AN ANALYSIS OF MATHEMATICAL LEARNING DIFFICULTIES BASED ON THE THEORY OF WANDINI AND ODA IN SOLVING FRACTION OPERATION PROBLEMS AMONG FIFTH-GRADE STUDENTS AT SD NEGERI MORKEPEK

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ABSTRACT

The purpose of this study was to determine the difficulties in learning mathematics and the factors that cause difficulties in learning mathematics based on Wandini and Oda's theory in solving problems on fraction arithmetic operations in grade V students of Morkepek Elementary School. This study used a descriptive qualitative approach. This study used data collection techniques with interview and documentation studies. The results of this study are 1). Difficulties in learning mathematics in using facts, namely students have difficulty in translating fraction story problems into solutions according to symbols or fraction numbers correctly. 2). Difficulties in learning mathematics in using concepts, namely students are unable to master the prerequisite concepts of fraction arithmetic operations regarding determining the LCM. 3). Difficulties in using principles, namely students have difficulty in connecting fraction concepts into appropriate calculation relations. 4). Difficulties in using skills, namely students are unable to solve problems according to fraction calculation procedures.

Keywords: Learning Difficulties, Arithmetic Operations, Fractions.

ABSTRAK

Tujuan penelitian ini adalah untuk mengetahui kesulitan belajar matematika dan faktor yang menyebabkan kesulitan belajar matematika berdasarkan teori Wandini dan Oda dalam menyelesaikan soal materi operasi hitung pecahan pada siswa kelas V SD Negeri Morkepek. Penelitian ini menggunakan metode dengan pendekatan kualitatif deskriptif. Penelitian ini menggunakan teknik pengumpulan data dengan teknik wawancara dan studi dokumentasi. Hasil dari penelitian ini yaitu 1). Kesulitan belajar matematika dalam menggunakan fakta, yakni siswa mengalami kesulitan dalam menerjemahkan soal cerita pecahan kedalam bentuk penyelesaian sesuai dengan simbol ataupun bilangan pecahan dengan benar. 2). Kesulitan belajar matematika dalam menggunakan konsep, yakni siswa tidak mampu menguasai konsep prasyarat materi operasi hitung pecahan berkenaan dengan

menentukan KPK. 3). Kesulitan dalam menggunakan prinsip, yakni siswa mengalami kesulitan dalam menghubungkan konsep pecahan ke dalam relasi perhitungan yang tepat. 4). Kesulitan dalam menggunakan skill, yakni siswa tidak mampu menyelesaikan penyelesaian soal sesuai dengan prosedur perhitungan pecahan.

Kata Kunci: Kesulitan Belajar, Operasi Hitung, Bilangan Pecahan.

A. Introduction

Education is a series of human activities aimed at developing one's full potential. According to Law No. 20 of 2003 regarding the national education system, specifically Article 1, education is a conscious and planned effort to create a learning environment and learning processes so that learners actively develop their potential: spiritual religious strength, self-control, character, intelligence, noble morals, and the skills needed for themselves, society, the nation, and the state.

The foundation of education is learning. Learning is an activity provided by educators (teachers) to learners so that knowledge, skills, competencies, attitudes, and beliefs are acquired. (Harianto, 2015). Mathematics is one of the subjects studied by learners at various educational levels, from primary school through higher education. Mathematics learning is characterized by its object's abstract nature, hierarchical concepts and principles, and the necessity to manipulate various forms. Therefore, mastering mathematics requires high-order reasoning and deep thinking, which helps reduce difficulties in learning mathematics.

Mathematical learning difficulties can be understood as a condition marked by obstacles in learning mathematics, particularly when solving problems involving symbols and numbers. According to the Trends in International Mathematics and Science Study (TIMSS), which conducts a survey every four years to assess the progress of mathematics and science education, Indonesia's average mathematics achievement ranks 44th out of 49 countries (TIMSS in Soesanto, 2023).This data suggests that mathematics education in Indonesia is still relatively at a low level of cognitive thinking, and students' conceptual understanding of mathematics is perceived as lacking.

Consequently, many students are likely to experience learning difficulties in mathematics.

This issue aligns with findings from observations and interviews conducted on July 17, 2025, at UPTD SD Negeri Morkepek. These revealed that students from Grade I through Grade VI struggled most with the topic of fraction operations, with Grade V having the highest percentage of students experiencing difficulty 43.4%. From formative assessment data in mathematics for Grade V (23 students), 10 students scored below the Minimum Passing Criteria (KKTP), with scores ranging from 20-60, while 13 students scored above the KKTP, with values between 75-80. The KKTP for mathematics is set at 75.

In an interview, the Grade V teacher noted that among all mathematics topics, fraction operations were the most challenging for students. She explained this difficulty stems from students' inability to correctly grasp the concept of fraction calculation, which in turn makes them struggle to solve any problems involving fraction operations.

This problem is consistent with earlier research by Ardilah (2017), entitled "Diagnosis of Mathematical Learning Difficulties of Grade V Students at Madrasah Ibtidaiyah Munawariyah, Palembang". That study concluded that students' learning difficulties in mathematics were due to their inability to master concepts properly and to calculate accurately prerequisites for solving arithmetic operations. These difficulties, the study argued, adversely affect students' capacity to solve mathematical problems. Based on these observations and the existing literature, it is essential that mathematics instruction be designed to match students' cognitive and character needs. Moreover, continual analysis during the instructional process is required to identify deficiencies. If any shortcomings are found, remedial teaching such as tutoring should be offered to students who are struggling with mathematics.

