Primary students' ability to convert verbal expressions into mathematical models in fraction materials

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Abstract

This research aimed to describe the patterns of errors and the forms of scaffolding needed by students to convert verbal expressions into mathematical models in fraction material. This research used a descriptive qualitative method. The research involved 4th-grade students from a selected elementary school in Cirebon City. Data were collected through tests and interviews. The instruments used were a written mathematical representation ability test and an interview question guide. The data analysis techniques employed included data reduction, data presentation, and conclusion drawing. The results showed that high-ability students effectively recognize numerators, denominators, and problem contexts, enabling accurate translation of verbal expressions into a mathematical model. Medium-ability students were able to answer most questions but still struggled to distinguish between numerators and denominators. On the other hand, low-ability students often had difficulty understanding verbal questions, which led to errors in writing fractions.

Keywords

Fractions, mathematical models, student ability, verbal expression

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Introduction

The ability to convert verbal expressions into mathematical models is an essential mathematical skill, as it helps students understand and solve problems more effectively. This ability is also helpful in students' daily lives, such as sharing a cake with friends, counting the number of pencils they own, or interpreting word problems in lessons. Representational ability plays a significant role for students, enabling them to solve mathematical problems more easily (Hendriana et al., 2018). Many mathematical problems are presented as stories or verbal descriptions that require interpretation before being translated into mathematical models that can be analyzed. This process begins with verbal representation as an initial step in understanding concepts, facilitating logical and systematic problem-solving. Representation is a key aspect of mathematics learning (Astuti & Siroj, 2017), allowing students to express their thoughts and feelings (Beetlestone, 2012), as well as convey mathematical ideas in the form of models or symbols to solve problems (Fadillah, 2012). Representation supports understanding abstract concepts and problem-solving with indicators of ability, including written words or texts (verbal), visual representations, and mathematical equations or expressions (Farhan & Retnawati, 2014). This process involves converting various forms of notations, symbols, tables, pictures, graphs, diagrams, or equations into other appropriate forms (Lestari & Yudhanegara, 2024).

Mathematical representation ability encompasses visual, verbal, and mathematical expression aspects that complement each other, with this research focusing primarily on verbal representation. Verbal representation or expression involves students' ability to understand and respond to problems presented through word problems, written text, or oral communication (Villegas et al., 2009). Anwar and Rahmawati (2017) further explained that verbal representation includes students' ability to formulate problem situations based on given data or other forms of representation. In addition, verbal representation also involves skills such as answering questions using words or text, describing problem-solving steps verbally, constructing stories that match a given representation, and interpreting representations presented in written form. In general, verbal representation is a way for students to comprehend and articulate a problem, serving as a tool for finding solutions (Sabirin, 2014). Therefore, verbal representation ability is essential in answering word problems, organizing mathematical thinking systematically, and communicating solutions clearly in written and oral forms.

Verbal representation plays a crucial role in fraction learning, particularly for 4th-grade students encountering more complex fraction concepts that require comprehension of story problems for accurate mathematical translation. However, due to its abstract nature, this often becomes a barrier for students, especially in simplifying fractions, distinguishing between numerators and denominators, and relating fractions to real-life contexts. According to Brata et al. (2023), many students struggle to understand fraction concepts due to a lack of careful reading and limited comprehension of the material, which affects their ability to solve problems based on verbal representation. Similar findings were reported by Yulianti and Wardana (2024), who noted that students had difficulty applying fraction concepts, such as distinguishing between numerators and denominators and using fraction formulas correctly.

Furthermore, Amir and Andong (2022) demonstrated that students encountered difficulties understanding fraction concepts, particularly in fraction division, simplification, and comparison. These difficulties were attributed to a lack of practice and weak foundational understanding. These findings indicate that understanding fraction concepts—especially in the context of word problems, remains a significant challenge for students. Therefore, instructional strategies that strengthen verbal representation skills are necessary to support more profound and contextual mastery of fraction concepts.

Several studies have shown that students' verbal representation skills remain underdeveloped. Zubaidah et al. (2023) stated that this is due to the limited opportunities students have to create their representations, as they often imitate examples provided by the teacher. Handayani (2015) added that representations such as tables and images are frequently used merely as supplementary materials, without attention to students' development of their representations. Syifa et al. (2022) revealed that students' verbal representation abilities still need improvement, particularly in expressing ideas systematically and logically. Sunanti et al. (2022) also showed that high-ability students could use all three types of representation, while students with medium and low abilities encountered difficulties, specifically in verbal representation. There is still a lack of research that explores error patterns and the application of scaffolding in converting verbal expressions into mathematical models. Studies focusing on verbal representation remain very limited.

