the number on the width of the beam, which should be "8cm" to "80cm". And the indicator R1, colored blue, students cannot find the right mathematical symbol in the answer.

DOI: <https://doi.org/10.24127/ajpm.v11i3.5576>

2. Comprehension Errors

Comprehension errors were experienced by 53 students while working on the questions, with a percentage of 51.96%. This shows that misunderstanding the problem is serious. Comprehension problems occur when students can read a question but fail to understand the questions' meaning, so students fail to solve the problem. In this study, students who did not understand the middle question did not write down the facts and were asked. They wrote down the facts and questions but made an error. An example of comprehension errors in a problem is the error made by S3 students when answering question Q2, shown in (Figure 3). Errors made by students when they could not write are known and asked when answering questions Q3. Figure 4 is an example of S6's work.

P. kolam renang = 10 m
L. kolam renang = 8 m
t. kolam renang = 2 m
Liter air yang dibutuhkan
= kolam penuh
 $P \times L \times t$
 $10 \times 8 \times 2$
160
• kolam setengah
 $\frac{1}{2} \times P \times L \times t$
 $\frac{1}{2} \times 10 \times 8 \times 2$
80
• air kolam yang dibutuhkan
240 liter

Figure 3. Comprehension errors

Volume balok = $l \times L \times t$
 $1500 = l \times 10 \times 125$
 $1500 = l \times 12.500$
 $\frac{12500}{1500} = l$
di jawab = $8,3 \text{ cm}^3$

Figure 4. Comprehension errors

Figure 3 shows that S3 records what is known and asked. However, experiencing an error in indicator C1 is

given a blue box. S3 only looks for the full and half pool volumes without specifying how many liters of water are needed. S3 should look for two full pool volumes by multiplying by two times the results of the full pool volume found and do the same for the half pool, which is to multiply by two times the volume of the half pool. While (Figure 4) shows that S6 has an error on the C2 indicator, which is given a green box, students cannot write what is known and asked in the problem but directly write the form of mathematical arithmetic operations.

3. Transformation Errors

Transformation errors were experienced by 10 students while working on the questions, with a percentage of 9.8%. This shows that the transformation errors experienced by students are relatively small. Transformation errors occur because students transform a mathematical sentence into symbols and arithmetic operations to solve. In this study, transformation errors are the failure of students to change the information known in the problem into the correct mathematical model, do not understand the steps for solving the problem, and when completing arithmetic operations. An example of transformation errors is an error made by S13 when working on problem Q1, shown in (Figure 5). S13 experienced an error in the T2 indicator, which was given a blue box (Figure 5). It can be seen that S13 made an error because students wrote down what they knew but did not write down what was asked. Hence, the completion of mathematical operations experienced difficulties and experienced errors in determining the formula, which was the first step in arithmetic operations.

DOI: <https://doi.org/10.24127/ajpm.v11i3.5576>

* diketahui

$$\begin{aligned} p &= 30 \text{ cm} \\ l &= 15 \text{ cm} \\ t &= 8 \text{ cm} \end{aligned}$$

V. balok = $p \times l \times t$
 $= 30 \text{ cm} \times 15 \text{ cm} \times 8 \text{ cm}$
 $= 3600 \text{ cm}^3$

* diketahui

$$\begin{aligned} s &= 2 \text{ cm} \\ l &= 2 \text{ cm} \\ s &= 2 \text{ cm} \end{aligned}$$

V. kubus = $s \times s \times s$
 $= 2 \text{ cm} \times 2 \text{ cm} \times 2 \text{ cm}$
 $= 8 \text{ cm}^3$

Figure 5. Transformation errors

4. Process Skills Errors

Process skills errors were experienced by 54 students while working on the questions, with a percentage of 52.94%. This shows that process skills errors are quite high. In this study, errors in process skills, i.e., errors in the perfect application of mathematical rules, inability to process problem-solving solutions, and errors in calculations. Examples of process skills errors experienced by S18 student on indicators P1 green boxes and P2 blue boxes. When S18 work on Q3 questions, as seen in Figure 6, a student cannot carry out the calculation process to the end because the division to find the length of the block is wrong in its proper placement; length (p) = 1,500,000/12500. The different errors experienced by S14 students in problem Q2 are shown in (Figure 7), which is indicated by a green box. Students cannot continue the completion process when determining the total volume in the swimming pool and only write the formula (2V. full pool + 2V. half pool).

Diketahui : $V = 1500 \text{ dm}^3$
 $= 1500.000 \text{ cm}^3$
 $l = 100 \text{ cm}$
 $t = 125 \text{ cm}$

Ditanya berapa panjang total

V. balok = $p \times l \times t$
 $1500.000 = p \times 100 \times 125$
 $1500.000 = p \times 12500$

$$p = \frac{150000}{1500.000} = 0,023 \text{ cm}$$

Figure 6. Process skills errors

Diketahui = $p = 10 \text{ m}$
 $l = 8 \text{ m}$
 $t = 2 \text{ m}$

Ditanya = Berapa liter air yang dibutuhkan?

