Jurnal Pembelajaran Matematika Inovatif
Volume 8, No. 6, November 2025

ISSN 2614-221X (print)
ISSN 2614-2155 (online)

DOI 10.22460/jpmi.v8i6.30806

# MATHEMATICAL MODELLING ABILITY OF JUNIOR HIGH SCHOOL STUDENTS IN SOLVING RATIO AND PROPORTION WORD PROBLEMS

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**ARTICLE INFO**

***Article History***
Received Jan 2, 2025
Revised Oct 11, 2025
Accepted Nov 21, 2025

***Keywords:***
Ability Analysis;
Mathematical Modeling;
Ratio and Proportion

**ABSTRACT**

*This study aims to identify the abilities and difficulties of junior high school students in translating word problems into mathematical models on the topic of Ratio and Proportion. The ability to model contextual problems is a crucial basic competency for junior high school students, but in reality many students still experience obstacles in this mathematical process. The approach used is descriptive qualitative, involving three eighth-grade students representing high, medium, and low ability levels. Using a two-question story problem instrument on ratios and proportions, the test results and interviews were analyzed, revealing that differences in student ability lie in their accuracy in understanding the context of the problems, selecting problem-solving strategies, and interpreting the results. High-ability students were able to build mathematical models well, while medium and low-ability students still experienced difficulties in the reflection and conceptual understanding stages. Factors that influence student abilities include learning motivation, understanding of basic concepts, and variations in teacher teaching strategies. This study contributes to the development of learning that emphasizes contextual understanding to improve students' mathematical modeling abilities.*

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Penelitian ini bertujuan untuk mengidentifikasi kemampuan dan kesulitan siswa pada tingkat SMP dalam menerjemahkan soal cerita ke dalam model matematika pada materi perbandingan. Kemampuan memodelkan masalah kontekstual merupakan kompetensi dasar yang kenyataannya banyak siswa yang masih mengalami hambatan dalam proses matematis tersebut. Pendekatan yang digunakan adalah kualitatif deskriptif dengan melibatkan tiga siswa kelas VIII yang mewakili tingkat kemampuan tinggi, sedang, dan rendah. Melalui instrumen 2 soal cerita materi rasio dan proporsi, dapat dianalisis hasil tes dan wawancara, ditemukan bahwa perbedaan kemampuan siswa terletak pada ketepatan memahami konteks soal, memilih strategi pemecahan, dan menafsirkan hasil. Siswa berkemampuan tinggi mampu membangun model matematika dengan baik, sedangkan siswa berkemampuan sedang dan rendah masih mengalami kendala pada tahap refleksi dan pemahaman konsep. Faktor yang memengaruhi kemampuan siswa mencakup motivasi belajar, pemahaman konsep dasar, serta variasi strategi mengajar guru. Penelitian ini memberikan kontribusi dalam pengembangan pembelajaran yang menekankan pemahaman kontekstual untuk meningkatkan kemampuan pemodelan matematis siswa.

***How to cite:***

Pebriyanti, T. P., & Suhesti, S. (2025). Mathematical modelling ability of junior high school students in solving ratio and proportion word problems. *JPMI – Jurnal Pembelajaran Matematika Inovatif, 8*(6), 843-854.

## INTRODUCTION

Introduction Mathematics learning at the Junior High School (SMP) level has an important role in forming logical, analytical, and systematic thinking skills in students. (Islamiati & Putra, 2025). Mathematical modeling problems generally take the form of story problems. Students' errors in solving story problems are generally caused by errors in constructing mathematical models. Different student characteristics often lead to different types of errors. Zulfah et al., (2019) Word problems are a type of math problem that incorporates reading, reasoning, analysis, and problem-solving skills. Therefore, students need to be challenged to master these skills in solving math word problems.

Mathematical story problems play a very important role in students' daily lives, because these problems prioritize real problems that are relevant to everyday life. This is reinforced by the latest findings Rezky et al., (2022) which states that students accustomed to being confronted with contextual problems are able to build relationships between mathematical representations and reality in a more critical and meaningful way. However, many teachers complain about students' poor ability to solve word problems. This is evident in the many errors students make when solving word problems, resulting in low math achievement. One reason students are unable to solve word problems is that they do not yet understand what is known and what is being asked in the problem. According to Musyarofah et al., (2025) Lack of skills in verifying models is also the main cause of students failing to solve story problems.

