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Kesalahan Pemahaman Siswa Sekolah Dasar dalam Menerjemahkan Soal Matematika

Davina Aurelia[1*], Ratna Ekawati[2], Slamet Arifin[3]
[1,2,3]Primary Education, Sekolah Pascasarjana, State University of Malang
E-mail: davina.aurelia.2421038@students.um.ac.id[1], ratna.ekawati.pasca@um.ac.id[2], slamet.arifin.pasca@students.um.ac.id[3]

Abstrak

Pemahaman adalah dasar dari pemecahan masalah; tanpa pemahaman yang memadai, siswa akan kesulitan menyelesaikan masalah dengan benar. Tujuan penelitian ini adalah untuk mengidentifikasi jenis-jenis kesalahan pemahaman matematika siswa sekolah dasar berdasarkan indikator pada teori Newman. Dengan menggunakan kerangka analisis kesalahan Newman, penelitian ini memberikan gambaran rinci, langkah demi langkah, tentang bagaimana siswa kehilangan pemahaman. Penelitian ini dilakukan dengan metode deskriptif kualitatif, menggunakan tiga siswa kelas tiga sebagai subjek, yang dipilih berdasarkan tingkat kemampuan matematika mereka (tinggi, sedang, rendah) yang ditentukan melalui tes diagnostik. Hasil analisis data menunjukkan bahwa pada ketiga tingkat kemampuan siswa yang dianalisis, terdapat pola yang berbeda dalam jenis-jenis gangguan pemahaman yang ditemui. Siswa berprestasi tinggi menunjukkan kesalahan pemahaman yang minimal, berhasil mengidentifikasi informasi utama. Sebaliknya, siswa dengan kemampuan sedang menunjukkan lebih banyak masalah dalam menghubungkan informasi yang tersedia. Siswa dengan kemampuan terendah menunjukkan kesalahan paling mendasar, salah dalam mengidentifikasi fakta dasar. Temuan ini menunjukkan perlunya pendekatan pengajaran yang menekankan pemahaman kontekstual dan pengembangan literasi matematika dalam memahami soal cerita. Mengintegrasikan metode berbasis bukti seperti pembelajaran berbasis masalah, yang telah terbukti meningkatkan literasi matematika pada siswa sekolah dasar, dapat membantu mengatasi tantangan pemahaman yang diamati dalam penelitian ini.

Kata Kunci: kesalahan pemahaman, matematika, pemecahan masalah, sekolah dasar

Primary Students' Comprehension Errors in Translating Math Problems

Abstract

Comprehension is the foundation of problem-solving; without proper understanding, students will struggle to solve problems correctly. This research aims to identify specific types of mathematical comprehension errors in primary school students based on indicators from Newman's theory. By using Newman's error analysis framework, the study gives a detailed, step-by-step look at how students lose comprehension. This research was conducted using a descriptive qualitative method with three third-grade students as subjects, selected based on their level of mathematical ability (high, medium, low) determined through a diagnostic test. The results of the data analysis show that across the three student ability levels analyzed, the data revealed distinct patterns in the types of comprehension breakdowns encountered. High-performing students demonstrated minimal comprehension errors, successfully identifying key information. In contrast, mid-level students exhibited more significant issues linking the available information. The lowest-performing students showed the most fundamental misunderstandings, incorrectly identifying basic facts. These findings imply the need for a teaching approach that emphasizes contextual understanding and the development of mathematical literacy in comprehending story-based problems. Integrating evidence-based methods like problem-based learning, which have been shown to improve mathematical literacy in primary students, could help address the comprehension challenges observed in this study.

***Keywords**: comprehension errors; mathematics; primary school; problem-solving*

INTRODUCTION

Problem-solving is one of the foundation skills of 21st-century skills. Problem-solving involves higher cognitive skills such as imagination, association, abstraction, comprehension, manipulation, reasoning, analysis, synthesis, and generalization, all of which require management and coordination (Rahman, 2019). Recent studies show that students still have difficulties in mathematical problem-solving, especially in understanding mathematical problems (Ainia & Amir, 2021; Nuraini et al., 2018; Nurharyanto & Retnawati, 2020; Setiyawati et al., 2022). Students often fixated on the steps given by the teacher when solving math problems (Carvalho, 2023). As a result, when students are faced with questions with different contexts, they have difficulty understanding the problem, because tasks that use routine procedures tend to lead to mechanical repetition in the absence of conceptual understanding (Jonsson et al., 2020). In addition, mastery of sentence-based math problem-solving skills is also still unsatisfactory, students still have difficulty understanding math problems presented in the form of story paragraphs, difficulty planning the right solution strategy, and errors in calculations (Ling & Mahmud, 2023).

Newman's error analysis theory provides a systematic framework for understanding these mathematical difficulties. According to this theory, students must progress through five sequential stages when solving mathematical problems: reading, comprehension, transformation, process skills, and encoding. Recent studies have applied this framework to categorize mathematical errors more precisely (Kusumadewi & Retnawati, 2020; Setiyawati et al., 2022). This hierarchical approach helps identify where students begin to struggle in the problem-solving process, whether at the initial reading stage or in later mathematical operations. Previous studies found that there were eight mathematical errors identified in primary school students, namely conceptual, procedural, problem-solving, problem understanding, converting problem sentences into mathematical sentences, computational, planning, and implementing the solution plan (Ainia & Amir, 2021; Nuraini et al., 2018).

However, although various types of mathematical errors have been identified in previous studies, the type of error that appears most prominent is comprehension errors. This is shown by the results of a previous study which found that students who experienced comprehension errors when solving math problems were at a fairly high level, reaching 81% (Nurharyanto & Retnawati, 2020; Setiyawati et al., 2022). The data is supported by the problems encountered by researchers in the field, where students have difficulty in determining the steps they should take after identifying information from a math problem. Similar things were found in several previous studies which stated that students did not understand the problem well and were less accurate in determining information about what was known and asked about the statement (Nuraini et al., 2018; Setiyawati et al., 2022).

Comprehension is the foundation of problem-solving, without proper understanding, students will find it difficult to solve problems correctly (Fuchs et al., 2018, 2020). Early prevention of comprehension difficulties can prevent successive errors in the later stages of solving (Bagassi & Macchi, 2020). However, although comprehension errors are recognized as one of the significant types of errors in the problem-solving process experienced by students, studies that deeply investigate the specific processes underlying these comprehension difficulties are still limited. The current literature lacks a detailed analysis of how different types of mathematical skills affect comprehension errors.