Therefore, the research aims to describe the error patterns and types of scaffolding needed by students in the process of converting verbal expressions into mathematical models, with a specific focus on verbal representation. The uniqueness of this research lies in its specific focus on identifying error patterns and designing appropriate scaffolding strategies in translating verbal expressions into mathematical models. The contribution of this research is expected to provide an empirical foundation for developing more targeted instructional interventions, particularly in enhancing students' verbal representation skills in understanding mathematical concepts.

Methodology

Research design, site, and participants

This research employed a descriptive qualitative approach to describe the error patterns and types of scaffolding required for students to convert verbal expressions into mathematical models in the context of fraction material. The research employs a descriptive design. Hall and Liebenberg (2024) explained that a qualitative descriptive approach seeks to provide a direct summary of events as they occur, without complex interpretation. The study involved 4th-grade students from a selected elementary school in Cirebon City. The selected subjects consisted of three students representing high, medium, and low levels of mathematical ability. The research subjects were selected through several systematic stages, beginning with a preliminary test. The details of this selection process are presented in Figure 1.

Figure 1. *Selection of research subjects*

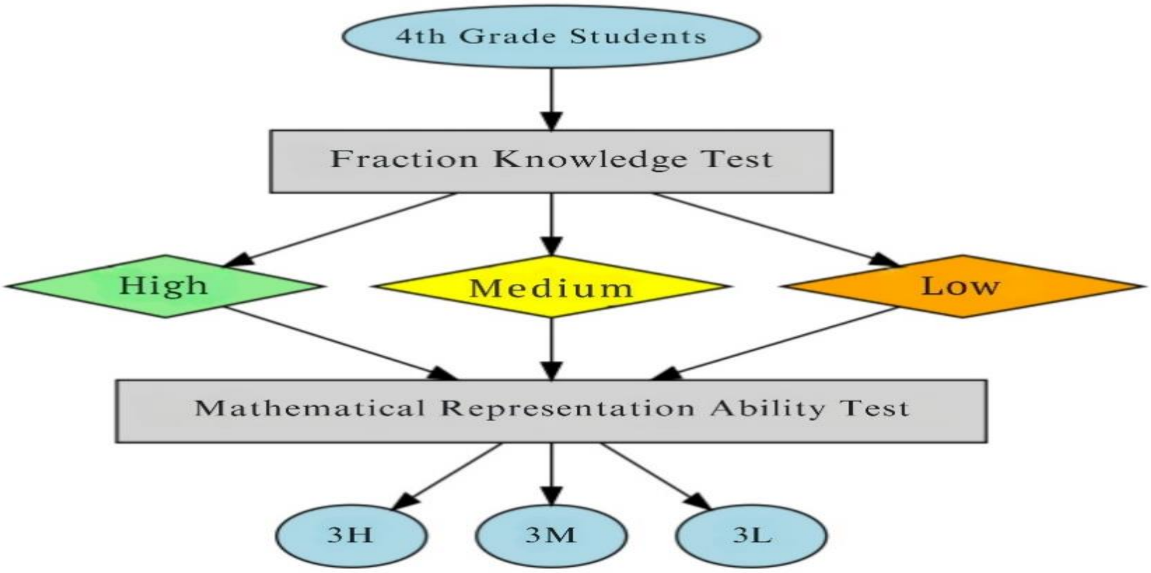


Figure 1 illustrates that fourth-grade students first took a fraction test to assess their understanding. They were then grouped into three categories: high, medium, and low. Subsequently, all students completed a mathematical representation skills test to evaluate how they translated fraction concepts into mathematical models. Based on the results, three students from each category (3H, 3M, 3L) were selected. This process facilitated analyzing the relationship between students' initial understanding of fractions and their ability to represent them mathematically.

Research design

The research employs a descriptive design. Hall and Liebenberg (2024) explained that a qualitative descriptive approach seeks to provide a direct summary of events as they occur, without complex interpretation.

Data collection and analysis

The research instruments included a mathematical representation skills test and an interview guide. The mathematical representation skills test was a written test designed to measure students' ability to convert verbal expressions into mathematical models related to fraction material. Additionally, interviews were conducted to obtain more detailed information regarding students' understanding of fraction concepts as transformed from verbal expressions into mathematical models. This in-depth data analysis refers to the method proposed by Miles and Huberman in (Sugiyono, 2016), which involves three stages of qualitative data analysis: data reduction, data display, and conclusion drawing (verification). This analytical process is schematically illustrated in Figure 2 below.

