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Problem Solving Errors in Mathematics Story Questions

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ABSTRAK

Masalah sehari-hari sering diekspresikan dalam bentuk soal cerita matematika. Namun, matematika sering dipandang menakutkan karena sulit dipelajari sehingga menyebabkan kesalahan dalam mengerjakan soal cerita matematika. Tujuan penelitian ini adalah menganalisis jenis-jenis kesalahan pemecahan masalah dalam menyelesaikan soal cerita matematika dan menganalisis faktor-faktor yang menyebabkan kesalahan pemecahan masalah dalam menyelesaikan soal cerita matematika. Penelitian ini merupakan jenis penelitian kualitatif dengan pendekatan studi kasus. Subjek dalam penelitian ini adalah siswa kelas 5 SD dengan objek penelitian kesalahan siswa dalam menjawab soal cerita matematika. Teknik pengumpulan data menggunakan lembar jawaban pertanyaan dan wawancara. Teknik analisis data menggunakan teknik analisis data interaktif Miles dan Huberman. Hasil penelitian menunjukkan kesalahan membaca sebanyak 39%, kesalahan pemahaman 81%, kesalahan transformasi 88%, kesalahan keterampilan proses sebanyak 90%, dan kesalahan penulisan jawaban akhir (kesalahan penyandian) sebanyak 90%. Faktor kognitif yang menyebabkan kesalahan pemecahan masalah dalam soal cerita matematika adalah: kelemahan memori; kelemahan pemahaman; dan analisis yang lemah. Faktor non-kognitif yang menyebabkan kesalahan pemecahan masalah dalam soal cerita matematika adalah cara siswa belajar dan cara mengajar guru. Berdasarkan hasil penelitian, guru perlu meningkatkan kemampuan siswa untuk mengurangi kesalahan keterampilan proses dan kesalahan penulisan pada jawaban akhir.

ABSTRACT

Daily problems are often expressed in the form of math story problems. However, mathematics is often seen as scary because it is difficult to learn, causing errors in doing math story problems. The aims of this study is analyses the types of problem-solving errors in solving math story problems and analyses the factors that cause problem solving errors in solving math story problems. This research is a type of qualitative research with a case study approach. The subjects in this study were elementary school students in grade 5 with the object of research being student errors in answering math story questions. Data collection techniques using question answer sheets and interviews. The data analysis technique uses Miles and Huberman interactive data analysis techniques. The results showed that reading errors were 39%, comprehension errors were 81%, transformation errors were 88%, process skill errors as much as 90%, and writing errors in the final answer (encoding errors) as much as 90%. Cognitive factors that cause problem solving errors in math story problems are: memory weakness; the weakness of understanding; and weak analysis. The non-cognitive factors that cause problem-solving errors in math story problems are how students learn and how to teach teachers. Based on the results of the study, teachers need to improve students' abilities to reduce process skill errors and writing errors in the final answer.

1. INTRODUCTION

The rapid development of science and technology brings changes to the Indonesian state in almost all aspects of human life (Englund et al., 2017; Istri Aryani & Rahayuni, 2016; Mutohhari et al., 2021). Many problems can be solved by mastering and improving science and technology. As is the case today, there are so many people who take advantage of technological sophistication like the internet to find the information they need quickly and easily (DeStefano et al., 2018; Hsieh et al., 2011; Kumalawati et

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al., 2021). One example is when a student wants to know more information about material that has not been, is being, and will be studied at school. Besides being beneficial for human life, on the other hand, these changes have brought humans into increasingly fierce global competition (Garba et al., 2015; Tiarasari et al., 2018; Titarenko & Little, 2017). Education has an important role in preparing quality human resources in the development of science and technology and building a better life (Bauer & Booth, 2019; Risnawati et al., 2019; Ulyah et al., 2021). In the Law of the Republic of Indonesia No. 20 of 2003 education is a conscious and planned effort to create a learning atmosphere and the learning process of students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation and state (Hanik, 2020; Law et al., 2019). There is one subject that is an important part of education so that it becomes a compulsory subject at all levels of education, namely mathematics. Mathematics has a tremendous contribution in human life. Mathematics is a symbolic language used to express quantitative and spatial relationships that make it easier for humans to solve problems in everyday life (Callingham & Watson, 2017; Purawati et al., 2016).