This study was conducted to determine specific types of comprehension errors that appear in understanding problems at various mathematical abilities of primary school students based on indicators from Newman's theory. This research is limited to analyzing the types of comprehension errors in mathematics problems on nine subjects representing high, medium, and low levels of mathematical ability in grade III students. This exploratory study offers significant insights into students' misconceptions regarding mathematical difficulties, establishing a crucial foundation for future research in this domain. Although the findings may lack generalizability to a broader population, they provide a significant preliminary perspective to inform and direct future research.

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METHOD

This research uses descriptive qualitative research, where the researcher plays a major role in analyzing the object to be studied. The purpose of qualitative research is to find and describe the activities carried out by the observed subjects as well as the effects of the actions taken (Adlini et al., 2022). This research was conducted at Pandanwangi Primary School Malang in October-November. The subjects in this study were third-grade primary school students totaling nine students. The selection of research subjects was carried out by purposive sampling, initiated by administering a pre-test on prerequisite material, specifically multiplication and mathematical sentences, to all students in the target class. Based on the pre-test scores, students were categorized into three levels of mathematical ability on the categories of high, medium, and low mathematical abilities according to the indicators in Table 1.

Table 1. Indicators of Student Ability Categories

Score	Category of Ability
Score > (Mean + 1 SD)	High Ability
(Mean - 1 SD) ≤ Score ≤ (Mean + 1 SD)	Medium Ability
Score < (Mean - 1 SD)	Low Ability

Source: (Arikunto, 2018)

The use of subjects representing high, medium, and low abilities aims to explore in depth the patterns of comprehension errors that may differ at each ability level. This is in line with qualitative research characteristics that emphasize the depth of analysis rather than the breadth of the sample. The field studied in this research is mathematics. The research instruments used in this study are interviews, observations, and documentation. The first is an observation activity carried out on third-grade primary school students. Second, the source of the interview is third-grade students. Interview activities were carried out after students finished working on the problems given, this question aims to find out the student's ability to identify information, understand the meaning of the problem, and how translate the language of the problem into a mathematical context. One example of a question in this interview is "What information can you take from this problem?" "What do you think after finding the important information?". Then, data analysis was carried out through the data reduction stage, identifying patterns and themes that emerged, followed by identification of findings, until finally concluding.

Data triangulation was used to check the validity of the data used in this study. Triangulation involves using multiple data sources and collection methods to gain a comprehensive understanding of the research problem. Specifically, data was gathered from three main sources: interviews with the third-grade student participants, observations of their activities, and documentation such as student work samples and records. By using these diverse data sources, we were able to examine the research topic from multiple perspectives. Additionally, different data collection techniques were utilized, including conducting semi-structured interviews, performing direct observations, and analyzing relevant documents. This methodological triangulation allowed us to validate the consistency and accuracy of the information we obtained. Through the process of comparing and corroborating the data from these various sources and methods, we were able to identify both convergent and divergent findings. This enabled us to cross-validate the information and develop a more nuanced and holistic understanding of the students' problem-solving processes and comprehension errors.

The data instrument used in this study is a diagnostic test in the form of essay items on length and weight measurement material detailed in Table 2.

Table 2. Test Instrument

No.	Question
1.	Lani bought 2 bags of flour. Each bag of flour weighs 250 grams. Lani also bought 500 grams of sugar. How many kg of flour and sugar did Lani buy in total?
2.	The distance from Tia's house to school is 6 times the distance from Vina's house to school. While the distance from Vina's house to the school is 200m. The distance from Tia's house to the school is … km.

The research was continued with an interview to determine students' ability to understand the problem, which is one of the stages of problem-solving. The things measured in this observation refer to indicators from Newman's theory used to identify errors made by students, the indicators are shown in Table 3.

Table 3. Comprehension Error Indicators Based on Newman's Theory

No.	Error Type	Error Indicator
1.	Inability to understand what is being asked	• Students misunderstand the intent of the question • Students cannot restate what is asked • Students can't identify what to look for
2.	Inability to identify the information provided	• Students incorrectly write down what information they know • Students cannot mention important information in the problem • Students misinterpret the available data
3.	Inability to link information to the questions	• Students cannot connect the data with what is asked • Students do not understand the relationship between information • Students do not recognize the relationship between parts of the problem
4.	Inability to restate the problem	• Students cannot explain the problem in their language • Students cannot represent the problem in another form • Students misinterpret the components of the problems

(Source: Summary of Sani & Rosnawati, 2022; Setiyawati et al., 2022; White, 2010)

Table 3 outlines the key comprehension error indicators based on Newman's theory of problem-solving errors. This framework provides a structured way to analyze the specific types of errors students make when attempting to understand and solve a problem. The error indicators in the table cover different stages of the problem-solving process. The first error type, "Inability to understand what is being asked," relates to students misunderstanding the intent or requirements of the question. The second error, "Inability to identify the information provided," indicates that students have trouble recognizing and extracting the relevant data from the problem statement. The third error, "Inability to link information to the questions," shows that students struggle to connect the given information to what the question is asking. The fourth error, "Inability to restate the problem," reveals that students have difficulty translating the problem into their own words and representations.

Specific behavioral manifestations accompany each of these error indicators, such as students misinterpreting the question, failing to mention important problem information, unable to identify the relationships between problem elements, and being unable to explain the problem in their language. By analyzing student responses through the lens of these comprehension-related error types, the researchers were able to pinpoint the specific breakdowns in the problem-solving process. Identifying these error patterns provides valuable insights into the cognitive and metacognitive challenges students face when solving problems. This framework allows for a structured assessment of problem-solving skills and can help educators develop targeted interventions to address the root causes of student difficulties.

RESULTS

After being given a diagnostic test, a score range was obtained which then became the basis for selecting subjects with details shown in Table 4. Based on the data in Table 4, nine subjects were selected for in-depth analysis based on high, medium, and low ability categories. The results of each high-ability subject (S/T) on item number 1 are shown in Figure 1 and Figure 2.