Figure 2. *Miles and Huberman's data analysis techniques*

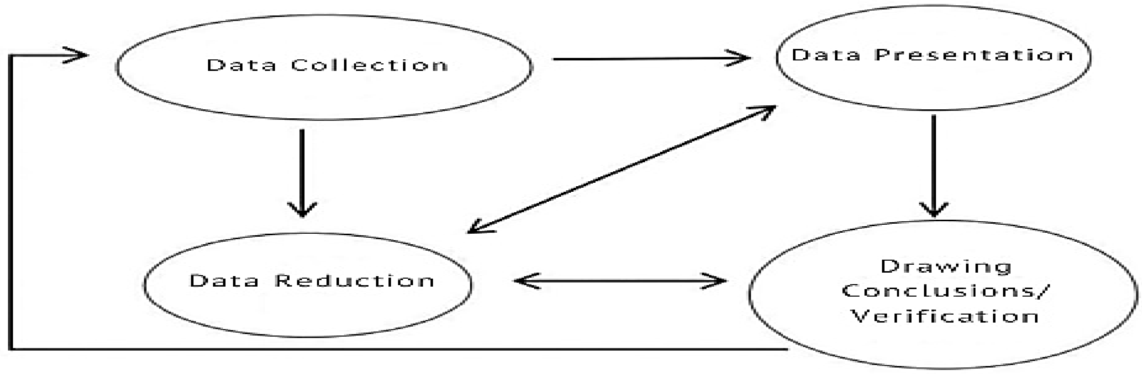


Figure 2 illustrates the three main stages of data analysis: data reduction, data display, and conclusion drawing. The first stage, data reduction, aims to summarize, filter, and focus the raw data to identify relevant information. At this stage, written test results are grouped based on student categories (high, medium, low), answers related to verbal representation indicators are marked, and error patterns are analyzed for each ability group. The second stage, data display, involves organizing data into an easily understandable format to support further analysis. Data display consists of setting up tables or charts showing students' test and interview responses, comparing results between different student groups based on verbal representation indicators, and clearly explaning what the data shows. The third stage, conclusion drawing and verification, aims to interpret the processed data to address the research objectives. At this stage, the researcher determines the extent to which students can convert verbal expressions into mathematical models, identifies error patterns and influencing factors, and verifies the findings through triangulation and member checking to ensure the validity of the results.

According to Amzir (2014), strategies to enhance data credibility include prolonged observation, research perseverance, triangulation, and member checking. This research ensures data validity by implementing several steps based on these strategies. First, source triangulation was conducted by analyzing and comparing data obtained from written tests and interviews to validate the consistency of information related to students' verbal representation abilities. Second, method triangulation was applied by using written tests to directly measure students' skills, while interviews were used to explore in-depth information about students' thinking processes and conceptual understanding. Third, member checking was performed by reconfirming students' interview responses to ensure the researcher's interpretations aligned with the students' intended meanings. Finally, the test and interview results were reviewed by mathematics education experts to ensure the relevance and validity of the instruments and analysis used.

Findings

The research results depict students' verbal representation abilities in converting verbal expressions into mathematical models on fraction material. The analysis is based on mathematical representation indicators developed by Suryana (2012) and modified by the researcher to suit the fraction material, which is the focus of this study. The first indicator is answering questions using words. This indicator involves questions posed to students to express their understanding of fraction concepts through verbal descriptions. Students' answers do not necessarily have to include numbers or direct fraction representations but rather focus on how they articulate their ideas or thoughts about fractions.

The second indicator explains the problem and its solution according to the given representation. This indicator includes questions that ask students to connect real-life situations or stories (verbal representations) with mathematical fraction forms. Students must understand the problem's context, analyze the provided information, and solve it using the correct fractional representation. To assess the extent to which students master these two indicators, analyzing their answers to each question can help reveal their understanding of fraction concepts. Below are the questions related to these two indicators. The question is,

> "Do you know what a fraction is? If you do, imagine you currently have 10 pencils, and you give 3 pencils to your younger sibling and 2 pencils to your friend. How would you write the portion of the pencils you gave away as a fraction? After learning about fractions, you are invited to a birthday party. On the table, there are 8 pieces of cake, and 5 pieces have been eaten by the guests. How would you write the portion of the cake that has been eaten as a fraction?"

The following outlines their thinking sequence to understand students' thought processes in solving fraction problems. The diagram below illustrates the steps students take to recognize the problem, comprehend the concept of fractions, and identify the numerator and denominator before writing the fraction correctly. An example of how high-ability students transform verbal expressions into mathematical models is shown in Figure 3.