Jawaban

V. kolam penuh = $p \times l \times t$
 $= 10 \text{ m} \times 8 \text{ m} \times 2 \text{ m}$
 $= 160 \text{ m}^3$

V. kolam setengah = $\frac{1}{2} \times p \times l \times t$
 $= \frac{1}{2} \times 10 \text{ m} \times 8 \text{ m} \times 2 \text{ m}$
 $= \frac{1}{2} \times 160 = 80 \text{ m}^3$

$$2 \text{ v. penuh} + 2 \text{ v. setengah}$$

Figure 7. Process skills errors

5. Encoding Errors

Encoding errors were experienced by 69 students when working on questions, with a percentage of 67.64%. Errors in writing the final answer are the most common error. In this study, errors in determining the final answer can occur even though students are successful in arithmetic operations but do not write conclusions. In this study, students were wrong in writing the final answer. Examples of processing skills errors made by S7 students when answering Q2 questions are shown in (Figure 8).

Meanwhile, S27, when answering Q1 questions, is shown in (Figure 9). In (Figure 8), it can be seen that S7 made an error in the indicators E1, indicated by a green box and E2 indicated by a blue box. Error E1 wrote down the unit that should have been changed to liters,

DOI: <https://doi.org/10.24127/ajpm.v11i3.5576>

namely $480\text{cm}^3 = 480,000\text{liters}$; error E1 occurred due to incomplete arithmetic operations indicated by the blue box. S27 experienced an error in indicator E1, shown by the green box. Namely, an error in writing the conclusion in the 450cm^3 answer should be 450 small cubes and making a conclusion sentence, such as "So many cubes that can fill the block box ar" See (Figure 9). S7 and S27 were able to find the final results of the questions correctly, but inaccuracy caused S7 and S27 students not to get the expected final results.

Diketahui: $p = 10\text{ m}$
 $l = 8\text{ m}$
 $t = 2\text{ m}$

Ditanya: Berapakah liter air yang dibutuhkan untuk mengisi kolam renang tersebut

Jawaban:

$$V_{\text{Balok}} = p \times l \times t$$

$$= 10 \times 8 \times 2$$

$$= 160\text{ m}^3$$

$$V_{\text{Silinder}} = \frac{1}{2} \times p \times l \times t$$

$$= \frac{1}{2} \times 10 \times 8 \times 2$$

$$= \frac{1}{2} \times 160$$

$$= 80\text{ m}^3$$

$$\text{Keseluruhan kolam} = (2 \times V_{\text{Balok}}) + (2 \times V_{\text{Silinder}})$$

$$= (2 \times 160) + (2 \times 80)$$

$$= 320 + 160$$

$$= 480\text{ m}^3$$

Jadi air kolam seluruhnya 480 liter

Figure 8. Final answer error

Diketahui: $p = 30\text{ cm}$
 $l = 15\text{ cm}$
 $t = 8\text{ cm}$
 $s = 2\text{ cm}$

Ditanya: Berapa banyak kubus kecil yang dapat dimasukkan pada total mainan tersebut?

Jawaban:

$$V_{\text{Balok}} = p \times l \times t$$

$$= 30\text{ cm} \times 15\text{ cm} \times 8\text{ cm}$$

$$= 3600\text{ cm}^3$$

$$V_{\text{Kubus}} = s \times s \times s$$

$$= 2\text{ cm} \times 2\text{ cm} \times 2\text{ cm}$$

$$= 8\text{ cm}^3$$

Banyak kubus kecil $3600 : 8 = 450\text{ cm}^3$

Figure 9. Final answer error

Discussion of student errors in solving word problems. Based on the research results, this section is a detailed discussion of each error students make in solving word problems on the topic of cubes and blocks. The research discussion section explains each result of the types of errors, including reading, comprehension, transformation, process skills, and encoding.

1. Reading Errors

Failure to read symbols or signs that prevent students from continuing the calculation process is called reading errors (Jha, 2012). The reason students make reading errors is that students do not understand the meaning of the words in the assignment. Based on the analysis of students' answers, it can be concluded that the reading errors made by students were errors in writing sentences, wrong words on topics or information in questions, and linguistic errors of numeric symbols. Students have difficulty reading texts with complex vocabulary and sentence structures, making it difficult for them to understand what is being asked of them (Brown, Skow, & IRIS Center, 2016). Students' reading errors included not writing down what was already known and what was asked. Students cannot identify the information contained in the questions, so they cannot continue to answer questions (Lubis, Pramudya, & Subanti, 2021).