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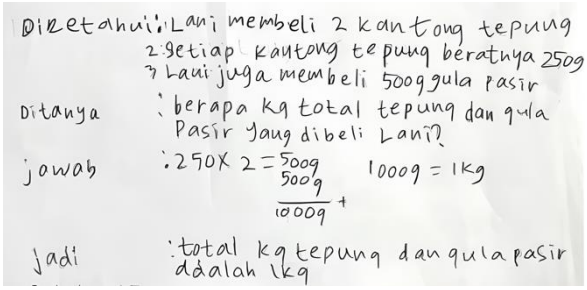
Table 4. Details of Selected Subjects by Ability Category

No.	Subject	Score	Category of Ability
1.	S/T/1	100	High Ability
	S/T/4	86	
	S/T/7	83	
2.	S/S/9	74	Medium Ability
	S/S/10	69	
	S/S/25	55	
3	S/R/26	49	Low Ability
	S/R/27	44	
	S/R/28	36	

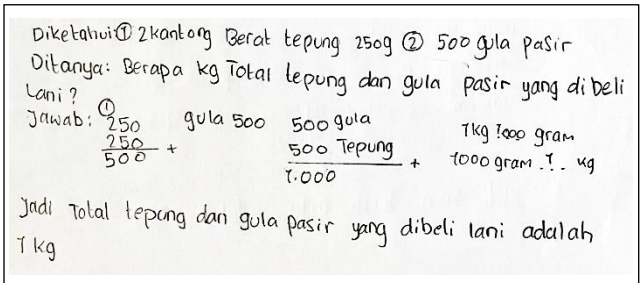
Figure 1 and Figure 2 show the work of S/T/1, S/T/4, and S/T/7. In their written solutions, all three students systematically recorded the key information such as the number of flour bags (2 bags) and the weight of each bag (250 g). Information about sugar (500 g) was also correctly identified. Their written work demonstrates they correctly identified that the question asked for the total weight of flour and sugar. Students were able to connect the available information to calculate the total weight and convert the unit from grams to kilograms according to the questions. The lack of student misunderstanding in this problem leads students to be able to solve the problem with a logical and correct final result to be expressed in kilograms.



Known: Lani bought 2 bags of flour. Each bag of flour weighs 250 grams. Lani also bought 500 grams of sugar.
Asked: How many kg of flour and sugar did Lani buy in total?
Answered: 250 x 2 = 500 g 1000 g = 1 kg

$$\frac{500\text{ g}}{1000\text{ g}} +$$

So: the total kg of flour and sugar that Lani bought is 1 kg.



Known: (1) 2 bags of flour weighing 250 g each, (2) 500 g of sugar.
Asked: How many kg of flour and sugar did Lani buy in total?
Answered: 250 500 gula 1 kg = 1000 gram

$$\frac{250}{500} + \quad \frac{500\text{ tepung}}{1000} +$$

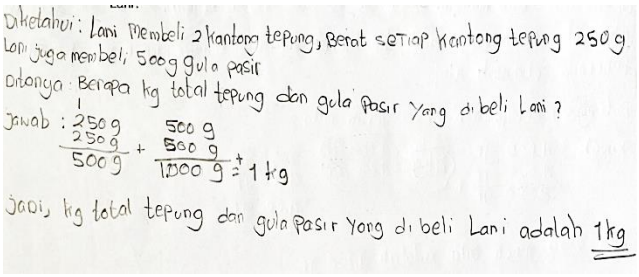
So the total of flour and sugar that Lani bought is 1kg.

Figure 1. S/T/1 and S/T/4 Answers to Question 1

The interview data provides deeper insight into their problem-solving process, the three were able to explain the steps they took after writing down the known information in the problem to calculate the total weight of the flour bag. As students explained:

> "Two bags of flour is equal to 500 grams because 250 grams plus 250 grams equals 500 grams. So the total flour and sugar that Lani bought was total, 500 grams of flour plus 500g of sugar equals 1 kg."

These verbal explanations align with their written calculations and reveal their step-by-step thinking process. While their written work showed the final conversion to kilograms, the interview response clarifies that they first calculated the total flour weight before combining it with the sugar weight. This demonstrates their understanding of both the additive process and unit conversion concepts.



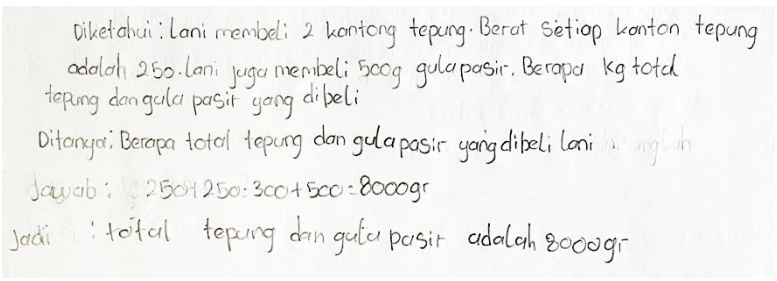
Known: Lani bought 2 bags of flour. Each bag of flour weighs 250 grams. Lani also bought 500 grams of sugar.
Asked: How many kg of flour and sugar did Lani buy in total?
Answered: 250 g + 250 g + 500 g + 500 g = 1000 g = 1 kg

So, the total kg of flour and sugar that Lani bought is 1 kg.

Figure 2. S/T/7 Answer to 1st Question

Based on the integrated analysis of both written answers and interview responses, S/T/1, S/T/4, and S/T/7, as high-ability subjects, showed a good understanding of the problem given. Their written work showed a systematic organization of information, while their interview responses revealed a clear conceptual understanding. The consistency between their written calculations and verbal explanations indicates genuine mastery rather than mere procedural knowledge. They not only solved the problem correctly but could articulate their reasoning, showing how they progressed from identifying key information to reaching the final answer of 1 kg through logical steps.

In a similar question, S/S/9 (medium-ability subjects) had the same understanding as the previous high-ability subjects. S/S/9 could write down the information on the number of flour bags (2 bags) and the weight of each bag (250 g). Information about sugar (500 g) is also correctly identified. The appropriate understanding was also evidenced by the students' addition operation that represented the total weight of flour with 250 + 250 as shown in Figure 3.



Known: Lani bought 2 bags of flour. Each bag of flour weighs 250 grams. Lani also bought 500 grams of sugar. How many kg of flour and sugar did Lani buy in total?
Asked: How much flour and sugar did Lani buy
Answered: 250 + 250 + 300 + 500 = 8000 gr

So: the total flour and sugar is 8000 gr.

Figure 3. S/S/9 Answer to 1st Question

However, S/S/10 and S/S/25 (medium-ability subjects) showed different understandings of the given problem. S/S/10 and S/S/25 in writing only stated that the weight of the flour bags purchased by Lani was 250 grams without any information on the purchase of two bags as shown in Figure 4 and Figure 5.