Problems in everyday life related to mathematics are usually written in the form of story questions. Giving story questions to students is intended to introduce and train students' abilities in solving math problems that exist in everyday life. Story questions are a form of questions that present problems related to everyday life in the form of stories (Antara & Dewantara, 2022; Dinda Rahmawati & Permata, 2018). Students will know more about the nature of a mathematical problem when students are faced with story problems. In addition, story problems are very useful for the development of students' thinking processes because in solving math problems in the form of story questions (Chu et al., 2017; Dietiker, 2015). It requires completion steps that require understanding and reasoning, including having to understand the meaning of each sentence in story problems, being able to find keywords from a problem, able to translate everyday sentences contained in story problems into mathematical sentences or make mathematical models, able to determine which elements should be equated with a variable, and so on. Lately mathematics is often seen as a scary subject because many students often have difficulty in learning the material contained in mathematics whose object of study is abstract. This statement was supported by the Ministry of Education and Culture through the Indonesia National Assessment Program (INAP) in 2016 which showed the results that around 77.13% of elementary school students throughout Indonesia had very low mathematics competence, namely 20.58% sufficient and only 2.29 % which is good category (Danoebroto, 2013; Hadi & Novaliyosi, 2019). The lack of understanding of students in solving math story problems can be caused by the process of instilling concepts from teachers to students which is also not right. Many teachers have not mastered the appropriate approach and method so that students are not able to understand well each concept of the material being taught. This resulted in students having difficulty in solving math story problems (Schmidt, 2012; Xin et al., 2008). These difficulties are characterized by several common mistakes in doing math problems, namely mistakes in understanding symbols, place values, calculations, using wrong processes, and unreadable writing (Gunbas, 2015; Dwi Rahmawati & Anwar, 2020). Therefore, to improve students' understanding of math story problems, it is necessary to implement an approach by the teacher to apply fun mathematics learning in various materials. The application of fun learning must begin first by finding the root of the problem that causes students to be less happy with mathematics. One of the methods used to find these problems is error analysis which is a method for analyzing the errors made by students in solving story-form questions (Santoso et al., 2022; Yunus et al., 2019). By knowing the mistakes made by students, then the factors that cause errors can be identified and can be used to apply appropriate and interesting learning methods for students. This is in line with the opinion expressed by previous researcher that state students' errors in many mathematics topics are the main source to find out students' difficulties in understanding mathematics (Annisa & Kartini, 2021). So that error analysis is a way to find out the factors that cause students' difficulties in learning mathematics. The results of relevant research have been carried out with various findings, as a consideration in conducting research, the researchers convey the results of research related to the problem under study. Previous study found that process skill errors were the dominant mistakes made by students (Jamal, 2018). While other research found the result that the dominant type of student error lies in the transformation error (Magfirah et al., 2019). The types of errors in solving story problems are divided into five, namely reading errors, understanding errors, transformation errors, process skills errors, and coding errors or writing answers (Koedinger & Nathan, 2004; Yunus et al., 2019). Then the factors causing errors divided into 2, namely in terms of cognitive and non-cognitive. The cognitive aspect includes matters relating to students' intellectual abilities and the way students process or digest mathematical material in their minds. While the non-cognitive aspects are all factors outside of things related to intellectual abilities such as attitudes, personality, learning methods,

physical health, emotional states, teacher teaching methods, learning facilities, and home atmosphere (Santoso et al., 2022; Soedjadi, 2000).

Based on the phenomena, opinions of experts, and the gaps in the research findings that have been submitted, they can be used as the basis for formulating problems, research objectives, and building a research framework. This is the basis for the author's interest in re-examining the development of the number of research objects and subjects, updating research methods, and differences in research locations. Based on the description of the background of the problem that has been described, the purpose of this study is to analyses the types of problem solving errors made by students in solving math story problems and analyses the factors that cause problem solving errors in solving math story problems.

2. METHOD

The research method used in this research is descriptive qualitative with a case study approach (Almeida, 2020; Campbell et al., 2020). The object of this research is the students' mistakes in answering math story questions. This research procedure consists of 3 stages, namely data identification, data description, and data analysis. Data identification is done by selecting student answer sheets to take student answer sheets that have errors. The student's answer sheet is said to be wrong if it does not match the criteria as in the answer key. The research location is at the Jatipurwo State Elementary School III, Jatipurno District, Wonogiri Regency. The subjects in this study were elementary school students in grade V. The selection of subjects was based on the consideration that students had already received the material, errors were made, and students are able to communicate the results of their work. Data collection techniques using observation, documentation, and interviews. The description of the data was carried out using the Newman method of error analysis. The indicators for determining student errors are show in Table 1.

Table 1 Error Indicator Based on Newman Method

No	Types of Errors	Error Indicator
1	*Reading error*	1. Students misread the keywords. 2. Students misread the symbols.
2	*Comprehension error*	1. Students do not write down what they know. 2. Students do not write down what is asked. 3. Students write down what they know wrong. 4. The student wrote down what was asked wrong. 5. Students incorrectly identify information.
3	*Transformation error*	1. Students do not write down mathematical sentences and formulas. 2. The student wrote the math sentence wrong. 3. The student wrote the formula wrong.
4	*Process skill error*	1. Students do not master the concept. 2. Student miscalculated. 3. Students do not complete calculations.
5	*Encoding error*	1. Students do not write units correctly. 2. Students do not write the final answer correctly.

Data analysis using interactive data analysis techniques (Miles & Huberman, 1994; Sugiyono, 2016). This data analysis technique consists of three stages, namely data reduction, data presentation, conclusion drawing and data verification. Data reduction refers to the process of selecting, focusing, simplifying, abstracting, and transforming the raw data written in field notes followed by recording. The presentation of data is done by bringing up a collection of data that has been organized and categorized which allows conclusions to be drawn. The data presented in the form of student work, interview data, and analysis results in the form of errors of each research subject which is the data findings.