Figure 3. *Thinking steps of high-ability students*

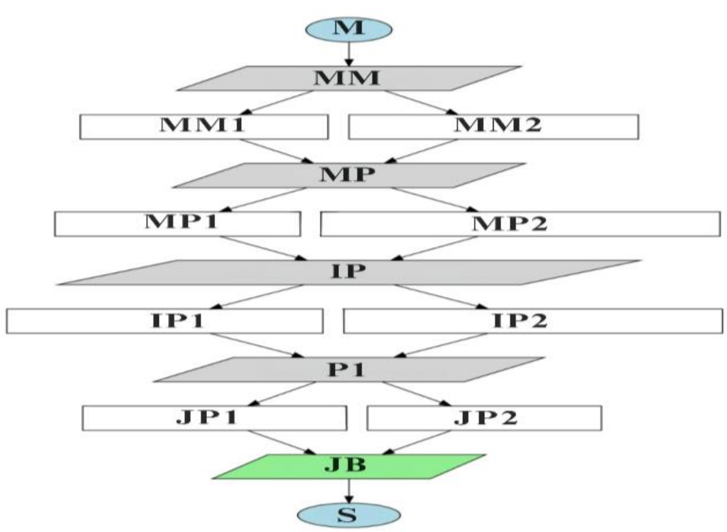


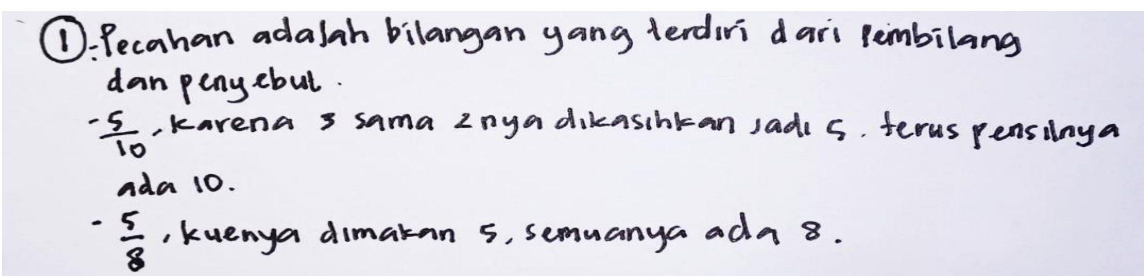
Figure 3 illustrates the thinking steps students take when recognizing the problem, recalling the concept of fractions, identifying the numerator and denominator, and writing the answer in fractional form. This process demonstrates that the students can process information logically and systematically. The following table presents the coding system used to analyze students' thinking processes when converting verbal expressions into fractions to support the thought process analysis.

Table 1. *Code terms in the thinking process of verbal expression ability*

Codes	Descriptions
M	Recognizing the problem.
MM	Reading the question carefully.
MM1	Realizing the problem involves fractions.
MM2	Understanding fractions.
MP	Recalling fraction concepts.
MP1	Connecting the problem to fraction concepts.
MP2	Identifying numerator and denominator.
IP	Determining the total parts (denominator).
IP2	Determining the parts used (numerator).
P1	Converting to fraction.
JP1	Writing 5/8 for the cake.
JP2	Writing 5/10 for the pencils.
JB	Correct answer.
S	Finished.

Based on the thinking process described in Figure 3, the following are the responses given by high-ability students during the test, as presented in Figure 4, along with interview transcripts illustrating their understanding of fraction concepts.

Figure 4. *Responses of high-ability students*



Translate

1. - A fraction is a number consisting of a numerator and a denominator.
   - 5/10 , because 3 and 2 are given so it becomes 5. Then 10 there are to 10 pencils.
   - 5/8 the cake was eaten 5, there were 8 of them all.

In Figure 4, the responses of the high-ability students demonstrate a strong understanding of fractions. The student can explain that a fraction consists of a numerator and a denominator and correctly write fractions corresponding to the questions. In the first problem, the student wrote 5/10, representing the number of pencils given compared to the total amount. For the second problem, the student wrote 5/8, correct, as 5 out of 8 pieces of cake were eaten. Although the explanation has minor inaccuracies, the student clearly understands the basic fraction concepts. Conceptual understanding is related to the thought process and involves perception and reflection to represent a mathematical concept (Sa'adah et al., 2023). The following is the narrative of the interview.

R : Today, we will discuss fractions. You answered the questions correctly. Can you explain, in your own words, what a fraction is?
S : Yes, ma'am. A fraction is a number consisting of a numerator and a denominator. The numerator is the number on top that shows the part we take, while the denominator is the number below that shows the total amount.
R : That's great! Now, regarding the previous question, you had 10 pencils and gave 3 to your younger sibling and 2 to your friends. How would you write the part of the pencils you gave in the form of a fraction?
S : Since I gave 3 pencils to my younger sibling and 2 to my friends, the total given is 5 pencils. So, the fraction is 5/10 because I took 5 out of the total 10 pencils.
R : Very good! Now, about the cake. At the birthday party, there were 8 pieces of cake, and 5 of them were eaten by the guests. How would you write the part of the cake that was eaten?
S : Since 5 out of the total 8 were eaten, the fraction is 5/8.
R : Your answers are excellent! Do you think fractions are important in daily life?
S : Yes, fractions are often used, for example, when sharing food. So, fractions are very useful.
R : Wow, you really understand fractions! Thank you for sharing your explanation.
S : You're welcome, ma'am! I enjoy learning about fractions.