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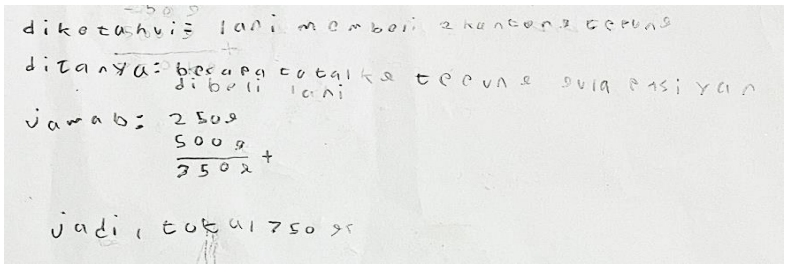


Known: Lani bought 2 bags of flour.
Asked: How many kg of flour did Lani buy
Answered: 250 g
500 g +
350 g

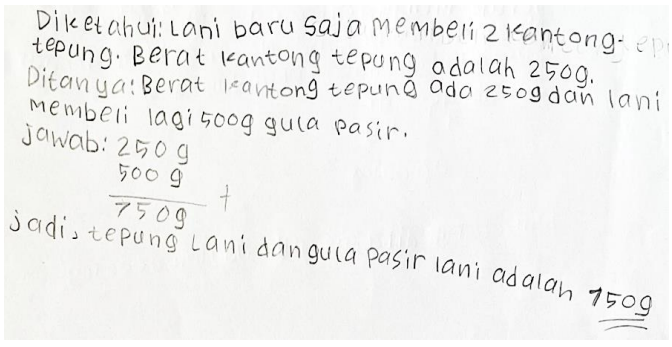
So, the total is 750 g.

Figure 4. S/S/10 Answer to 1st Question

S/S/10 and S/S/25 can identify, write, and state what was asked in the question correctly. However, an error was found in understanding the relationship between the information in the question that the number of bags of flour bought by Lani was two, but one bag weighed 250 grams. Therefore, S/S/10 and S/S/25 showed errors in continuing the addition operation to answer the question by only adding 250 grams of flour with 500 grams of sugar. In the interview, S/S/10 and S/S/25 mentioned that the weight of the bag of flour Lani bought was 250 grams, and Lani also bought 500 grams of sugar.

> "It is known that the bag of flour weighs 250 grams, Lani bought another 500 grams of sugar. What is asked is the total of Lani's flour and sugar, so add 250 grams of flour and 500 grams of sugar. The result is 750 grams"

Based on the results of the analysis of student answers and interviews, S/S/9, S/S/10, and S/S/25 as medium ability subjects showed a variety of understanding of the problems given. S/S/9 was able to identify important information and understand the relationship between the information well, but S/S/10 and S/S/25 experienced errors in identifying information about the number of flour bags in the problem, thus affecting the students' final answers to this problem.

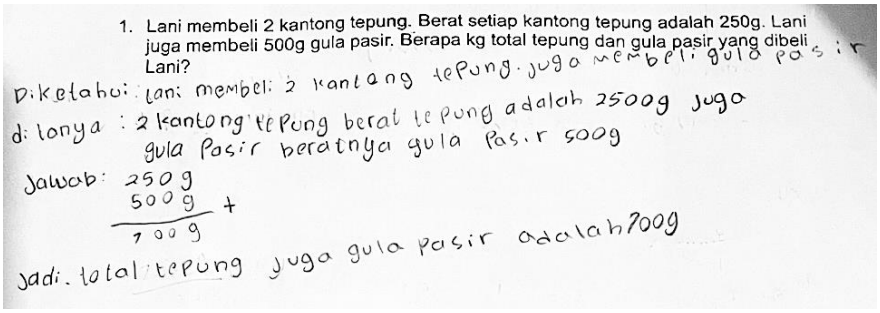


Known: Lani just bought 2 bags of flour. The weight of each bag of flour is 250 g.
Asked: The weight of the bag of flour is 250 g and Lani bought another 500 g of sugar.
Answered: 250 g
500 g +
750 g

So, Lani's flour and sugar weigh 750 g.

Figure 5. S/S/25 Answer to 1st Question

Similar errors were also found in the answers of S/R/26 and S/R/27 (low-ability subjects) who misunderstood the relationship between the information in the problem regarding the number of flour bags that should have been counted twice as shown in Figure 6 and Figure 7.



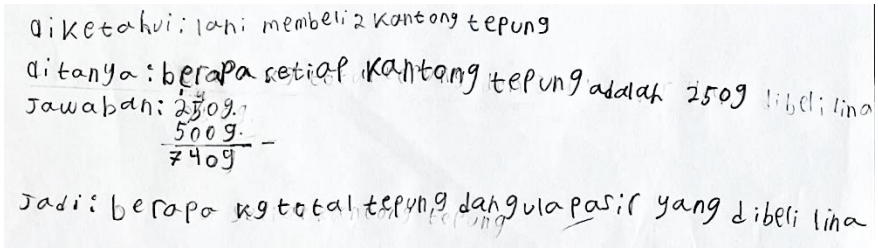
1. Lani bought 2 bags of flour. Each bag of flour weighs 250 grams. Lani also bought 500 grams of sugar. How many kg of flour and sugar did Lani buy in total?

Known: Lani bought 2 bags of flour. She also bought sugar.
Asked: The weight of 2 bags of flour is 2500 g, and the weight of sugar is 500 g.
Answered: 250 g
500 g +
700 g

So, the total weight of the flour and sugar is 700 g.

Figure 6. S/R/26 Answer to 1st Question

In the interview, S/R/26 and S/R/27 mentioned that in the problem, the total weight of the flour and sugar bags is known, and the question is how many kilograms. This shows that S/R/26 and S/R/27 were unable to identify the information given in the problem correctly by writing and stating that 250 grams is the weight of two bags. In addition, S/R/26 and S/R/27 also showed the inability to relate the information in the problem so students did not connect the information about the number of bags with the weight of each. However, even though the student showed these errors, the understanding of what was asked could be stated as fulfilled because the student tried to answer the total weight according to the question.