3. RESULT AND DISCUSSION

Result

Error Type

This study found five the types of errors in working on math story problems are reading errors, understanding errors, transformation errors, process skills errors, and writing errors in the final answer. Here are presented the types of errors experienced by students in solving math story problems.

a. Reading Error

Reading errors are errors made by students when reading the questions. Reading errors occur when students are not able to read the keywords or symbols contained in the questions so as to prevent them from continuing to the next stage. In this study, there were 39% of reading errors or 29 cases of 75 students' answers. Examples of reading errors experienced by students in this study are show in Figure 1.

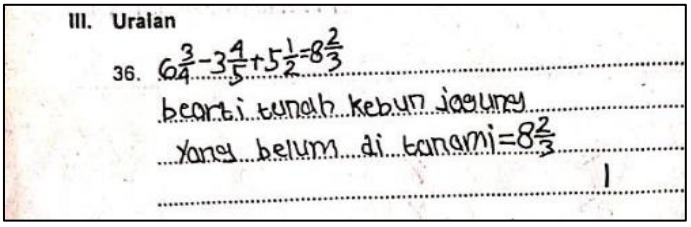

Figure 1. Students' answer sheets 1

Based on Figure 1 students' answer sheets, it is known that students have reading errors because students are reading wrongsay key of the questions and do not know clearly what is being asked in the problem so that it is wrong to write symbols. The student wrote the symbol for the problem incorrectly where the student should have written " "$6\frac{3}{4} + 3\frac{4}{5} - 5\frac{1}{2}$" but students write "$6\frac{3}{4} - 3\frac{4}{5} + 5\frac{1}{2}$". The student's error here is wrongly placing the addition symbol with the subtraction symbol. Student should write down the area of land that has not been planted by adding the total land owned by Mr. Budi and then subtracting the area of Mr. Budi's land that has been planted with corn. This error in reading is fatal because later it can cause errors in later stages.

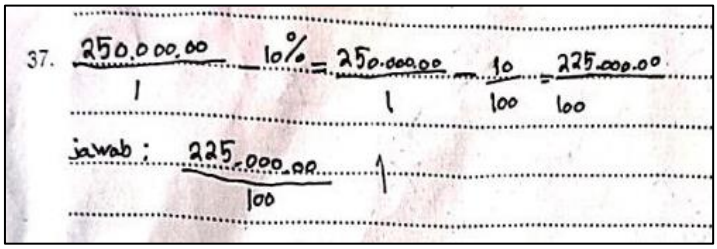

Figure 2. Students' answer sheets 2

Based on the Figure 2, it is known that students have reading errors because students do not know clearly what is being asked in the question so they write symbols incorrectly. The student wrote the symbol for the problem incorrectly where the student should have written "250,000 x 10%" but the student wrote "250,000 - 10%". Errorstudenthere it is wrong to put the multiplication symbol with the subtraction symbol.Students should write down the multiplication symbol to get the amount of the discount given. The right move forgotThe amount of the discount given is multiplying the price by the discount given so that the amount of the discount given will be found.

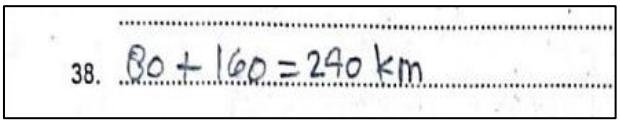

Figure 3. Students' answer sheets 3

Based on Figure 3, it is known that students experience reading errors because students do not know clearly what is being asked in the question so they write symbols incorrectly. The student wrote the symbol for the problem incorrectly where the student should have written "160 km : 80 km/hour" but students write "80 + 160". The student's error here is wrongly placing the addition symbol with the division symbol, besides that, another student's error in reading is that students do not know the units of each number they write down. Student should write symbol division to get the time taken by the car to reach the destination. The correct step to get the answer is the time traveled by the car is divided by the distance traveled by the speed of the car so that it will be found the time taken by the car to get to the destination.

b. Misunderstanding

Misunderstanding the problem is an error made by students after students are able to read the problems in the problem but do not know what problems they must solve. Misunderstanding the problem occurs when the student is able to read the question but fails to get what he needs, causing him to fail in solving a problem. In this study, there were 81% reading errors or 61 cases of 75 students' answers. Examples of misunderstandings experienced by students in this study are show in Figure 4.

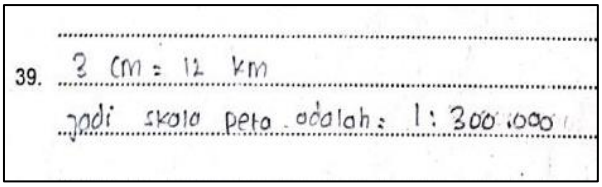

Figure 4. Students' answer sheets 4

Based on Figure 4, it is known that students have misunderstood because students do not write down what is known and asked in the question. Students actually know what is known and asked in the question but do not write it down. In the student answer sheet, students immediately write "3 cm: 12 km" so that this is what causes students to misunderstand. Students should first write down what they know and are asked about in the problem, namely "Know: distance on map = 3 cm, actual distance = 12 km = 1,200,000 cm, Asked: map scale?", then students determine the formula to complete, then followed with the correct and coherent steps in performing calculations so that students will not experience errors.

