Analysis of Factors Contributing to Elementary Students' Difficulties in Understanding Fractions

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Abstract
This study uses a literature analysis method to examine the factors causing learning difficulties in fraction concepts in Elementary Schools. The analysis was conducted on 11 research articles discussing the topic. The results of the analysis indicate that learning difficulties in fractions are caused by internal factors such as lack of conceptual understanding, low memory, and low interest in learning. External factors such as lack of use of learning media and a less conducive learning atmosphere also contribute to these difficulties. The implications of these learning difficulties in fractions are very significant, because they can hinder students' understanding of more complex mathematics material at the next level. Effective learning strategies to overcome learning difficulties in fractions include introducing concepts contextually, using various visual representations, implementing collaborative learning models, making connections with other mathematical concepts, providing varied practice questions, using concrete learning media, working with parents, and conducting tutoring. This study is expected to contribute to educators and researchers in understanding the factors causing learning difficulties in fractions in ElementarySchools and designing effective learning strategies to overcome them.

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1. Introduction

Mathematics is a fundamental subject that plays an important role in developing logical, analytical, and systematic thinking skills. These abilities are crucial to support students' success in learning more complex mathematical material at higher levels of education. One important basic concept in mathematics is fractions. Fractions are a basic concept that is important to understand further mathematical material such as percentages, ratios, and algebra. Lack of student understanding of fractions can lead to difficulties for students in solving other mathematical problems. Behr and Post (in Wheeldon, 2008) state that students may have difficulty learning algebra due to their lack of understanding of fractions.

Basic education is something important to facilitate in advancing the world of education. The purpose of elementary school education according to Haniyah (2019) is as a process of introducing the most basic abilities of each student, where each student learnsactively because of internal motivation and an atmosphere that provides ease for the optimal development of himself. Basic education strives to awaken the potential of students, both mental, social and spiritual potential. Therefore, students as individuals who are developing and have good potential. Well, the task of an educator is to increase the potential they have, write and develop the potential of students that exists in them (Susanto, 2019). This is because mathematics is a source of knowledge whose discovery and development depends on mathematics, so mathematics subjects are very beneficial for students as a basic science for application in other fields. Therefore, students are expected to be able to achieve the goalsof mathematics learning itself. According to Susanto (2019) explains that the purpose of mathematics learning in school is intended so that students are not only skilled in using mathematics but can also understand mathematical material. According to Santi (2016) states that the goal in mathematics is to encourage students to become problem solvers based on critical, logical, and rational thinking processes.

Based on literature studies from various studies, various difficulties have been found in students' understanding of fractions, such as difficulty in seeing fractions as a number, adding fractions by adding the denominator to the denominator and the numerator to the numerator.

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2. Method

This study uses a literature review method with a qualitative approach. This method was chosen because it allows for in-depth analysis of various studies that have been conducted previously related to students' difficulties in understanding the concept of fractions in Elementary School. Literature analysis allows us to dig up information from various sources, find patterns, and build a comprehensive understanding of the topic being studied.

2.1. Data Collection

This study used 11 research articles as data sources. The articles were selected based on their relevance to the research topic, namely students' difficulties in understanding the concept of fractions in Elementary Schools. The articles were selected based on criteria such as year of publication, research methodology, and research focus. After the articles were selected, the content of each article was analyzed in depth to identify factors that cause learning difficulties, effective learning strategies, and implications of learning difficulties in fractions.

2.2. Data Analysis

The findings from each article were grouped by category, such as conceptual difficulties, principal difficulties, verbal problem-solving difficulties, and factors that cause learning difficulties. This grouping helps in organizing complex data into more structured and easily understood information. Furthermore, the grouped data was synthesized to find patterns and relationships between findings. Data synthesis allows us to see the big picture of the problem being studied and find relationships between findings from various studies. Based on the data synthesis, conclusions were drawn regarding the factors that cause learning difficulties in fractions in Elementary Schools, the implications of these difficulties, and effective learning strategies to overcome them.

2.3. Data Analysis Techniques

This study uses qualitative descriptive data analysis techniques, which include:

Data Reduction: The process of selecting, simplifying, grouping, and transforming raw data from research articles into more structured and easily understood data. Data reduction helps in filtering relevant information and eliminating irrelevant information.

Data Presentation: The reduced data is presented in the form of narrative text, tables, and diagrams to clarify patterns and relationships between findings. Structured data presentation helps in understanding complex data and makes the interpretation process easier.

Conclusion Drawing: The process of drawing conclusions is carried out by interpreting the data that has been presented, looking for meaning and relationships between findings, and formulating comprehensive conclusions. Conclusion drawing is the final stage of data analysis, where we can draw valid and relevant conclusions based on the data that has been analyzed.

2.4. Data Validity

The validity of the data in this study is maintained by using triangulation techniques, namely comparing data from various sources, such as:

Source Triangulation: Comparing data from various research articles. Source triangulation helps in strengthening the validity of the data by looking at different perspectives from various sources.