The difficulties students experience in solving mathematical word problems have been the focus of various educational studies. Unlike direct calculation problems, word problems often cause confusion in students in determining important information, formulating problems, and choosing the correct mathematical operations. This shows that the problems faced by students are not only limited to a lack of mastery of formulas, but also include more complex aspects of understanding. Yola Putri Anggraini, (2020). A similar situation was also found at MTS SA Mambaul'Ulum, where teachers observed that most eighth-grade students struggled with solving word problems, both in daily exams and practice sessions. Although students performed well on multiple-choice and fill-in-the-blank questions, their ability to solve word problems remained low, with scores not yet satisfactory. This situation is important to note because word problems represent the application of mathematical concepts in real-life contexts.

Previous research has shown that junior high school students' ability to transform story problems into mathematical models is still relatively low. This is in line with research by Amelia Listri, (2025) which revealed that students often experience confusion in determining the correct arithmetic operations and some of them have not yet mastered the basic concepts of arithmetic operations. Many students tend to answer by simply replacing the numbers in the questions using the teacher's example answers without truly understanding the context of the problem. Furthermore, students take a long time to solve word problems and often fail to double-check their answers. This condition occurs due to a low ability to understand the content of the questions and a lack of practice with word problems. Likewise the research results Panjaitan et al., (2022) that the difficulties experienced by students in solving story problems include several aspects, namely: (1) Inadequate understanding of concepts can result in students experiencing difficulties in identifying information that is known and that is asked in the problem (2) Inability to build a mathematical model of the problem arises because students do not yet understand how to change the form of the problem into a mathematical representation (3) Low ability to remember formulas causes students to have difficulty in determining and applying the appropriate formula to solve the problem (4) Lack of accuracy when solving problems causes students to experience obstacles in interpreting the results obtained. Previous

research has also discussed junior high school students' mathematical modeling abilities in various mathematical topics, such as that conducted by (Aspia et al., 2025), who analyzed students' modeling abilities in the Set topic and found students had difficulties at the modeling stage. However, this study still analyzed students' abilities in general without categorizing them based on specific ability levels.

Previous studies have focused more on modeling skills in general or based on student ability categories, but not many have focused on analyzing students' abilities in translating word problems into mathematical models in Ratio and Proportion material in depth. Therefore, this study is expected to fill this gap by examining errors, causal factors, and student abilities based on high, medium, and low ability levels. This study differs from previous studies because it focuses on analyzing students' thought processes in creating mathematical models in the context of Ratio and Proportion problems, not just the final answers. Furthermore, this study combines data from essay tests and interviews to obtain a comprehensive picture of students' modeling abilities, including strategies, errors, and reflections on thinking. Thus, this study provides a new perspective in examining mathematical modeling abilities in junior high school students.

There are various factors both internal and external to students that can contribute to difficulties in learning mathematics. Internal factors include the level of intellectual intelligence (IQ), individual attitudes and behavior, low learning motivation, unhealthy physical conditions, and limited student perception abilities. Meanwhile, external factors include the lack of variety in teaching methods used by teachers, suboptimal use of teaching aids, limited school facilities and infrastructure, and the influence of the student's environment. Therefore, based on this background, it is necessary to conduct research that examines in depth the difficulties experienced by eighth grade students at MTs SA Mambaul' Ulum in solving mathematical story problems on the topic of Ratio and Proportion. The results of this study are expected to contribute to improving learning strategies, increasing teacher competence, and developing teaching materials that are more contextual and student-friendly.

## METHOD

This study uses a descriptive qualitative approach, which aims to understand and analyze students' mathematical modeling abilities in solving contextual mathematics problems. This study is to analyze the ability to ratio and proportion word problems into mathematical models and their solutions. The subjects of this study were 3 students of grade VII of junior high schools in Cianjur, West Java consisting of students with high, medium, and low abilities to analyze the ability to ratio and proportion word problems into mathematical models and their solutions. The selection of subjects was based on variations in mathematical abilities to provide a more comprehensive picture and the results of teacher considerations. Data collection techniques used in this study were conducting an introduction, compiling test questions in the form of descriptions, consulting with the supervising lecturer regarding test questions, collecting data and making conclusions. The preliminary activity began with determining the location of the school to be studied, asking permission from the school, conveying the research objectives to the school's mathematics teacher, and determining the research subjects.

