
Profile of Seventh-Grade Middle School Students' Understanding of Fractions

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Abstract. *This study aims to describe seventh-grade students' understanding of fractions at SMP. This study employs a descriptive qualitative approach and a case study design, with three students as subjects classified into high, medium, and low categories. Data were collected through tests, interviews, and documentation. The study's results show that students' understanding of fractions varies. Students in the high category can explain and apply the concept of fractions effectively. Students in the medium category still have difficulty distinguishing between types of fractions, but can explain the meaning of a fraction and give everyday examples. Meanwhile, students in the low category show limited understanding of the concept, as they still have difficulty explaining fractions and are therefore unable to apply it effectively.*

Keywords: *Fraction concepts, Conceptual understanding, Mathematics learning, Junior high school students*

INTRODUCTION

One of the basic concepts in mathematics that plays an important role in everyday life and in advanced mathematics learning is the concept of fractions (Tamonob et al., 2024). Students' understanding of fractions can be seen in several ways. For example, how students recognize and distinguish between different types of fractions, how they solve calculations involving fractions, and how they use these concepts in everyday situations. These aspects can provide an overview of the extent to which students truly understand fractions, rather than simply memorizing the steps involved in working with them. A well-understood concept will serve as a foundation for students to learn more complex principles and theories. Conceptual understanding occurs when individuals can think deeply about it, apply it in various situations, explain it in their own words, and develop mental and physical models of it (W. N. Sari et al., 2022). Understanding concepts should always be prioritized

over simply memorizing formulas or mastering calculation techniques (Siti Muthiah & Nurhasanah Siregar, 2024). The concept of fractions is one of the most important basic concepts to understand, so that students do not encounter difficulties in learning other material (Firdausi & Suparni, 2022). Students' understanding of fractions will be analyzed across several aspects, including their ability to recognize and distinguish between different types of fractions, perform fraction operations, and apply fractions in real-life situations (Gaspersz et al., 2023).

Many studies still focus on learning outcomes, such as Sukma Kurnia et al.'s study, which found that many students experience difficulties with addition, subtraction, multiplication, and division of fractions, especially when dealing with different denominators (Syukra et al., 2025). Research by Siti Rofiarul Azizah et al. found that using puzzle teaching aids helped students deepen their understanding of fractions, with their comprehension increasing from 75% in cycle I to 87.5% in cycle II (Hidayatullah & Zainil, 2023). Research by Ria Norfika Yuliandri et al. found that using folded paper media can help students understand mathematical concepts related to fractions, as evidenced by increased ability to answer fraction questions correctly and overall learning achievement (Yuliandari et al., 2024). Research by Iin Gusman et al. found that students' understanding of mathematical concepts, as assessed by learning motivation, improved when using counting funnels and fraction cards. Counting funnels can stimulate students' motivation and curiosity towards learning (Gusmana & Amir, 2024). Conceptual understanding has been widely researched. Adrianus A Jeheman, Bedilius Gunur, and Silfanus Jelatu have conducted research to determine the effect of realistic mathematics approaches on students' understanding of mathematical concepts (Jeheman et al., 2019). Kurnia Puspita Sari and Firman Firman also conducted research to analyze the effectiveness of worksheets in improving elementary school students' understanding of spatial concepts (K. P. Sari & Firman, 2023). Not much research has been done on fractions, so researchers are interested in understanding them. Although these studies provide effective learning strategies, most still focus on learning outcomes or media use, and do not emphasize students' in-depth conceptual understanding. This study focuses on aspects of understanding fractions,

including students' ability to distinguish between different types of fractions, understand the relationship between numerators and denominators, and relate the concept of fractions to everyday life. This focus is important because conceptual understanding is essential for students' ability to solve more complex mathematical problems and ensures that students are not only able to perform procedures but also understand the meaning of the concept of fractions.