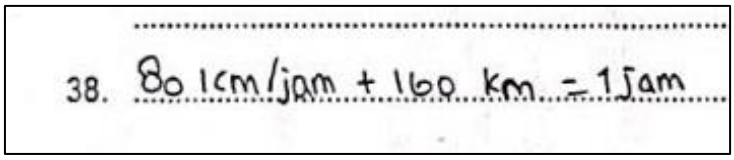

Figure 5. Students' answer sheets 5

Based on Figure 5, it is known that students have misunderstood because students do not write down what is known and asked in the question. In the student answer sheet, students immediately write "80 km/hour + 160 km" so that this is what causes students to misunderstand. Students should first write down what is known and asked in the question, namely "Knowing: car speed = 80 km/hour, distance traveled = 160 km, asked: how long does it take the car to reach the destination?", then students determine the formula to complete, then followed by the correct and coherent steps in performing calculations so that students will not experience errors.

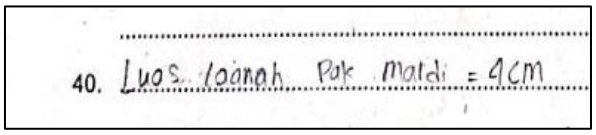

Figure 6. Students' answer sheets 6

Based on Figure 6, it is known that students have misunderstood because students do not write down what is known and asked in the question. Students do not write down what is known and asked from the question, but students immediately write down the final answer. Students do not understand the steps that must be used to solve the problem. Students should first write down what they know and ask about in the problem, namely "Know: image scale = 1: 3,000, length of image = 2 cm, asked: area of land Mr. Mardi", then students determine the formula to solve, then followed by the following steps. Correct and coherent in doing calculations so that students will not experience errors.

c. Transformation Error

Transformation errors are errors made by students after students are able to understand the problems contained in the problem, but are unable to choose an approach to solve the problem. Transformation errors occur when students have correctly understood the question of the given problem, but failed to choose the right mathematical operation to solve the problem. In this study, there were 88%

of transformation errors or 66 cases of 75 student answers. Examples of transformation errors experienced by students in this study are show in Figure 7.

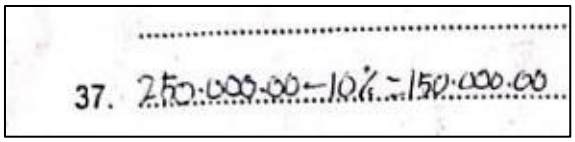

Figure 7. Students' answer sheets 7

Based Figure 7, it is known that students experience transformation errors because students do not write the formula correctly to solve the problem. The student's mistake was not to write down the formula to get a discount and the student immediately calculated the discount by means of the selling price minus the amount of the discount. In the student's answer sheet it is written "2500.00-10%", this is what causes students to experience transformation errors. Students experience transformation errors due to wrong reading and understanding errors first. The reading error is that the student gives the wrong symbol, while the error in understanding it is not writing down what is known and asked, thus causing an error in the next stage, namely the transformation error.

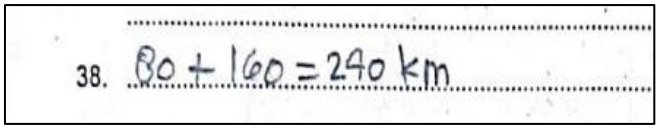

Figure 8. Students' answer sheets 8

Based on Figure 8, it is known that students experience transformation errors because students do not write the formula correctly to solve the problem. The student's mistake was not writing the formula to get the travel time and the student immediately calculated the travel time by adding the speed and distance traveled. In the student's answer sheet it is written "80 + 160", this is what causes students to experience transformation errors. Students experience transformation errors due to wrong reading and understanding errors first. The reading error is that the student gives the wrong symbol, while the error in understanding it is not writing down what is known and asked, thus causing an error in the next stage, namely the transformation error.

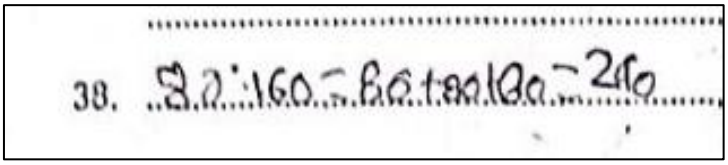

Figure 9. Students' answer sheets 9

Based on Figure 9, it is known that students experience transformation errors because students do not write the formula correctly to solve the problem. The student's mistake was not writing the formula to get the travel time and the student immediately calculated the travel time by adding the speed and distance traveled. In the student's answer sheet it is written "80: 160", this is what causes students to experience transformation errors. Students experience transformation errors due to wrong reading and understanding errors first. The reading error is that the student gives the wrong symbol, while the error in understanding it is not writing down what is known and asked, thus causing an error in the next stage, namely the transformation error.

d. Process Skill Error

Process skill errors are errors made by students in the calculation process. Process skill errors occur when students are able to choose the operation or sequence of operations correctly to solve problems, but students fail to perform calculation procedures correctly. In this study, there were 90% of process skill errors or 68 cases of 75 student answers. Examples of process skill errors experienced by students in this study show in Figure 10.