Students' ability to create mathematical models to solve contextual mathematical problems was researched and observed naturally according to actual conditions through written tests and interviews. The instruments in this study were two descriptive questions designed to measure students' ability to form mathematical models from contextual problems. In addition, semi-structured interviews were used to delve deeper into students' thought processes when solving

problems. The test results were used to see students' mathematical modeling abilities, while interviews were used to determine students' reasons and ways of thinking in forming mathematical models. The data obtained were collected, summarized, and analyzed qualitatively to produce meaningful information. To increase the validity of the data, triangulation was used, namely comparing the results of interviews between students, teachers, and the results of the researcher's observations to ensure the data obtained.

## RESULTS AND DISCUSSION

### Results

This research was conducted at MTS SA Mambaul'Ulum. The subjects of this research were grade VIII with 3 students and 1 mathematics teacher. This research analyzed the ability of junior high school students in translating story problems into mathematical models on the subject of Ratio and Proportion. The research data were obtained from interviews and prepared instruments. The steps in this research were: (1) Giving a test in the form of 2 essay questions to students to measure mathematical modeling abilities; (2) Analyzing the results of students' work from the test; (3) Conducting interviews based on the results of students' work; and (4) Analyzing data from the results of the mathematical modeling ability test and the interviews that had been conducted. Through these two questions, researchers can assess the extent to which students are able to understand the context of the story, extract important information, and construct appropriate mathematical models. In addition, researchers can also identify the types of errors made by students and the factors that cause difficulties in the modeling process, such as limited conceptual understanding, inappropriate solution strategies, or obstacles in interpreting the language of the questions.

**Table 1**. Students' Mathematical Modelling Ability

| Student | Problem | Mathematical Modelling Ability | Identified Difficulties |
|---|---|---|---|
| S1 (High) | Problem 1 | Correctly formulated mathematical equations and calculated percentage increases. | Units (Rp) were not included in the calculations. |
| S1 (High) | Problem 2 | Correctly modelled ingredient requirements and determined maximum production. | Units (grams and eggs) were not consistently specified. |
| S2 (Moderate) | Problem 1 | Correctly calculated the percentage increases for both fruits. | Misinterpreted the results when drawing the conclusion. |
| S2 (Moderate) | Problem 2 | Correctly determined that 10 boxes of cakes could be produced. | Did not clearly explain the comparisons between ingredient requirements and availability. |
| S3 (Low) | Problem 1 | Correctly applied the percentage increase formula to soursop prices. | Did not complete the calculation for mangosteen and struggled to continue independently. |
| S3 (Low) | Problem 2 | Did not provide an answer. | Modelling ability could not be assessed due to the absence of a response. |

Based on an analysis of the three research subjects, it was found that the types of errors students make when translating word problems into mathematical models vary according to their individual ability levels. Subject S1 demonstrated a strong ability to understand the context of the problems and construct mathematical models, though they occasionally failed to include the appropriate units. Subject S2 was able to perform calculations correctly but struggled with interpreting the results and drawing conclusions, and also failed to provide a detailed breakdown of the solution process. Meanwhile, Subject S3 experienced difficulties throughout the entire process—from understanding the intent of the problems and identifying relationships between quantities to constructing and solving the mathematical models. These findings indicate that errors in mathematical modeling are not limited to calculation accuracy; they also encompass the understanding of context, the translation of information into mathematical form, the presentation of the solution process, and the interpretation of results. Therefore, instruction should focus on each stage of the mathematical modeling process, ensuring that students are not only able to arrive at an answer but also understand the underlying mathematical reasoning and the process used to reach that solution.