Method Triangulation: Comparing data from the content analysis of the article with relevant theories. Method triangulation helps in ensuring that the data analyzed is in accordance with relevant theories and supports the conclusions drawn.

This study is limited to the analysis of students' difficulties in understanding the concept of fractions in Elementary Schools based on literature studies. This study does not specifically discuss the implementation of learning strategies in the classroom or student learning outcomes. Problem limitation helps in focusing the research and ensuring that the research is carried out in depth and directed.

3. Results and Discussion

3.1. Result

Based on the results of the analysis that has been carried out on several related articles, several difficulties were found that students experienced in understanding fractions.

3.1.1. Difficulty Understanding Concepts

Concepts refer to basic understanding. Students develop concepts when they can classify or group objects or when they can associate a name with a certain group of objects. Based on the analysis of student answers, conceptual difficulties lie in students' mistakes in determining the numerator and denominator in fractions. Likewise, in comparing fractions, students make mistakes in translating images into fractions. This difficulty is experienced by both low and medium-ability students.

Lack of Understanding Basic Concepts: Students who experience conceptual difficulties are students who have difficulty in classifying objects and associating a name with a certain group of objects. This shows that instilling concepts is very important. Students whose understanding of the basic concepts of fraction material is not yet mature make many mistakes and find it difficult to solve problems.

Influence of Prerequisite Material: This study found that many students experienced conceptual difficulties based on the analysis of answers from the tests that had been conducted. Students who experienced conceptual difficulties also varied, not only experienced by low-ability students, but students with medium and high abilities also experienced it. This is in line with research that states that "Basic concepts are generally used continuously to learn higher concepts. Therefore, in learning mathematical concepts, one must be able to master and understand a previous mathematical topic as prerequisite material. The prerequisite material must be truly understood and comprehended by students in order to understand the next material."

3.1.2. Principle Difficulties

Students are said to experience principal difficulties if they cannot identify the concepts contained in the principle correctly and cannot develop it as new knowledge. The principal difficulties experienced by students are where they make mistakes in writing fractional forms. Students understand the concept of numerator and denominator but are not careful in writing the nominal. So that the final answer written is wrong.

Low Memory: Students experience principal difficulties due to several factors, namely low memory ability and low interest in learning. Low memory can make it difficult for students to apply principles. Students with poor memory will have difficulty remembering the concepts they have learned, which is necessary if students want to apply a principle to a problem. - Low Learning Interest: Students' low learning interest also affects the difficulty of principles. Interest in the big Indonesian dictionary means a high tendency of the heart towards something. When we have a high interest, we will continue to pay attention to it. In this case, students have a low interest in learning. This affects their daily study time, where when we have a high interest, we will continue to repeat lessons such as rereading and increasing practice questions. If this is done, it can help students' difficulties in mathematics lessons as well as when they work on questions.

3.1.3. Difficulty Solving Verbal Problems

Difficulty in solving verbal problems is an extension of difficulty in using concepts and principles. Students who have difficulty in solving verbal problems are related to verbal problems or story problems. Where students must understand the terms and identify the arithmetic operations that must be used to solve the problem. In this case, students are required to have a good understanding of concepts and principles so that they do not have difficulty in solving verbal problems.

3.1.4. Difficulty Interpreting Keywords

Students who have difficulty solving verbal problems because students have difficulty interpreting keywords so they cannot determine the correct arithmetic operation. They also have difficulty understanding the questions. So, they cannot answer correctly or determine the arithmetic operation incorrectly.

3.1.5. Factors that Cause Student Difficulties

Conceptual Difficulties: Factors that cause students to experience conceptual difficulties are intelligence level, lack of interest in learning, and use of learning media. In understanding a concept, an adequate level of ability is required. Children who have a good level of intelligence tend to accept material faster than children who have a lower level of intelligence. Likewise, children who have a high interest in learning will tend to be enthusiastic in learning mathematics.

Principal Difficulties and Difficulties in Solving Verbal Problems: Students experience principal difficulties due to several factors, namely low memory skills and low interest in learning. Low memory can make it difficult for students to apply principles. Students with poor memory will have difficulty remembering the concepts they have learned, which is necessary if students want to apply a principle to a problem. This is consistent with the opinion of Nini Subini that low memory greatly affects a person's learning outcomes. Children who have studied hard but have below average memory will lose to children who have high memory. The results of their learning efforts are not commensurate with the achievements they get.

3.1.6. Efforts Made to Overcome Student Difficulties

Concept Difficulties: Students who experience conceptual difficulties tend not to understand basic knowledge in fractional material such as the symbols in fractions and their meanings. Based on this understanding, we can increase our understanding of the meaning of written symbols. So reading can be used as an effort to overcome mathematical concept difficulties. If reading activities are carried out repeatedly, students can better understand the concepts contained in fractional material.

Principle Difficulties and Solving Verbal Problems: In overcoming principal difficulties and solving verbal problems in solving fractional problems for grade III material, the following efforts are needed:

Providing Varied Practice Questions: Students need a lot of varied practice to get used to the keywords and symbols in the questions. By providing practice questions, it can help students' understanding process, especially in overcoming principal difficulties and solving verbal problems.