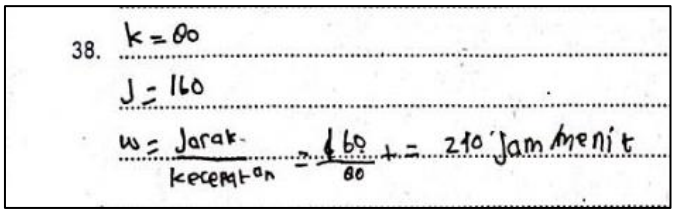

Figure 10. Students' answer sheets 10

Based on Figure 10, it is known that students experience process skills errors because students are wrong in calculations even though the formula used is correct. The student is correct in the reading stage, then the student is also correct in the understanding stage by writing down what is known and asked from the question, then the student is also correct in the transformation process by writing the formula to get the travel time. However, at the process skills stage, students experience a calculation error that can be seen in the student answer sheet, namely "W= distance/speed = 160+80 = 240 hours" Process skill errors will not occur if students write "W= distance/speed = 160/80 = 2 hours". The student's error lies in calculating the result of the distance divided by the speed, the student actually completes the calculation with the addition calculation operation where the student should do the division calculation. Students should write down the answer in 2 hours if the calculation is correct. Students who experience calculation errors can cause further errors, namely errors in writing the final answer.

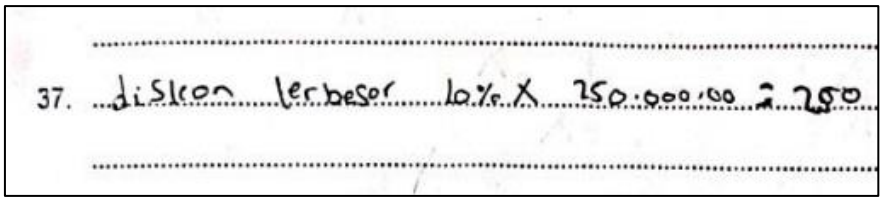

Figure 11. Students' answer sheets 11

Based on Figure 11, it is known that students experience process skill errors because students are wrong in calculations even though the formula used is correct. The student is correct in the reading stage, then the student is wrong in the understanding stage by not writing down what is known and asked from the question, then the student is right in the transformation process by writing the formula to get the discount correctly. However, at the process skills stage, students experience a calculation error that can be seen in the student answer sheet, namely "10% x 250,000.00 = 250". Process skill errors will not occur if students write "W10% x 250,000.00 = 25,000".Students should write the answer 25,000 if the calculation is correct. Students who experience calculation errors can cause further errors, namely errors in writing the final answer.

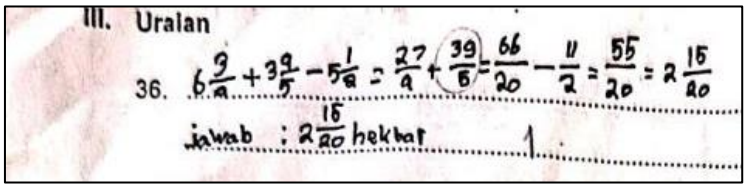

Figure 12. Students' answer sheets 12

Based on Figure 12, it is known that students experience process skill errors because students are wrong in calculations even though the formula used is correct. The student is correct in the reading stage, then the student is wrong in the understanding stage by not writing down what is known and asked from the problem, then the student is right in the transformation process by writing the formula to get the area of land that has not been planted correctly. However, at the process skills stage, students experience a calculation error that can be seen in the student answer sheet, namely "$6\frac{3}{4} + 3\frac{4}{5} - 5\frac{1}{2} = \frac{27}{4} + \frac{39}{5} = \frac{66}{20} - \frac{11}{2} = \frac{55}{20} = 2\frac{15}{20}$". Process skill errors will not occur if students write "$6\frac{3}{4} + 3\frac{4}{5} - 5\frac{1}{2} = \frac{27}{4} + \frac{12}{5} - \frac{5}{2} = \frac{135+76-110}{20} = \frac{101}{20}$". The student's error is that in calculating fractions the student does not equate the denominator first, so that the fractional counting operation performed by the student results in the wrong result. Students

should write down answers5 hectares$\frac{1}{20}$if the calculation is correct. Students who experience calculation errors can cause further errors, namely errors in writing the final answer.

e. Final Answer Writing Error

Writing errors are mistakes made by students because students are less careful in writing. Errors in writing the final answer occur if students are able to work on the solution to the problem, but cannot state the solution in an acceptable written form. Errors in writing the final answer often occur because students experience errors in the previous stages, especially at the process skills stage. In this study, there were 90% of process skill errors or 68 cases of 75 student answers. Examples of errors in writing the final answer experienced by students in this study are show in Figure 13.