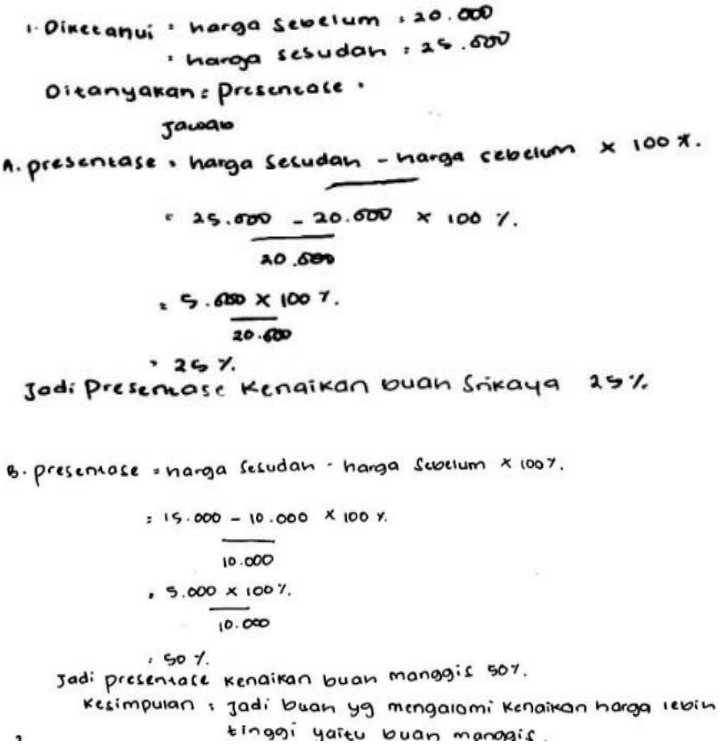
## Discussion

Based on the research results, the mathematical modeling abilities of eighth-grade students in solving word problems related to the topic of ratios vary according to each student's proficiency level. This variation is evident in their capacity to comprehend information provided in the problems, formulate mathematical models, perform calculations, and draw conclusions based on the results obtained. These findings indicate that success in solving word problems depends not only on the accuracy of calculations but also on a student's ability to connect contextual information with mathematical concepts. Consequently, the following discussion focuses on an analysis of the mathematical modeling abilities of students with high (S1), medium (S2), and low (S3) proficiency levels, while also relating these findings to relevant prior research.

To understand the variation in students' mathematical modeling abilities in solving word problems on ration and proportion topics, this study used a descriptive qualitative approach involving three junior high school students who were selected purposively. The three subjects each represented 6 categories of high (S1), medium (S2), and low (S3) ability based on the results of the initial assessment. The selection of subjects was carried out carefully to ensure that they reflected the diverse mathematical modeling abilities in the class, so that they could be analyzed in depth and provide a representative picture. Each subject was analyzed based on the results of working on two essay problems based on real contexts, which were designed to assess students' abilities in understanding, modeling, and solving mathematical problems on ratio and proportion word problems topics.

The first question discusses calculating the percentage increase in price using the example of purchasing fruit, while the second question relates to the Ratio and Proportion of ingredients in a cake-making activity. To understand the students' thinking more deeply, the researchers also conducted semi-structured interviews after the students completed the written test. These interviews were conducted to determine the strategies used by students in solving the questions, the errors that occurred, and the reasons behind their answers. By combining data from the written test results and interviews, the analysis focused on several important aspects: how students understood the information in the questions, transformed it into a mathematical model, selected and implemented a solution strategy, and presented their answers mathematically and logically. By comparing the three research subjects, it is hoped that differences in the thinking patterns and types of difficulties experienced by students at different ability levels can be identified. The results of this study are expected to serve as a basis for designing learning

strategies that are appropriate to students' needs, particularly to improve mathematical modeling skills in solving story problems related to everyday life.




**English Version**

1.Known : initial price : 20.000
Final Price : 25.000
Asked : Percentage
Answer

A. Percentage $= \frac{\text{Final price} - \text{Initial price}}{\text{Initial price}} \times 100\%$

$= \frac{25{,}000 - 20{,}000}{20{,}000} \times 100\%$

$= \frac{5{,}000}{20{,}000} \times 100\%$

$= 25\%$

Result: The percentage increase in the price of sugar apple is 25%

B. Mangosteen (Manggis)

Percentage& $= \frac{\text{Final Price} - \text{Initial Price}}{\text{Initial Price}} \times 100\%$

$= \frac{15{,}000 - 10{,}000}{10{,}000} \times 100\%$

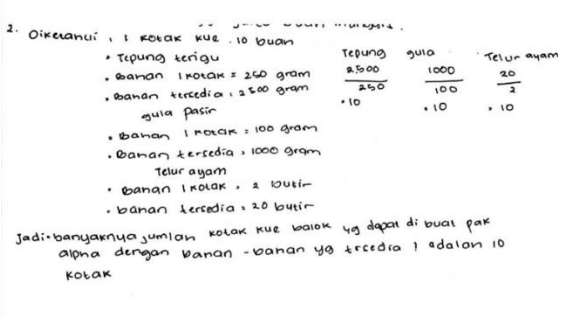
$= \frac{5{,}000}{10{,}000} \times 100\%$

$= 50\%$

Result: The percentage increase in the price of mangosteen is 50%.
Conclusion: Therefore, the fruit with the higher price increase is the mangosteen.