Note:
R: Researcher
S: Student

Based on the interview results, the high-ability student demonstrated a thorough understanding of fractions by explaining that a fraction consists of a numerator, the number on top, and a denominator, the number below, representing the whole. In solving the problems, the student calculated that the total pencils given was 5 out of 10, thus written as 5/10, and understood that the part of the cake eaten was 5 out of 8, written as 5/8. Furthermore, the student recognized that fractions have practical benefits in daily life, such as when sharing food, indicating that they grasp the theoretical concept and its real-life applications. The thinking process of a student with moderate ability in solving fraction problems is illustrated in Figure 5.

Figure 5. *Thinking steps of a student with moderate ability*

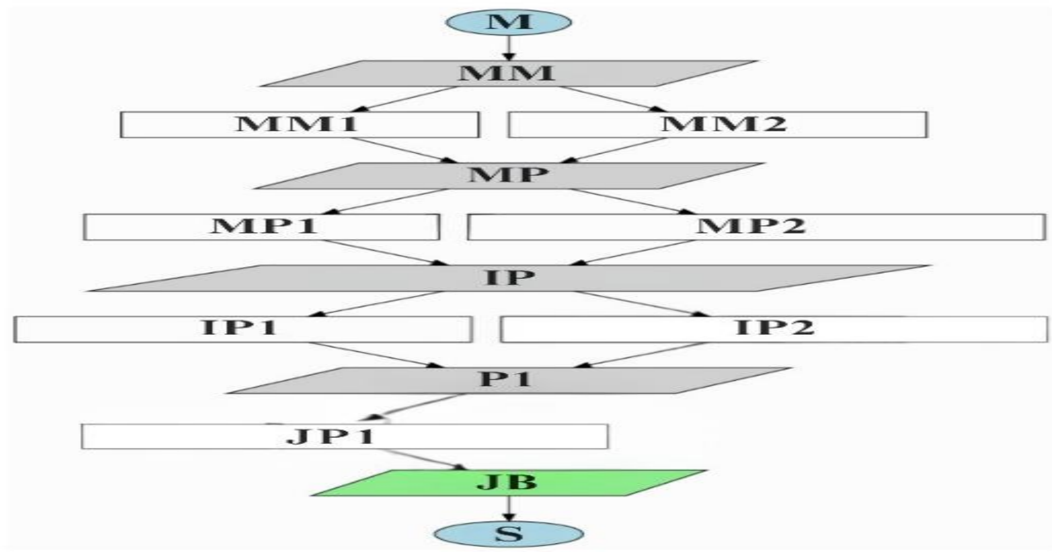
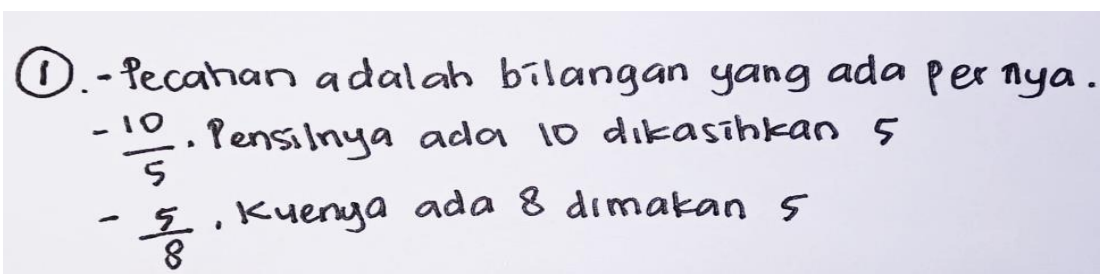


Figure 5 illustrates that although the student can identify the problem situation, they experience difficulties in accurately determining the numerator and denominator. This is evident from the inconsistent sequence of their thinking process when translating the verbal problem into a mathematical model. Based on the thinking process outlined in Figure 5, the following are the answers provided by the student with moderate ability during the test, as shown in Figure 6, along with an interview transcript that illustrates their understanding of fractions.

Figure 6. *Responses of moderate-ability students*



Translate

1. - Fraction are numbers that have parts.
   - 10/5. There are 10 pencils marked 5.
   - 5/8, There were 8 cakes, 5 were eaten.

In Figure 6, the responses of the moderate-ability student demonstrate a decent understanding of fractions, although some errors in fraction notation are still evident. For the first question, the student wrote 10/5 instead of 5/10, indicating a possible misunderstanding of the relationship between the numerator and denominator. However, for the second question, the student correctly wrote 5/8. This minor mistake suggests that the student grasps the concept of fractions but still requires practice in accurately writing them. The following is the narrative of the interview.