Known: Lani bought 2 bags of flour.
Asked: How much does each bag of flour weigh 250 g.
Answered: 250 g
500 g
740 g

So: How many kg of flour and sugar did Lina buy in total

Figure 7. S/R/27 Answer to 1st Question

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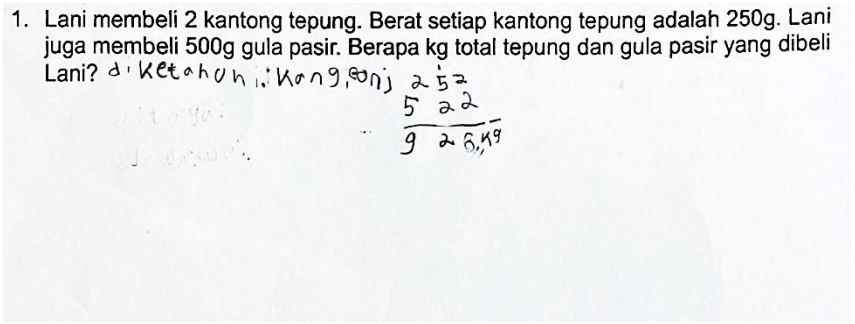
However, in the same category, S/R/28 as a low-ability subject showed difficulty in understanding the problem, which is evidenced by the student's inability to write and mention what was the important information in the problem and what was asked both in writing as in Figure 8, and during the interview.


1. Lani membeli 2 kantong tepung. Berat setiap kantong tepung adalah 250g. Lani juga membeli 500g gula pasir. Berapa kg total tepung dan gula pasir yang dibeli Lani? diketahui: kangeoni 252 522 926 kg

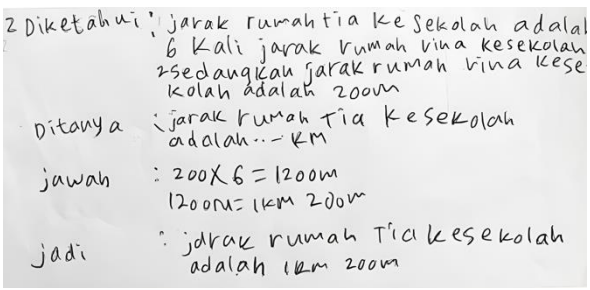
1. Lani bought 2 bags of flour. Each bag of flour weighs 250 grams. Lani also bought 500 grams of sugar. How many kg of flour and sugar did Lani buy in total?

Known: kangeoni 252
522
926 kg

Figure 8. S/R/28 Answer to 1st Question

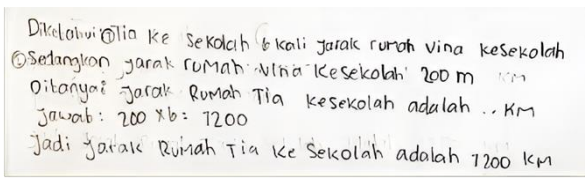
From the analysis of the first problem, the main error found was the inability of students to identify the information given and relate it to the question. Students misunderstood that 250 grams is the weight of one bag of flour if the total weight of two bags of flour should be calculated as 2×250 grams. However, students only recorded one of the bags, so the total weight calculated was wrong. This error shows the students' lack of skill in understanding explicit information and relating data to the context of the question.

Next is the discussion on the second question item, the results of the answers of each high-ability subject (S/T) in question number 2 are shown in Figure 9 and Figure 10.


2 Diketahui : jarak rumah tia ke sekolah adalah 6 kali jarak rumah vina kesekolah sedangkan jarak rumah vina kesekolah adalah 200m
Ditanya : jarak rumah Tia kesekolah adalah ... KM
jawab : 200 X 6 = 1200m
1200m = 1km 200m
jadi : jdrak rumah Tia kesekolah adalah 1km 200m

Known: The distance from Tia's house to school is 6 times the distance from Vina's house to school. Meanwhile, the distance from Vina's house to school is 200 m.
Asked: The distance from Tia's house to school is … km.
Answered: 200 m x 6 = 1200 m
1200 m = 1 km 200 m

So: the distance from Tia's house to school is 1 km 200


Diketahui: (1)Tia ke sekolah 6 kali jarak rumah vina kesekolah (2)Sedangkan jarak rumah vina kesekolah 200 m
Ditanya: jarak Rumah Tia kesekolah adalah .. Km
Jawab: 200 x 6 = 1200
Jadi jarak Rumah Tia ke Sekolah adalah 1200 km

Known: (1)The distance from Tia's house to school is 6 times the distance from Vina's house to school. (2) Meanwhile, the distance from Vina's house to school is 200 m.
Asked: The distance from Tia's house to school is … km.
Answered: 200 x 6 = 1200

So, the distance from Tia's house to school is 1200 km.

Figure 9. S/T/1 and S/T/4 Answers to 2nd Question

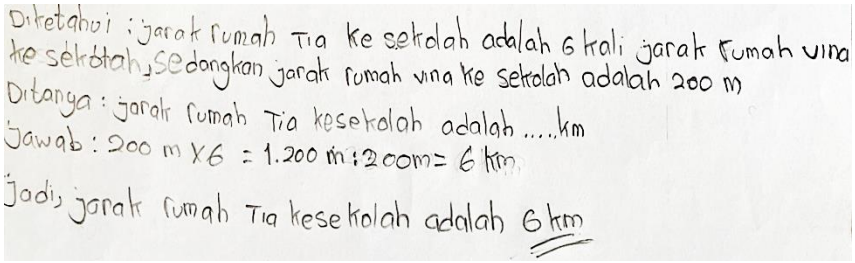
Figure 9 shows the work of S/T/1, and S/T/4 on question number 2, based on these answers students show a good understanding of the question asked, namely calculating the distance from Tia's

house to the school in kilometers. Students can identify the information given correctly, including the distance of Vina's house to the school (200 m) and that the distance of Tia's house is 6 times that distance. In addition, students also successfully relate the information to the question, and convert the calculation results from meters to kilometers correctly (1200 m to 1 km 200 m). Students use logical and clear solution steps so that the answers given are by the questions. This work reflects a good understanding and does not show any significant errors.

When interviewed, S/T/1 and S/T/4 explained that the steps they took after writing down the known information in the problem were to calculate the distance from Tia's house to school by multiplying the distance of Vina's house to school by 6.

"Counting the 200m 6 times. So 200 + 200 + 200 + 200 + 200 + 200 equals 1200 meters."

In contrast to the results obtained by S/T/7, in this case, S/T/7 was able to understand the direction of solving this problem, but there was an error in its understanding of the steps that must be taken to convert units from meters to kilometers as shown in Figure 10.