**Figure 1.** Answer Number 1 Subject S1

Based on observations of the answers of students with a high ability level (S1), on question number 1, the students demonstrated good ability in converting verbal problems into mathematical forms that can be calculated. This is in line with what Syabillah et al. (2024) which states that story problems can be solved if students have mathematical modeling skills including understanding verbal context and can translate information into mathematical symbols so that they are able to find the right solution. This is clearly seen in this student's ability to translate the narrative of the story problem about the price of fruit (dragon fruit and mangosteen) into a mathematical equation. The use of formulas has been done correctly to calculate the percentage increase in price, as well as his success in performing rasio and proportion calculations, strong conceptual understanding and effective application skills. However, to improve the clarity and completeness of mathematical communication, it would be better if students include units such as (Rp) in each step of their calculations.




**English version :**

Given : 1 box of cakes contains 10 pieces Flour Sugar Chicken eggs

- Wheat flour $\frac{2500}{250} = 10$ $\frac{1000}{100} = 10$ $\frac{20}{2} = 10$
  - Amount per box = 250 grams
  - Available amount = 2500 grams
- Granulated sugar
  - Amount per box = 100 grams
  - Available amount = 1000 grams
- Chicken eggs
  - Amount per box = 2 eggs
  - Available amount = 2 eggs

Therefore, the number of boxes of cakes that Mr.Alpha can make with the available ingredients is 10 boxes

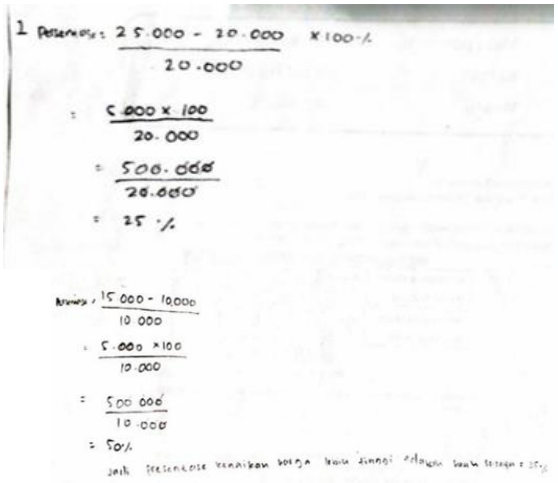
**Figure 2.** Answer Number 2 Subject S1

Similarly, in problem number 2, the students' mathematical modeling was very good. They successfully translated the story problem about cake ingredients into a systematic mathematical model, neatly separating the data on the ingredient requirements per unit of cake and the total availability of ingredients. Using the correct formula to determine the maximum number of cakes that can be made based on the limited ingredients demonstrated excellent reasoning skills. However, similar to the first problem, adding units (grams, grains) in each calculation would have been very helpful in clarifying the context of each number used, thus simplifying the solution process.

Researcher : "Did you have any difficulty with this problem?"
S1 : "A little, ma'am. I had a little trouble calculating percentages in division, because it was quite time-consuming. But I understand the problem and it's very understandable."

From the interview results, this student has a quick understanding and can immediately understand what is meant by the story problem and knows how to solve it. This demonstrates the ability to interpret the problem and efficient problem-solving strategies. However, the student still experiences difficulty in division operations, especially when calculating percentages, which sometimes takes longer to complete. This is in line with what was stated by Ermawati et al. (2024) who stated that solving division-based story problems generally takes students longer. This demonstrates that even though students possess a strong conceptual understanding and strong modeling skills, basic calculation remains a challenge that needs to be honed to improve efficiency and speed in problem-solving.