R **:** Today we are learning about fractions. Can you explain, in your opinion, what a fraction is?
S **:** A fraction is a number with a slash (/), Ma'am.
R **:** Okay, so you think a fraction is a number that uses the slash symbol (/), right? Can you give an example from the problem?
S **:** Hmm... for the pencils, there are 10 and you gave 5. So, 10 divided by 5.
R **:** Oh, so you think the fraction is 10/5? Let's look at the problem again. You have 10 pencils, then you gave 3 to your little sister and 2 to your friends. How many did you give in total?
S **:** 3 plus 2… so 5.
R **:** Correct! Now, if the total is 10 pencils and you gave 5, how would you write that as a fraction?
S **:** 5/10?
R **:** Yes, that's right! So the correct fraction is 5/10 because you gave 5 out of 10 pencils. Now let's try the other problem. There are 8 pieces of cake at a birthday party, and 5 were eaten. How do you write the part of the cake that was eaten as a fraction?
S **:** 5 over 8.
R **:** Good! Now, do you think fractions are important in daily life?
S **:** Yes, for sharing things, Ma'am.
R **:** Correct! Fractions are often used in daily life, for example when sharing food or other items. Thank you for sharing your experience!
S **:** You're welcome, Ma'am.

Note:
R: Researcher
S: Student

The interview revealed that the student initially miswrote the fraction as 10/5. However, after receiving guidance, the student understood that the correct fraction in the context of the problem is 5/10. This indicates that the student possesses a basic understanding of fractions but still requires direction to apply them to real-life situations. Next, the thinking process of a low-ability student in solving fraction problems is illustrated in Figure 7.

Figure 7. *Thinking steps of a low-ability student*

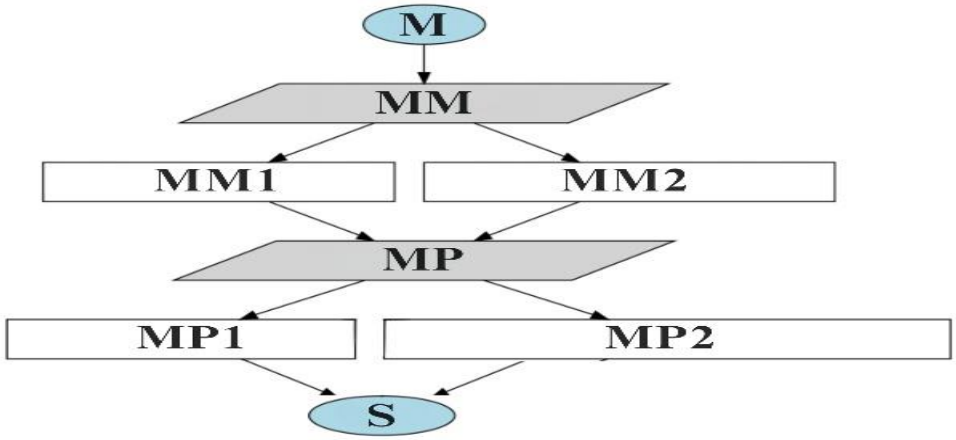
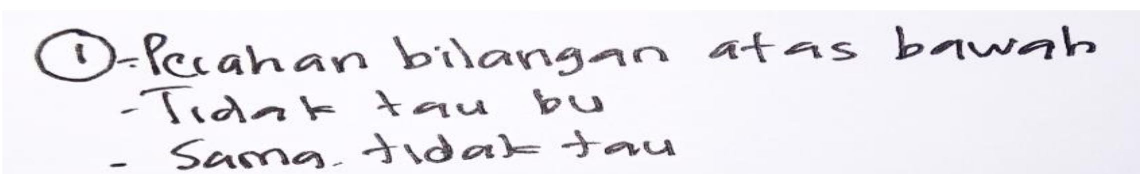


Figure 7 illustrates that low-ability students cannot construct a complete sequence of thought. They can recognize the general characteristics of fractions, but still cannot connect the information from the problem with the correct mathematical concept of fractions. Based on the thinking process outlined in Figure 7, the following is the response provided by the low-ability student during the test, as shown in Figure 8, along with the interview transcript that illustrates their understanding of the concept of fractions.

Figure 8. *Responses of low-ability students*



Translate

1. Fraction of numbers up and down
   - Dont know, Ms
   - I don't know either

In Figure 8, the responses of the low-ability student show only a limited understanding of fraction concepts. The students provided partially correct answers in recognizing fractions, but were not entirely accurate. Their responses, such as "I don't know, Ma'am" and "I don't know either," indicate confusion in solving the problems. This student requires further guidance using a more straightforward approach and concrete examples to understand how to construct fractions from everyday situations. The following is the narrative of the interview.

R : In your opinion, what is a fraction?
S : The one with numbers on top and bottom, Ma'am.
R : Okay. If you have 10 pencils and give 3 to your sister and 2 to your friend, how would you write that as a fraction?
S : (Hesitant) Umm… I don't know, Ma'am.
R : That's okay, let's try it together. How many pencils were given away?
S : 5.
R : Correct! So the fraction is 5/10. Now, if there are 8 slices of cake and 5 are eaten, how would you write that?
S : (Silent) I don't know, Ma'am.
R : The answer is 5/8. Do you think fractions are important?
S : (Nods) Yes, Ma'am.
R : Can you give an example of fractions in everyday life?
S : (Hesitant) Sharing food?
R : That's right! Thank you for trying to answer.
S : You're welcome, Ma'am.