2. Comprehension errors

Comprehension errors mean that students can read the questions but do not understand what they are doing, so students' answers do not match what they want to ask (Lestari et al., 2018). Errors can occur because students do not understand the keywords in the

DOI: <https://doi.org/10.24127/ajpm.v11i3.5576>

questions, students do not understand the key information in the questions, and what is being asked in the questions. This is in line with research (Chusnul et al., 2017), which reported that students got lost without paying attention to the information and asking questions. As for those who said they did not understand the meaning of the questions, most did not answer at all or rewrote the questions and provided entries that showed their lack of understanding of the questions and wrong concepts.

3. Transformation errors

Transformation errors occur because students do not know which formula will be used in problem-solving and cannot correctly solve problems in mathematical operations problems or work sequences (Oktafia, Putra, & Habibi, 2020). Transformation errors are based on misunderstandings because students who do not understand the problem make an error in changing the information system (Ahyar, Turmudi, & Prabawanto, 2019; Hanifah, Hidayat, & Aripin, 2020). Based on the analysis of students' answers, it can be concluded that the transformation errors made by students were due to failing to transform the questions into mathematical models and not being careful in performing mathematical operations when working on the questions. When students get points from the questions asked, they make an error in solving problems because they do not remember the formula they learned (Anugrah & Kusmayadi, 2019). The fact that students can understand what is being asked about the problem, but they don't know what order they need to solve the problem correctly (Yuliana, Taufik, & Susanti, 2021).

4. Process Skills Errors

Errors occur at this stage because students have made an error in the previous stage, so the skill process stage also makes an error (Sukoriyanto, 2020). Weaknesses in process aspect skills, many students do not understand the mathematical elements in the material (Siskawati, Zaenuri, & Wardono, 2021). So that solving the problem correctly will experience procedural errors such as writing the wrong target results to be achieved. Because students have difficulty solving mathematical problems because they are unable to master mathematical skills, determining the solution for mathematical operations must be detailed and structured (Nabiyev, Çakiroğlu, Karal, Erümit, & Çebi, 2016). Or because students fail to develop systematic steps in problem-solving in a consistent, detailed, and accurate manner (Junaedi, Suyitn, Sugiharti, & Eng, 2015).

5. Encoding Errors

Based on the results of student exams, it can be concluded that the final interpretation errors made by students did not produce correct results able to move, hopefully. Encoding errors are very serious because students manage to reach the data processing stage, fail, or do not think of a particular solution. Because the most common errors are in the encoding and understanding stages, it is normal considering that the studies were conducted at different levels of education. These errors are generally less thorough because students will write, be less careful in counting, and be in a hurry to do the work (Santoso, Akhmad, & Ulum, 2017). This is due to students' lack of priority and interest and indifference in concluding the right final result because they assume that the

DOI: <https://doi.org/10.24127/ajpm.v11i3.5576>

answers that have been calculated are appropriate (Rohmah & Sutiarso, 2018). This is because when students experience problems in working, they cannot get the correct results, and if students do not understand the purpose of the problem from the start, they will not be able to write the correct decisions (Agustiani, 2021). As with the final answer error, some students make an error because they are not used to writing conclusions after each math problem is solved, let alone carefully checking the correctness of the answers (Fitriani, Turmudi, & Prabawanto, 2018).

The findings of this study are that elementary school students experience the most errors in three types of NEA error stages: students' comprehension, process skills, and encoding. The three stages are related so that if students make an error in comprehension, it will result in errors in the next stage. This is also reinforced by the existence of data analysis using NEA at each stage of calculating student answers. The contribution of this study is an initial empirical finding that the NEA theory is an error stage (not an error category). This is indicated by student errors that start with errors in comprehension, causing errors that lead to encoding errors. This study can have implications for teaching and learning mathematics. Students' comprehension of texts and mathematical content in word problems must be strengthened first so that students are successful in problem-solving.

CONCLUSION AND SUGGESTION

Based on the research and interviews, it can be concluded that many students still make an error in solving word problems on cube and block material. Reading errors are errors

in interpreting sentences correctly, obtaining keywords or information in questions, and modeling mathematical language with mathematical symbols. Comprehension errors are indicated by not writing down what is known and asked and being unable to identify the questions. Transformation errors occur because they do not use the correct mathematical operations to solve the problem and cannot determine the formula to be used. Process skills errors are identified by applying mathematical formulas and incomplete mathematical methods. Among the student errors that have been described, encoding errors are the most frequent errors made by students. Because students understand what is known and asked but are not accustomed to calculating it correctly, they do not fully understand how to use the mathematical methods they have learned.

Students should practice problem-solving by understanding and identifying problems and drawing conclusions from answers, which are the link between the final solution and the question. Given that there are still many shortcomings in this research, we hope that other researchers can conduct similar research related to different research studies and choose other mathematical tools

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