In high-ability students (S1), it was apparent that they were able to grasp the essential content of the story problems very well and were able to translate them into the correct mathematical form. S1 was able to use the percentage Ratio and Proportion formula correctly and demonstrated logical and structured thinking. Furthermore, students were able to connect the situation in the problem with the appropriate solution steps. This indicates that high-ability students already have a good conceptual understanding and are able to apply mathematical procedures correctly. However, minor shortcomings were still found in how they presented their answers, such as not writing units at some stages of the calculation. These errors indicate that although students' conceptual understanding is strong, the accuracy and completeness of their mathematical answers still need to be improved. This is in line with the opinion of Khusna & Ulfah, (2021) which states that students with high abilities are often still lacking in the aspect of communicating the results of mathematical modeling explicitly.



$$\text{Persentase} = \frac{25.000-20.000}{20.000} \times 100\%$$

$$= \frac{5.000 \times 100}{20.000}$$

$$= \frac{500.000}{20.000}$$

$$= 25\%$$

$$\text{Persentase} = \frac{15.000-10.000}{10.000} \times 100\%$$

$$= \frac{5.000 \times 100}{10.000}$$

$$= \frac{500.000}{10.000}$$

$$= 50\%$$

**Figure 3.** Answer Number 1 Subject S2

In contrast to the previous students, students with moderate abilities (S2) after being observed showed basic skills in understanding and processing information from story problems into appropriate mathematical models. In the first problem about the percentage increase in fruit prices, students applied the percentage formula correctly and obtained the correct results: 25% for mangosteen and 50% for soursop. However, students incorrectly concluded that mangosteen experienced a higher increase, indicating that their ability to interpret the results is still relatively low. This is in line with Fajri et al., (2022) which states that students often experience misconceptions not at the calculation stage, but in the final interpretation of the results of mathematical modeling.

*Researcher : "Did you encounter any difficulties when working on this problem?"*
*S2 : "Not bad, ma'am. I understand the problem's purpose, but when I tried to write it down, I felt confused."*
*Researcher : "Where were you confused?"*
*S2 : "When I was writing down the solution, ma'am."*

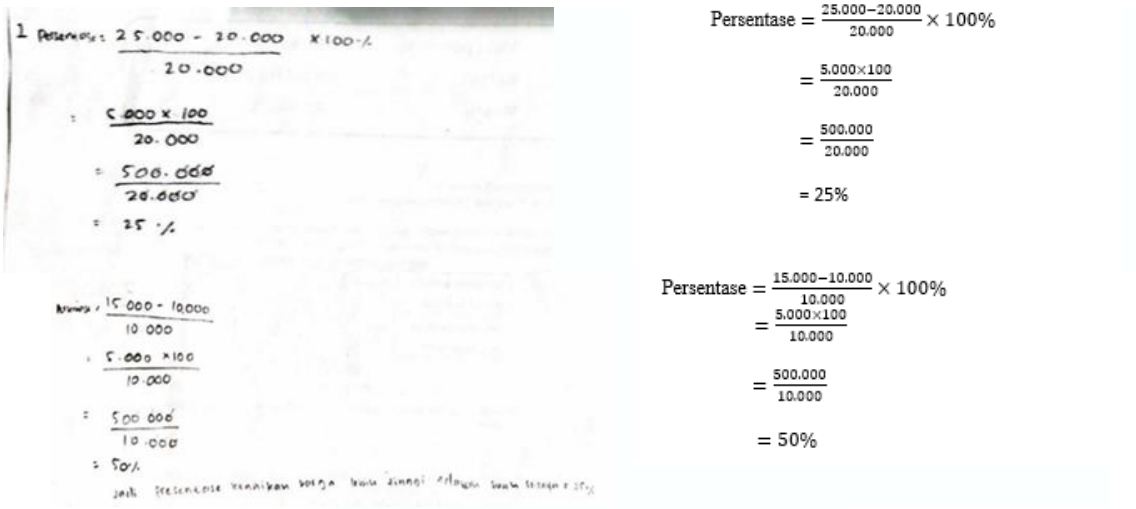
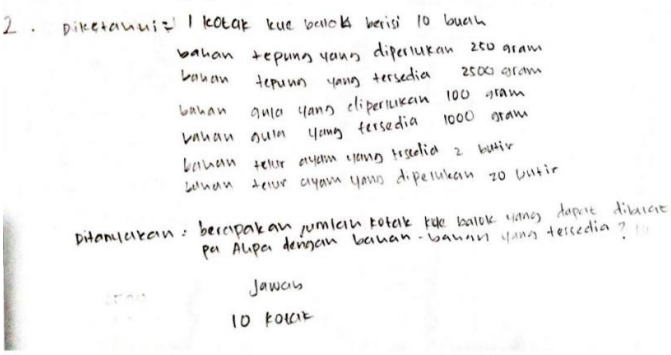