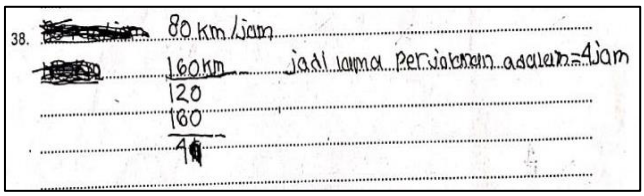

Figure 13. Students' answer sheets 13

Based on Figure 13**,** it is known that students have written errors in their answers because the students were wrong in the calculation process, so that the writing of the final answer is also wrong. Student errors here occur in almost all stages, starting from the reading stage, the understanding stage, the transformation stage, the process skills stage, and the final answer writing stage. Errors in the previous stages are fatal in the later stages, especially at the stage of writing the final answer. In the answer sheet, students write the final answer "so the journey time is 4 hours", the answer is wrong. Students should write the final answer "so the car travel time to arrive at the destination city is 2 hours" if the student's answer is correct. Students are often found wrong in writing the final answer even though students have succeeded in the reading stage to the process skills stage. So here it takes the ability for students to change the mathematical sentence back into the answer sentence that is asked according to the problem.

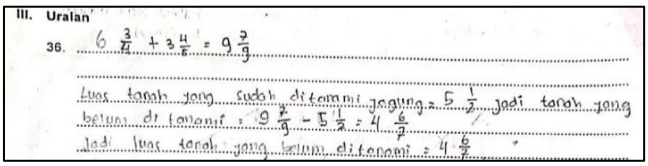

Figure 14. Students' answer sheets 14

Based on Figure 14, it is known that students have written errors in their answers because the students were wrong in the calculation process, so that the writing of the final answer is also wrong. Student errors here occur in almost all stages, starting from the reading stage, the understanding stage, the transformation stage, the process skills stage, and the final answer writing stage. Errors in the previous stages are fatal in the later stages, especially at the stage of writing the final answer. In the answer sheet, students write the final answer "so the area of land that has not been planted =$4\frac{6}{7}$", the answer is wrong. Students should write the final answer "So the area of Pak Budi's land that has not been planted is"5 hectares $\frac{1}{20}$ If the student's answer is correct. Students are often found wrong in writing the final answer even though students have succeeded in the reading stage to the process skills stage. So here it takes the ability for students to change the mathematical sentence back into the answer sentence that is asked according to the problem.

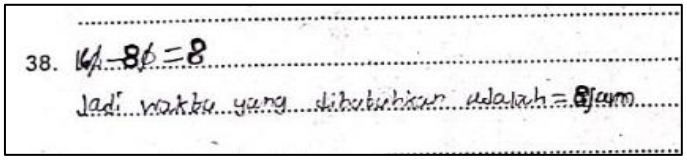

Figure 15. Students' answer sheets 15

Based on Figure 15, it is known that students have written errors in their answers because the students were wrong in the calculation process, so that the writing of the final answer is also wrong. Student errors here occur in almost all stages, starting from the reading stage, the understanding stage, the transformation stage, the process skills stage, and the final answer writing stage. Errors in the previous stages are fatal in the later stages, especially at the stage of writing the final answer. In the answer sheet, students write the final answer "so the time it takes is 8 hours", the answer is wrong. Students should write the final answer "so the car travel time to arrive at the destination city is 2 hours" if the student's answer is correct. Students are often found wrong in writing the final answer even though students have succeeded in the reading stage to the process skills stage. So here it takes the ability for students to change the mathematical sentence back into the answer sentence that is asked according to the problem. The types of students' errors are show in Table 2.

Table 2. Types of Student Errors

No	Error Type	Error Indicator	Case	Percentage (%)
1	Reading keywords and symbols	1. Misread keywords. 2. Misread symbols.	29	39
2	Understanding the Problem	1. Do not write down what is known. 2. Do not write down what was asked. 3. Misrepresenting what is known. 4. Wrong write what was asked. 5. Wrongly identified information.	61	81
3	Problem Transformation	1. Do not write down mathematical sentences and formulas. 2. Wrong math sentence. 3. Wrong formula.	66	88
4	Process Skills	1. Not mastering the concept. 2. Miscalculated. 3. Did not complete the calculation.	68	90
5	Final Answer Writing	1. Did not write units correctly. 2. Did not write the final answer correctly.	68	90

Causative factor Error

Factors causing problem solving errors in solving math story problems are divided into two, namely cognitive factors and non-cognitive factors. Cognitive factors include remembering, understanding, applying, analyzing, evaluating, creating. Non-cognitive factors include attitudes and personality, learning methods, physical health, emotional state, teacher teaching methods, learning facilities, and home atmosphere. In this study found the factors that cause student errors as follows:

a. Cognitive Factor

Remembering is a fundamental aspect that refers to the ability to recognize and remember material that has been studied ranging from simple things to remembering theories that require depth of thinking. The ability to remember here includes remembering concepts, processes, methods, and structures. In this study, the factors causing student errors were found due to the weakness of students to remember. Weaknesses in remembering often occur when writing formulas to solve problems, students are often found wrong in writing formulas and even without writing formulas.