An incorrect initial concept will hinder the subsequent stages of conceptual understanding (Sadiah & Afriansyah, 2023). Less varied methods cause children to become bored and tired of learning mathematics (Atiaturrahmaniah et al., 2021). Students often have difficulty understanding the concept of equivalent fractions because the learning is abstract and not linked to real-life experiences (Az-zahara et al., 2025). There are still students who have difficulty understanding mathematical concepts, especially in mathematics. In addition, some students have difficulty understanding equivalent fractions and basic fraction operations, suggesting that their understanding of fractions has not been fully developed.

Students' difficulties in understanding fractions, especially equivalent fractions and basic fraction operations, indicate that their initial conceptual understanding has not been optimally formed. Frequent misunderstandings of fractions indicate the need to identify students' misconceptions, so their understanding of fractions can be clearly mapped. In addition, conceptual understanding should be built gradually from shapes and values to fraction operations and linked to everyday concepts. Therefore, this study aims to describe students' understanding of the concept of fractions, including their forms, values, and operations with basic fractions.

Understanding the concept of fractions is a pillar that students must have, and fraction material, including recognizing, representing fractions in forms, and explaining the relationships among

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RESEARCH METHOD

This study employs a qualitative, descriptive, case study design. This study was conducted in class VII D at SMP N 3 PALU, with a total of 25 students. Qualitative research is descriptive in nature and uses analytical tools to answer research questions. The emphasis on process and meaning-seeking is more prominent, encouraging the possibility of new theories and more complete and comprehensive data (Waruwu, 2024). Descriptive research, often referred to as taxonomic research, is so called because it is intended to explore and clarify an existing social symptom, phenomenon, or reality (Syahrizal & Jailani, 2023).

The data collection methods used in this study were tests, interviews, and documentation. The fraction concept comprehension test was developed based on concept comprehension indicators, namely defining concepts, identifying concept characteristics, connecting or providing examples of previously unfamiliar concepts, and applying these concepts in problem-solving and in everyday life. The interviews were conducted after the students had completed the test questions on understanding fractions. The researchers then selected subjects from the high, medium, and low groups to be interviewed about their understanding of fractions as they completed the test questions. The interview process was documented using audio and written notes.

The research instruments used were a written test and interview guidelines. The fraction concept comprehension test sheet consists of a written test designed to assess understanding of the fraction concept. The written test consists of four questions, aligned with the concept comprehension indicators. The material used is common fractions and mixed fractions. Meanwhile, the interview consists of four questions in accordance with the concept comprehension indicators. The interview method used in this study is an unstructured interview. Therefore, question 4 will

be divided into several questions. The interview questions were designed to be as easy to understand as possible for the research subjects. Experts validated the instrument before use. The instrument validators consisted of two mathematics lecturers from the State Islamic University of Datokarama Palu.

The triangulation used in this study is technical. In technical triangulation, the author uses multiple strategies to collect data from different sources to obtain data from the same source. In this study, the author used tests, interviews, and documentation as data collection techniques.

RESULT AND DISCUSSION

The level of conceptual understanding among seventh-grade junior high school students remains very low, especially in fractions. The subjects were from class VII D, comprising 11 female and 14 male students. Based on the results of the first test, 1 student was classified as high, 1 as low, and 1 as low. The selected subjects will be interviewed about their understanding of fractions. The results of the fraction concept comprehension test are shown in Table 1.

Table 1. Subjects' Data From the Fraction Concept Comprehension Test

Indikator	Results		Jumlah Total
	Siswa		
	Laki-laki	Perempuan	
MAW		1	1
SFA		2	2
DD	1		3

After the test, the next stage was interviews, in which the researcher interviewed the three subjects. The following are the results of the interviews with the three subjects, grouped by their understanding of the concept of fractions. The researcher distinguished between test questions and interview questions.