**Figure 4.** Answer Number 1 Subject S2

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*Researcher : "Did you encounter any difficulties when working on this problem?"*
*S2 : "Not bad, ma'am. I understand the problem's purpose, but when I tried to write it down, I felt confused."*
*Researcher : "Where were you confused?"*
*S2 : "When I was writing down the solution, ma'am."*



**English version :**
Given : 1 box of cakes contains 10 pieces
Flour required 250 grams
Flour available 2500 grams
Sugar required 100 grams
Sugar available 1000 grams
Eggs required 20
Eggs available 2
Question : How many boxes of cakes can Mr.Alpha make with the available ingredients?
Answer : 10 boxes

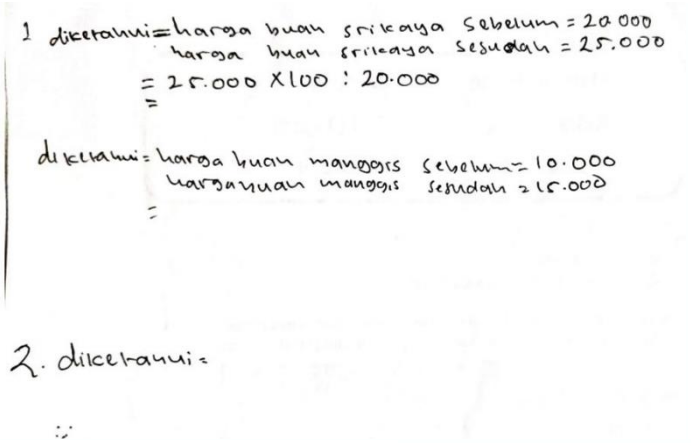
**Figure 5.** Answer Number 2 Subject S2

In the interview, the student was able to explain the process correctly, but his reflection on the conclusion did not align with the calculation results. This reflective ability is a crucial aspect of contextual mathematical problem-solving. according to Tunu et al., (2022), Students' reflective abilities in the context of realistic mathematics are closely related to their ability to draw conclusions from the results of the mathematical models they have created. In the second problem concerning cake-making ingredients, the student demonstrated a fairly good ability to simplify the data and calculate the maximum production limit. He concluded that all the ingredients were sufficient to make 10 boxes of cake, although the Ratio and Proportion process for each ingredient was not explained in detail. (Riduan et al., 2024) stated that creating mathematical models can increase students' interest in understanding the problems presented. Furthermore, modeling skills encompass not only the calculation process but also the ability to communicate the model comprehensively in written form. The weaknesses of postgraduate students in this aspect indicate the need to strengthen mathematical communication. Although the final result is correct, students have not yet fully developed written mathematical arguments explaining the decision-making process based on material constraints.

According to Fitriya & Kurniawan, (2024) In good mathematical modeling, the ability to convey reasons or justification for the chosen solution is crucial for assessing the depth of conceptual understanding. Furthermore, this student was not yet able to fully manage the evaluation stages of the mathematical model that had been created. In best practices in mathematical modeling, students are expected not only to calculate and solve, but also to evaluate and relate the results to the initial context. This is in line with the opinion Aulia, (2020) which states that the contextual learning model requires students to think reflectively and critically about real contexts.

The conclusion of this analysis is that students with average abilities can go through the initial stages of modeling (understanding the problem, designing the model), but often fail at the final stages (interpreting the results and drawing conclusions). This is in accordance with a study by (Muslim et al., 2025) which states that mathematical modeling will not be effective without explicit training in the aspects of result analysis and reflection. Therefore, a learning strategy is needed that not only emphasizes proceduralism, but also develops students' reflective and evaluative thinking skills. This is reinforced by recent findings from Rezky et al., (2022), which states that students who are accustomed to being faced with contextual problems are able to build relationships between mathematical representations and reality in a more critical and meaningful way. In the second problem, the S2 students also showed quite good abilities in calculating the maximum limit of ingredients for making a cake, but were not yet able to explain the mathematical reasons underlying the steps for solving it. This condition indicates the weakness of students' mathematical communication and argumentation skills because most

students had difficulty in describing the steps for solving, were less precise in using symbols or notations and were not coherent in drawing conclusions from the results (Miftha et al., 2025). Therefore, learning is needed that can train students to explain their thinking processes and write logical reasons for the solutions they obtain.