Students with low ability still experience difficulties in understanding fractions and applying them to problems. They recognize the concept of "numbers on the top and bottom," but they cannot determine the fraction correctly without assistance. Overall, students in the high-ability category demonstrate good and consistent understanding. In contrast, students in the medium and low categories still require guidance in distinguishing between numerators and denominators and applying fraction concepts in various situations. Students tend to be less active in constructing their knowledge. This evidence suggests that people often memorize information without truly understanding it. Based on data triangulation involving observations, tests, and interviews, the following describes students' thought processes in converting verbal expressions into mathematical models of fractions.

Table 2. *Overview of students' thought processes*

Thinking process		
High-ability students	**Moderate-ability students**	**Low-ability students**
Students demonstrate a strong and consistent understanding when converting verbal expressions into fractions. They can quickly identify the problems, comprehend the concept of fractions well, and logically explain each step they take in determining the numerator and denominator. During the interview, students can provide clear explanations	Students demonstrate a basic ability to identify the numerator and denominator, but there are often mistakes in writing fractions, such as errors in the order of the numerator and denominator. Although they can understand the core of the problem, they sometimes struggle to formulate the correct fraction. Interviews reveal that students grasp the basic concept of fractions but	Students with low ability have difficulty identifying the numerator and denominator and often cannot connect verbal expressions to the correct fraction concepts. They are frequently confused and unable to explain fraction problems clearly. Interviews indicate a lack of understanding of fractions, with many students not knowing how to relate

regarding the function of the numerator as the part taken and the denominator as a whole. They also relate this understanding to real-life examples, such as sharing food. In the test, students write fractions accurately and consistently, indicating a deep mastery of the concept. Observations show that they can solve the problems with little to no assistance from the teacher, relying on sound logic and conceptual understanding.	occasionally get stuck on technical errors like writing the fraction upside down (for example, 10/5 instead of 5/10). During observations, students often require some guidance to direct their steps, and although they can follow instructions, their thinking process is not yet fully automatic. They sometimes rely on external prompts rather than fully utilizing their internal understanding.	numbers to the concept. In tests, their answers are often incorrect or left unanswered. They appear to rely heavily on direct assistance from the teacher and struggle to think independently. Observations show that these students tend to be inactive in the problem-solving process and wait for further instructions from the teacher without attempting to find solutions independently.

Discussion

Based on the interview results, an analysis was conducted on two indicators of mathematical representation: answering questions verbally and explaining problems according to the given representation. For the first indicator, high-ability students could explain the concept of fractions verbally and accurately. They mentioned that fractions involve numerators and denominators,n or recognized fractions as numbers containing the term "per." Students in the moderate category understood this concept, such as responding that a fraction is "a number with something on top and something below" or "like a half," although some hesitation was observed.

Meanwhile, students in the low-ability category experienced difficulties in answering. Most responded with "I don't know" or "I forgot," and even after being given prompts such as "numerator and denominator," some began to recall. However, not all were able to explain. These difficulties indicate that students still have misconceptions about fractions, particularly regarding the numerator and denominator (Gabriel et al.,visu 2013). This aligns with Alamsyah et al. (2019), who stated that elementary school children often develop spontaneous thinking patterns without deep evaluation, especially when dealing with fraction problems. According to Alamsyah et al. (2019), students do not control what they are working on but follow previous steps without a comprehensive understanding. This situation arises due to a weak grasp of basic concepts.

Therefore, a scaffolding strategy tailored to students' ability levels is needed so that they can gradually develop their verbal representation skills. As students gain independence, scaffolding, a learning support strategy, gradually reduces its structured assistance (Van de Pol et al., 2010). For low-ability students, scaffolding is provided through a concrete approach. Teachers use visual aids such as pictures of cakes or paper cutouts to demonstrate that fractions are parts of a whole. This step aligns with the Concrete–Representational–Abstract (CRA) approach, which has been proven effective in developing conceptual understanding of fractions (Powell, 2019). In addition, guided questions such as "If you divide one cake into two and take one piece, how many parts do you have?" help students form an initial understanding (Sayeski & Paulsen, 2020).