1. Identification of High Category S_1 Fraction Concept Comprehension Test Results

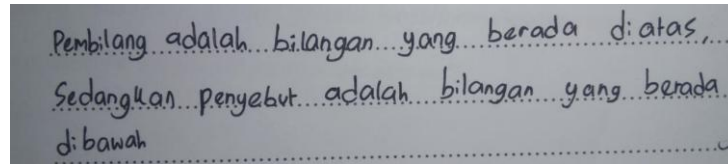


Figure 1. Answer to question no.1

Transcript of the researcher's interview with S_1

Researcher: In your opinion, what is a fraction? Explain it in your own words.

Subject 1: In my opinion, a fraction is divided into two parts: the numerator and the denominator. Fractions are often used in various ways, such as calculating money, speed, and so on.

Researcher: How do you distinguish between common fractions, mixed fractions, and decimal fractions?

Subject 1: As far as I know, common fractions only have two numbers, one above 1 and one below 1. Mixed fractions have three numbers: one on the left, one above, and one below. Decimal fractions are fractions that have a comma in the number.

Researcher: You have one hour to study, and your teacher suggests spending half an hour on math and the remaining time on science. If you have never divided your time like that before, how would you know how to do it?

Subject 1: Half an hour for math and the remaining 30 minutes for science.

Researcher: Can you tell me how you use fractions in your daily life? For example, when cooking, dividing food, or when shopping?

Subject 1: For example, if we have a round cake and divide it into 4 pieces, the ratio is 4:4. If we divide it among 4 people, the ratio becomes 3:4.

The results of the written test and interview with subject 1 regarding the understanding of the concept of fractions showed no obstacles, and the subject felt confident with the answers given during

the interview and the written test. This differs from the research conducted by Nurhaswinda et al., which found that students did not yet understand the relationship between the concept and material related to mathematics such as addition, subtraction, and the difference between numerators and denominator that are the same and different, and the determination of part of a fragment of an object associated with the in the real world in students' daily lives. The difference in this study is that the subjects can answer all the researcher's questions and understand fractions (Nurhaswinda & Neni Nurjanah, Dinda Nabila, Hikmatun Nisa, Khairunnisa, 2025). According to Kilpatrick, Swafford, and Findell, conceptual understanding of mathematics is characterized by the ability to understand the meaning, relationships, and representations of a concept. Subject 1's ability to answer questions correctly and explain the concept of fractions shows that their conceptual understanding has been formed, so that Subject 1 has optimally understood the concept of fractions.

2. Identification of Test Results for Understanding of Fractions—Intermediate Level S_2

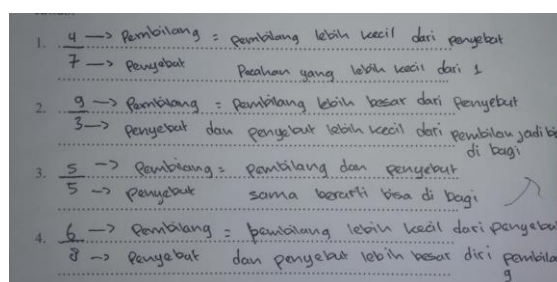


Figure 2. Answer to question no. 2

Transcript of the researcher's interview with S_2

Researcher: In your opinion, what is meant by a fraction? Explain in your own words.

Subject 2: In my opinion, fractions include common fractions,

decimal fractions, and mixed fractions.

Researcher: How do you distinguish between common fractions, mixed fractions, and decimal fractions?

Subject 2: There are only $\frac{2}{4} + \frac{2}{4}$

Researcher: You have 1 hour to study, then the teacher suggests $\frac{1}{2}$ hour for math and the rest for science. If you have never divided your time like that before, how would you know how to divide it?

Subject 2: I have 1 hour, half an hour for math and the rest for science

Researcher: Can you tell me how you use fractions in your daily life? For example, when cooking, dividing food, or when shopping.

Subject 2: Fractions in daily life. For example, buying oranges. There are 5 oranges a day, so I can eat 5.