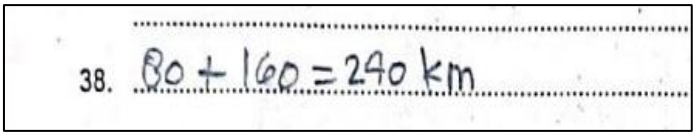

Figure 16. Students' answer sheets 16

Based Figure 16, students cannot write down the formula to solve the problem. Students do not write down the formula used because they forget or do not remember the formula that will be used to solve the problem. As a result, students will solve the problem without writing the formula first, causing students to experience errors. The correct step that students must take is to write down what is known

and asked first, then write down the formula to solve the problem, followed by the completion of arithmetic operations and writing the final answer.

Understanding is a higher aspect of remembering. Understanding ability refers to the ability to demonstrate facts and ideas by classifying, organizing, comparing, describing, understanding, and especially understanding the meaning of the things that have been learned. Strong understanding is characterized by being able to change something that has been learned in the form of translation, interpretation, and extrapolation. In this study found the factors causing student errors caused by the weakness of students to understand. Weaknesses in understanding often occur when writing down what is known and asked from the question, it is often found that students do not write down what is known and asked from the question. In the following, the factors that cause student errors are presented due to students' weaknesses in understanding.

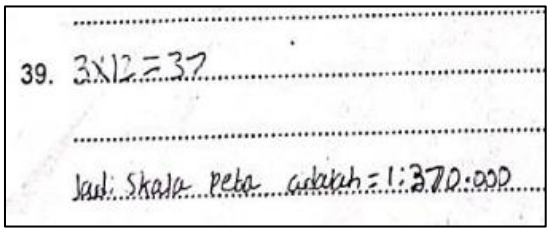

Figure 17. Students' answer sheets 17

Based on Figure 17, students cannot write down what they know and are asked about from the questions. Students cannot write down what is known and asked from the questions because students do not understand the meaning of the things they have learned. As a result, students do not understand the meaning of the question which causes students to experience errors in solving the problem. Looking at the S6 student answer sheets, students did not understand the meaning of the questions so that even in the calculations the arithmetic operations used were also wrong.

Analyzing is an aspect that involves testing and breaking down information into parts, determining how one part relates to another, identifying motives or causes and drawing conclusions and supporting material for those conclusions. There are three characteristics in the analysis aspect, namely element analysis, relationship analysis, and organizational analysis. In this study, the factors causing student errors were found due to the weakness of students to analyze. Weaknesses in analyzing often occur when solving problems in which there are two processes, it is often found that students cannot complete the initial process first to complete the next process of the problem. In this study, students' weaknesses were found in analyzing question number 40 as show in Figure 18.

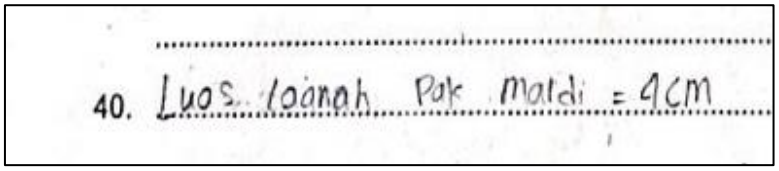

Figure 18. Students' answer sheets 18

Based on Figure 18, students did not carry out the initial process to solve the problem, namely the process of changing the size of the image to the actual size. Students do not do the initial process because students cannot identify the information from the questions that are used to determine how one part relates to another part. As a result, students are wrong in solving problems because they do not change the size of the image to the actual size first. Seeing the answer sheets for S12 students, students immediately calculated the area of Mr. Mardi's land by multiplying the size in the picture (2 cm) x (2 cm) with the result of 4 cm. The correct step in solving the problem is that the student should change the size on the picture first to the actual size (2 cm in the picture = 2 x 3,000 = 6,000 cm = 60 m),

b. Non Cognitive Factors

The way of learning is the individual behavior of students, which is more specifically related to the efforts that are being or are usually done by students to acquire knowledge. An efficient way of learning is a way of learning that is appropriate, practical, economical, directed, in accordance with the existing situation and demands in order to achieve learning objectives. Based on the learning conditions, the methods include: how to study at home (distance), school, and how to study in groups. In this study,