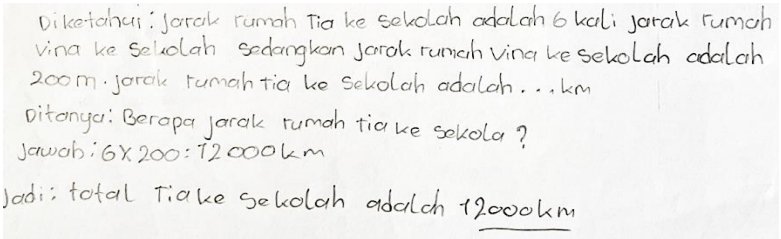


Known: The distance from Tia's house to school is 6 times the distance from Vina's house to school. Meanwhile, the distance from Vina's house to school is 200 m.
Asked: The distance from Tia's house to school is … km.
Answered: 200 m x 6 = 1200 m : 200 m = 6 km

So, the distance from Tia's house to school is 6 km.

Figure 10. S/T/7 Answer to 2nd Question

From the answers and the results of the interview with S/T/7, it is known that the cause of the mistake is because the student relates the information she obtained about the distance from Tia's house to the school from the calculation results, namely 1200 meters, which needs to be converted into km units. Then S/T/7 misunderstood that the conversion was done by subdividing the distance of Vina's house to the school, which is 200 meters. This then causes S/T/7 to get the wrong final answer.



Known: The distance from Tia's house to school is 6 times the distance from Vina's house to school. Meanwhile, the distance from Vina's house to school is 200 m. The distance from Tia's house to school is … km.
Asked: How far is Tia' house from the school?
Answered: 6 x 200 = 1200 km

So: the total distance from Tia's house to school is 1200km.

Figure 11. S/S/9 Answer to 2nd Question

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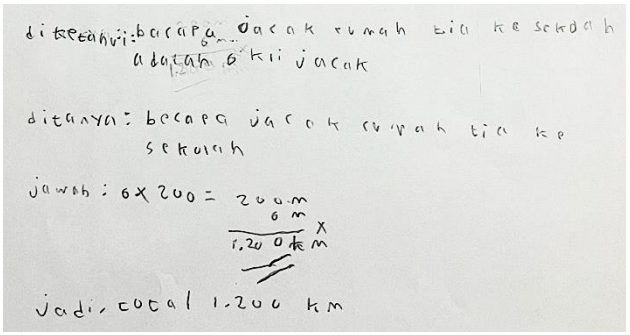
In similar questions, S/S/9 and S/S/10 (medium ability subjects) had a correct understanding of solving the problem. S/S/9 can write down the information found in the problem completely as shown in Figure 11. On the other hand, S/S/10 showed an understanding of the information in the problem but did not write down the information completely as shown in Figure 12.



Known: The distance from Tia's house to school is 6 times the distance.
Asked: How far is Tia's house from the school?
Answered: 6 x 200 = 200 m

$$\frac{6\text{ m}}{1.200\text{ km}}\ \text{x}$$

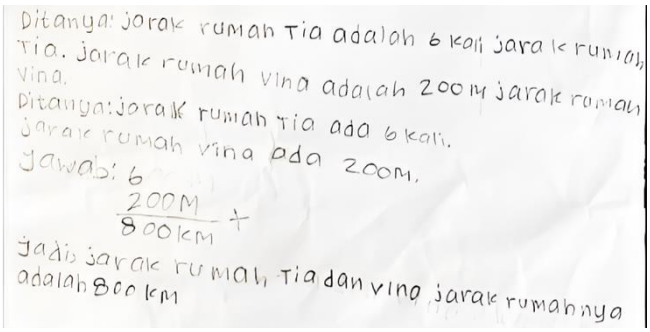
So, the distance from Tia's house and Vina's house is 1.200km.

Figure 12. S /S/10 Answer to 2nd Question

In the interview, S/S/9 and S/S/10 could mention the known information in the problem more clearly than what they wrote. They could explain the steps they took to work on this problem after writing down the information they knew by multiplying the distance from Vina's house to school by 6.

"The distance from Vina's house to school is 200 meters, and the distance from Tia's house to school is 6 times the distance from Vina's house to the school. So Tia's house goes to school 6×200."

Unlike the other two subjects with the same ability, S/S/25 showed an error in understanding the problem. This is shown in the selection of mathematical operations used to answer this question. Instead of multiplying 200 m by 6, the student added 6 to 200 m as shown in Figure 13.



Known: The distance from Tia's house is 6 times the distance from Tia's house. The distance from Vina's house is 200 m from Vina's house.
Asked: The distance from Tia's house is 6 times. The distance from Vina's house is 200 m.
Answered: 6

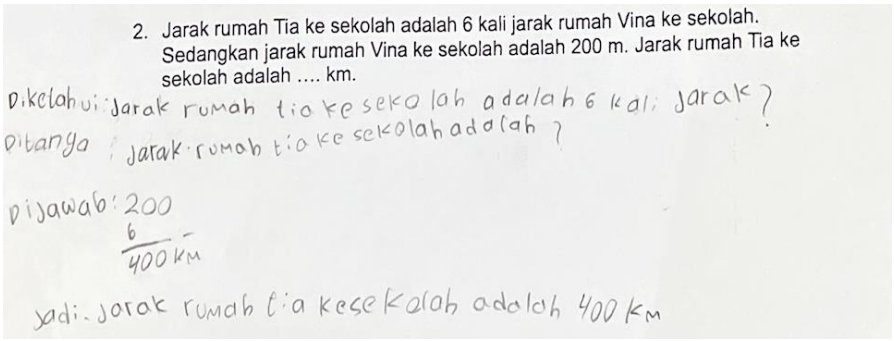
$$\frac{200\text{ m}}{800\text{ km}}+$$

So, the distance from Tia's house and Vina's house is 800km.

Figure 13. S/S/25 Answer to 2nd Question

Based on these data, S/S/25's error in understanding this problem occurred in the inability to identify the information provided, especially in understanding the relationship between the information in the question, where the keyword '6 times' means that the distance from Tina's house to school should be calculated as six times the distance from Vina's house to school. However, students did not experience errors in understanding what was asked or restating the problem because students tried to answer about the distance from the available information and were able to explain the calculations according to what was understood.

Similar errors occurred in S/R/26 and S/R/27 (low-ability subjects), where the same error was found in understanding the vocabulary of '6 times' which ideally leads students to calculate six times the distance from Vina's house to school. In the answers of S/R/26 and S/R/27, both wrote down important information from the problem but were incomplete and used improper operations (subtraction and division) to represent the information in the problem as shown in Figure 14 and Figure 15.



2. The distance from Tia's house to school is 6 times the distance from Vina's house to school. Meanwhile, the distance from Vina's house to school is 200 m. The distance from Tia's house to school is ... km

Known: The distance from Tia's house to school is 6 times the distance?
Asked: What is the distance from Tia's house to the school?
Answered: 620

$$\frac{6}{400\ \text{km}}$$

So, the distance from Tia's house to school is 400km.