The results of the written test and interview with subject 2 regarding understanding of fractions showed a few problems. However, subject 2 was unable to distinguish between common fractions, mixed fractions, and decimal fractions. Other than that, Subject 2 answered all interview questions well. This differs from the research conducted by Deaniera Dwi Gustiani et al., which found that students made mistakes in solving math problems, specifically regarding symbols, letters, and words (Gustiani & Puspitasari, 2021). According to Skemp, understanding of mathematical concepts consists of instrumental and relational understanding. Instrumental understanding is demonstrated by the ability to use rules or procedures, while relational understanding is demonstrated by the ability to understand the meanings and relationships among concepts. Subject 2's inability to distinguish between types of fractions shows that the subject has a more dominant instrumental understanding, so that their understanding of the concept of fractions is not yet fully optimal.

3. Identification of Test Results for Conceptual Understanding of Fractions:
Low Category S_3

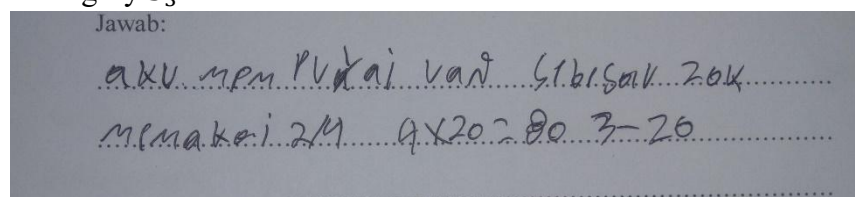


Figure 3. Answer to question no. 3

Transcript of the researcher's interview with S_3

Researcher: In your opinion, what does a fraction mean? Explain it in your own words.

Subject 3: The numerator is above, and the denominator is below.

Research: How do you distinguish between common fractions, mixed fractions, and decimal fractions?

Subject 3: For example, common fractions are $\frac{4}{7}$, mixed fractions $\frac{9}{5}$, and decimal fractions, such as $\frac{5}{5}$

Researcher: You have 1 hour to study, then the teacher suggests $\frac{1}{2}$ hour for math and the rest for science. If you have never divided your time like that before, how would you know how to divide it?

Subject 3: I have 1 hour and 30 minutes for math and 20 minutes for science.

Researcher: What about the remaining 10 minutes?

Subject 3: I use it for a break.

Researcher: Can you tell me how you use fractions in your daily life? For example, when cooking, dividing food, or when shopping?

Subject 3: I have 20,000 rupiah. I use $\frac{2}{4}$, $4 \times 20 = 80$

The results of the written test and interview with subject 3 on understanding the concept of fractions. Subject 3 did not fully understand the concept of fractions, so Subject 3 did not answer the questions very well. In line with research conducted by Aska Afriandi and Hidayat, which shows that some students still have a low understanding of the

concept of fractions, especially in solving fraction problems, which is very similar to this case, where students lack understanding of the concept of fractions and therefore do not answer optimally (Aska & Hidayat, 2025). According to Hiebert and Lefevre, understanding mathematical concepts is a network of interconnected knowledge, so that students not only remember procedures but also understand the relationships between concepts. If the basic understanding of fractions and arithmetic operations has not been properly formed, students will have difficulty solving fraction problems, especially those involving arithmetic operations. This causes students to make mistakes when applying formulas and solution steps.

CONCLUSION

Based on the research and discussion, it can be concluded that the understanding of fractions among seventh-grade students at SMP Negeri 3 Palu varies according to their ability levels. Students in the high category can understand, explain, and apply the concept of fractions appropriately to solve the given problems. Students in the medium category show sufficient understanding of the concept. However, their application remains limited to procedural tasks, and they are not yet fully able to explain it in depth. Meanwhile, students in the low category show limited understanding of the concept, characterized by difficulties in identifying the basic concepts of fractions and determining the appropriate steps for solving problems. These findings indicate that students' understanding of mathematical concepts is influenced by their ability to relate concepts to solution procedures. Therefore, learning strategies that emphasize strengthening conceptual understanding are needed so that students can build a more comprehensive understanding of mathematics.

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