the factors causing student errors were found due to new ways of learning. Since the Covid 19 virus, students are mostly studying from home. The lack of face-to-face intensity with the teacher is thought to cause a decrease in students' ability to solve school problems, especially math story problems. The teacher's way of teaching is one of the main points of achieving maximum learning. An efficient way of teaching is a way of teaching that makes it easier for students to catch what is conveyed by the teacher so that students can then practice their learning outcomes independently to solve problems that can be in the form of questions. In this study, the factors causing student errors were found due to the teacher's way of teaching. The existence of the Covid-19 virus causes teachers to be unable to carry out learning to students face-to-face. This new condition requires teachers to conduct online learning for students. Distance learning makes it difficult for teachers to deliver material optimally due to the limitations of learning media and the lack of time to adapt to new methods. As a result, interaction with students decreases, causing a decrease in students' ability to solve problems, especially math story problems. Based on observations to the teacher, distance learning causes students to get bored easily because the intensity of time is less. In addition, not all students are also able to use new learning media facilities (mobile phones) and there are also signal limitations in certain areas. So that the way the teacher teaches is also a factor causing the decline in students' abilities which causes student errors in solving math story problems. distance learning causes students to get bored easily because the intensity of the time is less. In addition, not all students are also able to use new learning media facilities (mobile phones) and there are also signal limitations in certain areas. So that the way the teacher teaches is also a factor causing the decline in students' abilities which causes student errors in solving math story problems. distance learning causes students to get bored easily because the intensity of the time is less. In addition, not all students are also able to use new learning media facilities (mobile phones) and there are also signal limitations in certain areas. So that the way the teacher teaches is also a factor causing the decline in students' abilities which causes student errors in solving math story problems.

Discussion

Error Type

This study reveals the types of errors that are often made by students in solving problem solving problems such as math story problems. The types of errors found in this study are divided into five types according to the research developed by Newman. The types of errors found in this study were reading errors, understanding errors, transformation errors, process skills errors, and writing errors in the final answer. In this study found the results in the form of reading errors (reading errors) as much as 39%, understanding errors (comprehension errors) as much as 81%, transformation errors (transformation errors) as much as 88%, process skill errors as much as 90%, and error writing the final answer (encoding errors) as much as 90%. The error in writing the final answer became the biggest mistake in this study to support the results of research conducted by several previous research (Amni & Kartini, 2021; Halim & Rasidah, 2019; Dinda Rahmawati & Permata, 2018).

Factors Causing Error

Several causes of students' errors in solving math story problems were found in this study. Interestingly, there were two factors found, namely cognitive factors and non-cognitive factors. Cognitive factors are related to factors that come from within a person. While non-cognitive factors are related to factors that come from outside a person such as the environment. This phenomenon is in line with the theory presented by previous study which states that the factors that cause students to have learning difficulties that cause these students to make mistakes in solving problems (story questions) have two aspects, namely cognitive aspects and non-cognitive aspects (Anisa, 2015; Usman, 2014). Cognitive factors that cause students to experience errors in solving story problems can vary from one student to another. In this study found cognitive factors that cause student errors in the form of remembering, understanding, and analyzing. These results support the theory presented by previous research which states that cognitive factors that affect one's thinking ability in learning include: remembering, understanding, applying, analyzing, evaluating, and being creative (Kyllonen & Woltz, 2014; Tsaparlis, 2005). Often students find it difficult to remember what number operations are used to solve problems. Apart from remembering, the other is understanding. Understanding is also a factor that causes students to experience errors in solving problems. Students can read the questions given but students have difficulty understanding what the purpose of the questions is and what is being asked of the questions. An even higher level of remembering and understanding that causes students to experience errors in solving math story problems is analyzing. In analyzing students are required to solve problems and find the correct answer to the problem based on their own way.

Furthermore, non-cognitive factors were found that caused errors in problem solving math story problems, namely how students learn and how to teach teachers. How to learn and how to teach in question is a way of learning and how to teach remotely which causes a decrease in students' abilities. This is in line with previous researcher which states that with the distance learning method, students need time to adapt or get used to it so that they are able to face new changes that will indirectly affect their absorption of learning and research (Dewi, 2020). Previous study stated that the impact of online learning during the COVID-19 pandemic caused a decline in the thinking and physical abilities of elementary school students (Gularso et al., 2021). These results are also in accordance with the theory described by previous study, the psychological impact for children who study at home during the new normal is that it causes a decrease in children's enthusiasm for learning so that students' abilities decrease (Mulyana. et al., 2020). In the Covid-19 pandemic situation forcing the education system to be carried out indirectly (face to face), this was implemented for health reasons for both teachers and students themselves. The lack of face-to-face learning and frequent distance teaching forces students to study independently, causing students to have difficulty understanding some lessons which results in a decrease in students' ability to solve problems, especially math story problems. The implication of this study is providing information related to the types of errors and their factors. The teacher can use this information for improvements through updating learning methods so as to increase students' abilities, understanding, and interest in mathematics subjects, especially in math story questions. This study still have many limitations, one of the limitations of this study is the subject of research that only involves one elementary school. It is hoped that further research will be able to deepen and expand the topic of this research related to Problem Solving Errors in Mathematics Story Questions.

4. CONCLUSION

The results of the study indicate that the dominant error that is often made is the error in processing skills and writing the final answer, so that teaching teachers need to increase efforts to correct this by knowing the causal factors. Factors causing errors in solving math story problems come from cognitive factors and non-cognitive factors. Cognitive factors in the form of remembering, understanding, and analyzing. Non-cognitive factors in the form of how to learn and how to teach teachers.

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