Figure 14. S/R/26 Answer to 2nd Question

In the interview, S/R/26 and S/R/27 were incomplete in mentioning the known information in the problem. They explained that the step they took to work on this problem after writing down the information he knew was to reduce and divide the distance between Vina's house and school by 6.

> "It is known that the distance from Tia's house to school is 6 times the distance from Vina's house. Vina's house to school is 200m. So 200 minus 6." (W-S/R/26)

> "The distance from Vina's house to school is 200m, asked the distance of Tia's house to school. So Tia's house of 200 is divided by 6." (W-S/R/27)

This shows that S/R/26 and S/R/27 were unable to identify the relationship between the information in the problem where students misunderstood the keyword '6 times' means that the distance from Tina's house to school should be calculated as six times the distance from Vina's house to school. In addition, the subject also showed an inability to relate information to the problem so students did not apply the relationships between units correctly. However, even though the student showed these errors, the understanding of what was asked could be stated as fulfilled because the student tried to answer the distance from Tia's house to school.

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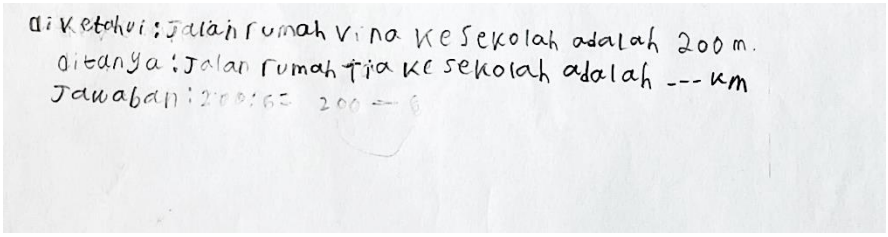
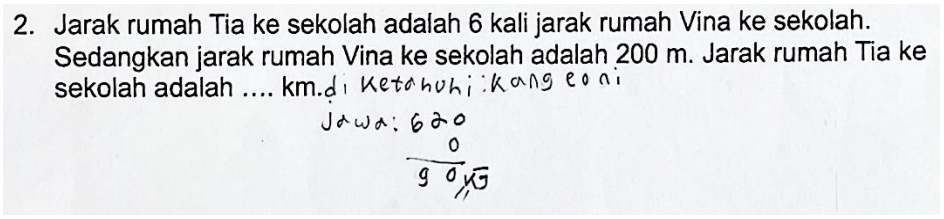


Known: Vina's house to school distance is 200m.
Asked: Tia's house to school distance is … km.
Answer: 200 : 6 = … (erased)

Figure 15. S/R/27 Answer to 2nd Question

However, in the same category, S/R/28 as a low-ability subject showed difficulty in understanding the problem, which was evidenced by the students's inability to write and mention what was the important information in the problem and what was asked both in writing as in Figure 16, and during the interview.



2. The distance from Tia's house to school is 6 times the distance from Vina's house to school. Meanwhile, the distance from Vina's house to school is 200 m. The distance from Tia's house to school is ... km
Known: kangeoni
Answer: 620
0
90 kg

Figure 16. S/R/28 Answer to 2nd Question

In the second problem, students showed errors related to the conversion of distance units. Although students were able to multiply the distance from Vina's house to school with the correct multiplying factor (6), the final result became inaccurate because students misinterpreted the unit from meters to kilometers and incorrectly identified the appropriate mathematical operation to represent the relationships between the information in the problem. These errors indicate students's inability to identify the relationship between information and apply the concept of unit conversion correctly. Overall, the findings highlighted that most of the students' comprehension errors were related to the processing of explicit information, the relationship between data, and the logical interpretation of the problem context.

DISCUSSION

Based on the results of the analysis, the level of students' mathematical ability correlates with the level of comprehension errors experienced. High-ability students (S/T) showed minimal comprehension errors; they were able to identify important information in the problem correctly, understand the relationship between information, and apply a systematic solving strategy. This can be seen from the subject's ability to identify the number of flour bags and their weight and relate them to information about sugar to get the right total weight. The findings align with Nahdi's (2024) Assertion that effective

problem-solving in mathematics requires reading comprehension skills. The study indicates a significant positive correlation between reading comprehension and mathematical problem-solving skills, suggesting that comprehension is a critical first step in the problem-solving process (Nahdi et al., 2024).

In contrast, medium-ability students (S/S) showed more significant comprehension errors, especially in linking the available information. Despite the subjects' ability to identify basic information like the weight of one bag of flour and sugar, they failed to comprehend the connection between two bags of flour, leading to errors in the total calculation. The research by Abdullah et al. (2015) Corroborates the notion that comprehension errors are a substantial contributor to overall mathematical errors, with a significant percentage of errors attributed to fluency factors, including reading and comprehension. This indicates that students who struggle with comprehension are likely to face challenges in executing mathematical operations accurately. Rachmawati et al. (2021) Also underscores the close connection between communication mistakes in mathematics and comprehension errors, highlighting the critical role of students' ability to articulate their understanding in effective problem-solving.

For low-ability students (S/R), the misunderstanding that occurred was more complex and fundamental. Not only did the subjects struggle to link information, but they also demonstrated an inability to correctly identify important information, as evidenced by the misunderstanding that 250 grams is the weight of two bags of flour. This aligns with the assertion by Paut et al. (2023) A weak mastery of mathematical concepts leads to errors in problem-solving, emphasizing that a solid understanding of the material is crucial for effective problem resolution. When students grasp the concepts well, they are better equipped to tackle mathematical problems and apply their learning in real-world contexts. This difference in the level of comprehension errors indicates that students' mathematical ability affects the way they process and integrate information in math problems, whereas students with higher abilities tend to have a more comprehensive and systematic understanding.