**English version :**

1. Given : Price of sugar apple before = 20.000
   Price of sugar apple after = 25.000
   = 25.000 x 100 : 20.000
   =
   Given : Price of mangosteen before = 10.000
   Price of mangosteen after = 15.000
2. Given :

**Figure 6. Answer 1 Subject S3**

In contrast to the previous students, students with low ability (S3) showed quite different conditions. In question number 1, the results of observations showed that students actually understood the basic concept of calculating the percentage price increase. This is evident from the initial steps carried out correctly, namely calculating the price difference of the soursop fruit, then dividing it by the initial price and multiplying it by 100. However, students only completed the calculation for the soursop fruit and did not continue the calculation for the mangosteen fruit. Based on the results of the interview, students admitted to experiencing confusion in applying the same calculation steps to the next data, even though the initial method used was correct. Furthermore, students also appeared to lack confidence in continuing the calculation process independently after completing one part of the problem.

*Researcher : "Are you having difficulty with this problem?"*
*S3 : "Yes, ma'am."*
*Researcher : "Where are you having difficulty?"*
*S3 : "I don't understand what the problem means. I'm confused about how to write it, ma'am, because I really don't understand it."*

Based on observations of students' answers to question 2, it appears that students have experienced difficulties from the initial stage, namely in understanding the purpose of the question. This is evident from the students' answers, which only wrote the "Known" section without continuing to the next calculation step. From the results of the interviews, students revealed that they did not understand the meaning of "number of blocks of cake boxes that can be made" and did not know how to use the data presented in the table. Students were not yet able to understand the ratio and proportion relationship between the number of ingredients available and the material requirements to make one block of cake box. Furthermore, students also appeared to be unfamiliar with working on story problems that involve data tables and relationships between variables. This is indicated by the lack of effort to record, process, or calculate the numbers contained in the table. This finding is consistent with Wardani et al. (2024), who found that students experienced difficulties in formulating, applying, and interpreting mathematical concepts when solving ratio and proportion problems in contextual situations. Students tended to simply read the questions without trying to interpret what was

actually asked. This condition indicates that students still have weaknesses in understanding the basic concept of Ratio and Proportion and in solving contextual problems.

Based on the results of research involving three eighth grade students with high (S1), medium (S2), and low (S3) ability levels, it was found that students' ability to change story problems into mathematical models on Ratio and Proportion material was greatly influenced by conceptual understanding, logical thinking skills, and skills in recognizing important information in the problem. The results of the analysis showed that each category of student ability had different characteristics and obstacles at each stage of mathematical modeling, starting from understanding the problem, compiling a mathematical model, solving the model, to interpreting the results obtained.

## CONCLUSION

The results of this study indicate that students' abilities in transforming word problems into mathematical models on the topic of Ratio and Proportion vary. Students with high ability generally understand the problem content and construct mathematical models correctly, although they are less careful in writing units or final results. Students with average ability are able to perform calculations correctly, but often make errors when interpreting their results. Meanwhile, students with low ability still struggle to understand the meaning of the problem and determine appropriate solution steps. This situation is influenced by internal factors, such as low learning motivation and an indefinite conceptual understanding, as well as external factors, such as the use of conventional learning methods and a lack of variety in learning media. This finding is crucial in education because it demonstrates that student barriers are not only limited to numeracy skills, but also vary across cognitive processes depending on their level. Therefore, learning that relates material to real-world contexts and actively engages students can be an alternative to help students better understand word problems and construct mathematical models more accurately. Furthermore, mathematics teaching cannot be generalized; a more specific approach is needed. Innovative learning models, such as those supported by learning media, can be applied to reduce reliance on conventional methods. Using real-world contexts close to students' everyday lives can also be used to strengthen verbal language and mathematical symbols. However, this study is limited by the number of subjects, which involved only a few students, and the limited scope of material limited to Ratio and Proportions. Future research is expected to expand the research subjects and explore other mathematical materials to provide a broader picture of the challenges of students' mathematical modeling.

## ACKNOWLEDGEMENT

We would like to express our gratitude to the many parties who provided assistance in the preparation of this research report. We also extend our gratitude to the leadership of IKIP Siliwangi, our supervising lecturers, and MTS SA Mambaul'Ulum for providing the opportunity and facilities to the researchers during their research.

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