Using Concrete Learning Media: Based on the results of the analysis that has been carried out, it was found that teachers do not always use learning media. Meanwhile, according to Piaget's cognitive development theory, elementary school students are at the concrete operational stage. Learning media is needed so that students can understand better and make it easier for students because they are not yet at the abstract thinking stage. Where this causes students to have difficulty understanding concepts.

Working with Parents: Parents play an important role in the child's education process. Based on the results of the analysis, children who are guided in their studies by their parents will show good progress, although some children who have great difficulty have not reached the KKM. However, their learning progress has increased.

Tutoring: Tutoring is routine and scheduled, the following can help students get used to repeating lessons and practicing questions. In accordance with the definition of tutoring, it is the process of providing assistance to students in solving difficulties related to learning problems.

3.2. Discussion

A literature review of 11 research articles that discuss students' difficulties in understanding the concept of fractions in elementary school shows that these difficulties are caused by internal and external factors. Internal factors include lack of conceptual understanding, low memory, and low learning interest. External factors include lack of use of learning media and a less conducive learning environment. These findings are in line with learning theories that emphasize the importance of conceptual understanding, memory, and motivation in the learning process.

3.2.1. Internal Factors

Lack of Conceptual Understanding: Lack of conceptual understanding of fractions as a representation of part of a whole and the relationship between numerator and denominator is a major factor in learning difficulties. This shows that students may not fully understand the meaning of fractions, so they have difficulty applying the principles of fractions. These findings are in line with constructivist theory, which emphasizes the importance of building strong conceptual understanding through meaningful learning experiences.

Low Memory: Low memory is also a significant factor. Students with low memory will have difficulty remembering concepts they have learned, making it difficult to apply the principles of fractions. This shows that students may need more effective memory strategies, such as reviewing material, taking notes, or using memory aids (Manjani et al., 2024; Testiani et al., 2022).

Low Learning Interest: Low learning interest can also be a barrier. Lack of interest in mathematics can make students less motivated to learn and practice concepts. This shows that teachers need to create an interesting and motivating learning environment so that students are actively involved in the learning process (Manjani et al., 2024; Diniarti, Yudha, & Vioreza, 2023; Testiani, Ramadhani, & Kuswidyanarko, 2022).

3.2.2. External Factors

Lack of Use of Learning Media: Lack of use of concrete and varied learning media is a significant external factor. Concrete and engaging learning media can help students visualize and understand abstract concepts such as fractions. Lack of use of media can make the learning process less effective (Hariyani, Herawati, Andriani, & Suherman, 2023; Testiani, Ramadhani, & Kuswidyanarko, 2022).

Less Conducive Learning Environment: A noisy or unsupportive learning environment can disrupt students' concentration, making it difficult for them to focus and absorb lesson material. A less conducive learning environment can hinder students' understanding, making it difficult for them to focus and absorb lesson material (Testiani, Ramadhani, & Kuswidyanarko, 2022).

3.2.3. Implications

Difficulty learning fractions has significant implications for student learning development. Lack of understanding of the concept of fractions can hinder students' understanding of more complex mathematics material at the next level. This can have an impact on student achievement and their interest in mathematics (Hidayah, Arief, & Cahyadi, 2020; Manjani et al., 2024; Testiani, Ramadhani, & Kuswidyanarko, 2022).

Effective Learning Strategies: Effective learning strategies to overcome learning difficulties with fractions include: 1) Introducing Fraction Concepts Contextually: Connect fraction concepts to real-life situations to help students understand their meaning. 2) Using a Variety of Visual Representations: Use a variety of visual representations, such as diagrams, pictures, and manipulatives, to help students visualize and understand fraction concepts. 3) Implementing a Collaborative Learning Model: Encourage students to help each other and discuss understanding fraction concepts through group learning or pair learning. 4) Making Connections between Fraction Concepts and Other Mathematical Concepts: Connect fraction concepts to other mathematical concepts, such as addition, subtraction, multiplication, and division, to strengthen student understanding. 5) Providing a Variety of Practice Problems: A variety of practice problems help students hone their conceptual understanding and problem-solving skills. 6) Using Concrete Learning Media: Use concrete and interesting learning media to help students understand abstract concepts such as fractions. 7) Working with Parents: Involve parents in the student's learning process to provide support and guidance at home. 8) Conducting Tutoring: Tutoring can help students overcome learning difficulties and improve their understanding of fraction concepts.

This study shows that learning difficulties in fractions in Elementary Schools are caused by internal and external factors. Teachers need to understand the factors that cause learning difficulties and apply effective learning strategies to help students build a strong understanding of fraction concepts. By applying appropriate learning strategies, teachers can help students improve their ability to solve mathematical problems and achieve optimal learning achievement.

4. Conclusion

By implementing the right learning strategies, teachers can help students build strong conceptual understanding and improve their ability to solve mathematical problems. This research is expected to contribute to educators and researchers in understanding the factors that cause learning difficulties in fractions in elementary school and designing effective learning strategies to overcome them.

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