The results of the analysis of students' comprehension errors in translating math problems, which were strengthened through the triangulation of student and teacher interview data, showed that students' errors were mainly caused by limitations in understanding explicit information and translating it into the context of solving problems. In the first problem, students tended to misidentify the relationship between the number of flour bags and the weight of each bag, which can be seen from the students' answers which only add up the weight of one bag of flour (250g) with the weight of sugar (500g) without taking into account the context of 'two bags of flour'. This error occurs because students cannot correctly identify "what is known" from the problem. This is by the findings of the Nuraini et al. (2018) and Setiyawati et al. (2022) Where students do not understand the problem well and lack accuracy in determining information about what is known and asked about the statement. The difficulties experienced by students in translating explicit information on the problem, as seen in the case of processing information about the number of flour bags, affect the problem-solving process in the next stage, namely the selection of appropriate mathematical operations until the final result is obtained. In line with, Fuchs et al. (2018) Who emphasizes that understanding is the foundation of problem-solving, and without proper understanding, students will have difficulty solving problems correctly. These findings are also reinforced by Bagassi & Macchi (2020) Who states that early prevention of comprehension difficulties can prevent successive errors in the next stage of solving.

Teachers also confirmed that these student errors are common, mainly due to a low understanding of 'math sentences' in problems that require interpretation beyond basic operations. Research shows that students' difficulties in solving mathematical problems are often due to a lack of ability to read and understand the information contained in the problems (Sumartini & Safitri, 2022). Ling & Mahmud (2023) Also emphasized that students' ability to understand the structure of mathematical problems presented in the form of story texts is very limited. They tend to focus on numbers and basic operations without comprehensively understanding the context and relationships between information. These findings emphasize the importance of developing learning strategies that not only focus on solving procedures but also on contextual understanding and interpretation of mathematical problems. This points to potential cognitive and linguistic factors that contribute to students' struggles, beyond just procedural habits. For example, students may have trouble grasping the underlying relationships and conceptual structures within story-based math problems.

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Several cognitive and linguistic factors might contribute to students' challenges in this area. On the cognitive side, many students struggle with reading comprehension skills, lacking the ability to fully understand the contextual information and relationships presented in mathematical word problems (Boonen et al., 2016). They also often have weak problem-solving strategies, tending to jump straight to numerical calculations without a clear plan, and can be hindered by limitations in their working memory and underdeveloped logical reasoning skills (Lin, 2021). Linguistically, students learning in a non-native language may face additional barriers due to their language proficiency, unfamiliar mathematical vocabulary and terminology, complex syntactic structures, and unfamiliar contextual references in word problems (Prediger et al., 2018). Addressing these cognitive and linguistic factors through targeted instructional strategies focused on reading comprehension, problem-solving frameworks, language support, and exposure to diverse problem contexts is crucial for helping students develop the necessary skills to comprehend and solve mathematical word problems effectively.

In the second problem, no misunderstanding was detected because the students had understood the initial information correctly. This is evidenced by the ability of students to correctly identify the first step, which is to multiply the distance of Vina's house to the school (200m) by the multiplying factor (6) to find out the distance of Tia's house to the school. In this case, the error occurred when converted from meters length unit to kilometers length unit (unit conversion). In the interview, the student mentioned the use of the ladder method for unit conversion, but the step was done without understanding the relationship between levels in the unit ladder, resulting in an incorrect answer. In addition, the teachers also confirmed that students are often trapped by the complexity of story-based or context-based problems, especially in measurement and unit conversion materials such as gram-kilograms or meters-kilometers.

Although teachers have provided practice with simpler problem forms, students still show confusion in identifying relevant mathematical operations, such as adding or subtracting. Students' errors in unit conversion and context understanding of story problems reflect a broader pattern in mathematical problem-solving difficulties. The results of this study are in line with the findings Ling & Mahmud (2023) Who identified that students experience significant difficulties in understanding mathematical problems presented in the form of story paragraphs, especially in planning appropriate solution strategies. This difficulty was evident when students faced a distance unit conversion problem, where they were able to identify basic operations but failed to integrate a deeper conceptual understanding.

An interesting finding in this study is that although students know basic procedures such as the use of the unit conversion ladder method, they fail to understand the logical relationships between levels in conversion systems. This is in line with the Jonsson et al. (2020) Tasks that use routine procedures tend to lead to mechanical repetition in the absence of conceptual understanding. In this context, students fixated on procedural steps without understanding the meaning and relationships between the underlying concepts.

This data analysis shows that the most common comprehension errors found from students based on Newman's Theory indicators lie in students' inability to identify and relate the explicit information given in the problem. Students tend to focus only on part of the information and fail to understand the relationship between the information in the context of the problem. The reason is in mathematical literacy, especially in understanding and interpreting information in story-based problems, as well as in applying basic concepts such as unit conversion without being fixated on the usual procedural steps. Therefore, more teaching approaches are needed to build students' understanding of the relationship between information, the unit conversion process, and the problem context to overcome these errors.

So, to overcome this difficulty, the learning strategy that can be applied by teachers in the future is to emphasize reading practice and understanding mathematical problems comprehensively, not just focusing on numbers and operations. As stated by Mulyati et al., (2017) understanding mathematical text and solving basic math problems have a positive correlation, thus emphasizing the importance of integrative learning between reading and learning mathematics. That way students can be trained to understand the structure and interconnectedness of information in mathematical problems. Explicit teaching on how to identify the known and questionable information in the problem, as well as connecting it to the context of the problem is mostly done through problem-based learning. Problem-

based learning is more effective in improving mathematical literacy in primary school students than in direct instruction (Firdaus et al., 2017). As well as providing examples of varied problems, not only limited to basic operations, to train students' understanding of the structure and relevance of information in mathematical problems.

CONCLUSION

Based on the study results, the main comprehension errors in students' interpreting of math problems stemmed from their inability to identify and relate explicit information given in the problem. Students often focus on only part of the information, which leads to errors in later stages of problem-solving. The level of students' mathematical ability correlated with the types of errors made. High-ability students showed minimal comprehension errors, while medium-ability students had difficulty linking the information even though they could identify the basic facts. Low-ability students experienced more complex comprehension errors, struggling with both identifying and relating the given information. These errors were mainly due to poor understanding of 'mathematical sentences' that require more interpretation beyond basic operations, limited ability to read and understand the information in the problem, and students' tendency to focus on procedures without a deep conceptual understanding. These findings imply the need for a teaching approach that emphasizes the development of mathematical literacy- the ability to read, understand, and interpret the contextual information in mathematical problems. Improving these literacy skills will directly impact students' capacity to understand and comprehend the problem statements and navigate the problem-solving process. Instructional methods could involve modeling effective problem interpretation, providing scaffolded practice with story-based problems, and encouraging students to explain their reasoning beyond just the final answers. A recommendation for future research would be to explore how the identified comprehension errors could be addressed through different educational settings and teaching approaches. Investigating the efficacy of these literacy-focused interventions across diverse classroom contexts would provide valuable insights to further support students' mathematical problem-solving abilities.

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