Students with moderate ability require scaffolding in the form of concept clarification and reinforcement of mathematical language. Teachers can provide fraction illustrations and ask students to explain verbally, then correct or clarify the terms used. Pair or small group discussions can also encourage students to increase their confidence and accuracy in expressing ideas (Krawec, 2014). Scaffolded questioning gradually helps students construct correct and structured verbal sentences at this stage. Meanwhile, for high-ability students, scaffolding focuses on expanding concepts and practicing reflective thinking. Students may be assigned tasks such as explaining fractions to peers, writing narratives about what parts are, or verbally comparing two fractions. These activities reinforce understanding and develop mathematical representation skills (Boaler & Foster, 2021). Teachers might consider posing reflective questions such as "Why are you sure that one-half is greater than one-fourth?" to encourage deeper thinking.

On the second indicator, students with high ability can answer correctly and provide logical explanations based on the context of the problem. For example, they respond with "5/10" for the pencils provided and appropriate explanations. At this stage, an appropriate scaffolding strategy is to provide guiding questions such as "What indicates the part taken?" and "What indicates the total amount?", so that students become more aware of the relationship between the context and the fractional representation they write. This approach aligns with Sayeski and Paulsen (2019), who emphasized the importance of guiding students to build understanding through reflective questioning.

Students in the moderate category tend to answer correctly on simple problems but often make mistakes when solving more complex questions. Errors were found in the question about the eaten cake, where some students answered "8/5," indicating a confusion between the concepts of numerator and denominator. This classification is consistent with Nasiruudin and Hayati (2019), who found that many students struggle to differentiate between denominators and numerators. For students in this category, scaffolding can be provided through gradual assistance, such as guided questions and structured discussions, to help students link information from the problem to the correct fractional form. Rittle-Johnson (2017) explained that systematic, gradual assistance is practical in developing deeper conceptual understanding.

Low-ability students struggle significantly with understanding and solving fraction problems. Many students responded that they did not know the answer to the pencil problem. However, some students did not sum the total number of pencils given (3 and 2) into "5/10," but instead answered separately with "3/10 and 2/10." This error indicates a lack of understanding of how to construct fractions to represent parts of a whole. This aligns with Ruhyana (2016), who stated that such mistakes may be caused by students still having difficulty understanding and distinguishing the use of mathematical symbols and notations. In this case, relevant scaffolding involves using concrete tools such as pictures or real objects to demonstrate wholes and parts, along with exercises in visually constructing fractions. According to Mok et al. (2019), visual support has been proven effective, especially for low-ability students who still require concrete representations.

High-ability students demonstrate a strong understanding of answering and explaining fraction representations. Students in the medium category grasp the basic concepts but tend to get confused with more complex problems, especially when distinguishing between the numerator and the denominator. Students in the low category show minimal understanding, often merely copying answer patterns or providing illogical responses, such as separating parts of a fraction without summing them first. Such behavior is related to the fact that each student has different representational abilities, which affect how they receive, comprehend, and analyze information (Syahid & Noviartati, 2019).

Thus, implementing structured scaffolding adjusted to students' ability levels can assist them in overcoming difficulties in understanding and solving fraction problems. Teachers need to adjust the type of support provided according to the individual needs of each student, enabling every learner to develop a deeper and more meaningful understanding of the concept of fractions. This approach aligns with the fundamental principles of scaffolding, which aim to provide appropriate assistance at the right time, allowing students to learn more effectively and gain stronger comprehension.

This research is expected to offer profound conclusions regarding the ability of fourth-grade students to transform verbal expressions into mathematical models, particularly in fractions. The main recommendation in this article is to include a thorough analysis of the various strategies students use to understand and convert verbal information into mathematical forms. Researchers are also advised to consider the influence of teaching methods and individual student characteristics in this process. The benefits of this research are significant, as it can contribute to developing more effective teaching methods that help students gain a deeper and more practical understanding of fraction concepts. Furthermore, this research can serve as a valuable reference for teachers in designing learning strategies that enhance students' mathematical representation skills.

Conclusion and Recommendations/Implications

The results of this research indicate that the ability of fourth-grade students to convert verbal expressions into mathematical models in fractions varies according to their skill levels. High-ability students demonstrate a strong understanding of fraction concepts and can accurately and logically transform verbal statements into mathematical models. Students with moderate ability possess a basic understanding of fractions but still face more complex problems, particularly distinguishing between the numerator and the denominator. Meanwhile, low-ability students struggle to comprehend verbal problems and make errors when writing fractions.

Factors influencing students' abilities include their understanding of basic fraction concepts, skills in reading the problems, and analytical abilities. The uniqueness of this research lies in its specific focus on identifying error patterns and designing appropriate scaffolding strategies in transforming verbal expressions into mathematical models. The findings suggest teachers should emphasize a context-based learning approach to strengthen students' representational skills. As a practical guideline, teachers can assist students in identifying key words in verbal problems that indicate fractional meanings, such as "half," "quarter," or "equally divided," then guide them to convert these words into corresponding fraction symbols, and finally ask students to illustrate or write mathematical models based on the provided information.

Disclosure Statement

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Use of AI Statement

The authors declared that they had not used any AI tools in their manuscript preparation and submission.

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