Therefore, this study seeks to identify the underlying factors causing mathematical learning difficulties in Grade V, given that this class has the highest proportion (43.4%) of students facing challenges with fraction operations. It is hoped that the findings will help reduce these difficulties in Grade V, particularly in the domain of

fraction operations, preventing them from carrying over to Grade VI. Based on the formative assessment data, the researcher formulated the problem under the title: "An Analysis of Mathematical Learning Difficulties in Solving Fraction Operation Problems Among Fifth-Grade Students at SD Negeri Morkepek."

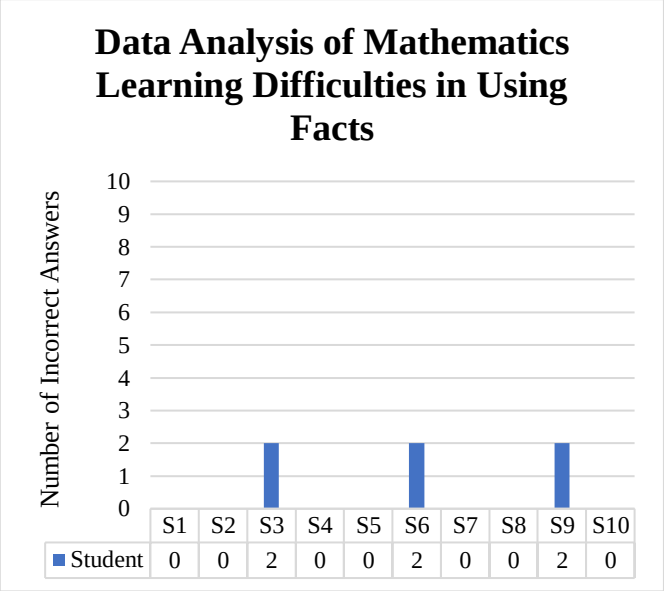
B. Research Method

In this study, the researcher employs a descriptive qualitative method. The purpose of qualitative research is to provide a narrative or written description of events that have occurred. Sugiyono (2019:24) argues that in descriptive qualitative research, which prioritizes presentation of information through words or images rather than statistics, one may conceive of it as a set of scientific procedures that yield trustworthy results. The data collection techniques in this research consist of observation, interviews, and document study.

C. Risult and Discussion

In this stage of the research, the investigator describes the data obtained from interviews with the Grade V teacher and 10 students who struggle with mathematics, as well as documenting the formative daily test results for analysis. This analysis aims to reveal the nature of the learning difficulties in mathematics, categorized by mathematical content, specifically concerning the topic of fraction operation in the Grade V classroom.

1) Description of the Data on the Findings of Mathematical Learning Difficulties in Using Facts

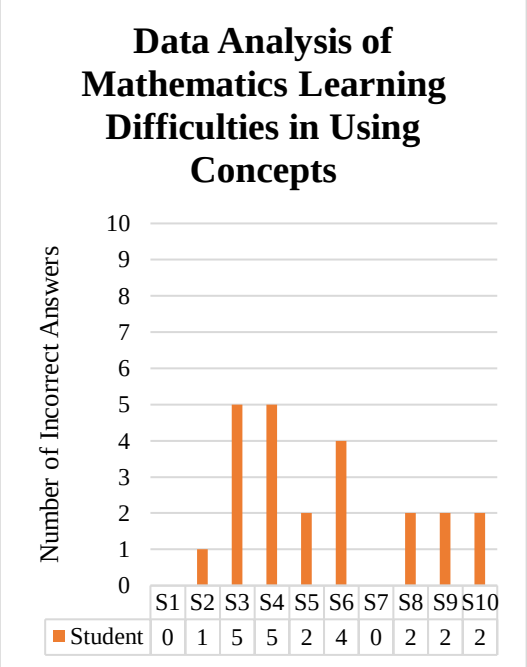


Grafik 1 Data Analysis of Mathematics Learning Difficulties in Using Facts

Based on the results of the documentation study and interviews conducted, it emerges in Figure 2 that among students S1 through S10 who exhibit learning difficulties in using factual

knowledge for the topic of fraction arithmetic, specifically in relation to symbols and terminology, the difficulties are most pronounced in students S3, S6, and S9. These three students are unable to accurately translate and write story problems into their corresponding fraction symbol based solutions.

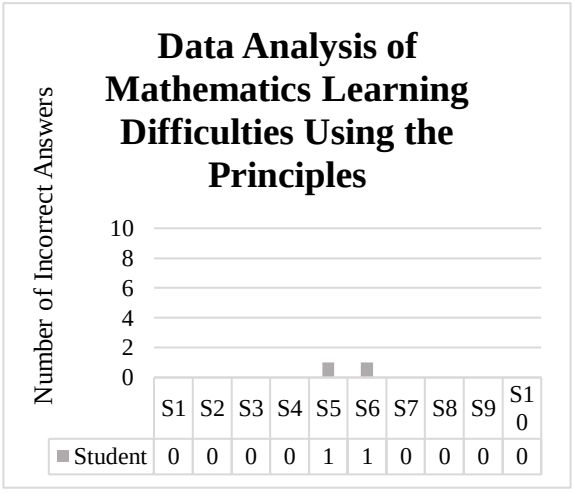
2) Description of Findings on Mathematical Learning Difficulties in Using Concepts



Grafik 2 Data Analysis of Mathematics Learning Difficulties in Using Concepts

Based on the results of the documentation study and interviews, Figure 3 shows that among students S1 through S10, eight students (namely S2, S3, S4, S5, S6, S8, S9, and S10) exhibit learning difficulties in applying conceptual knowledge within the topic of fraction operations. These eight students are unable to correctly perform the calculations for addition and subtraction of fractions, or they do not understand the concept of the least common multiple (LCM) (KPK) a prerequisite for solving addition and subtraction operations on fractions.

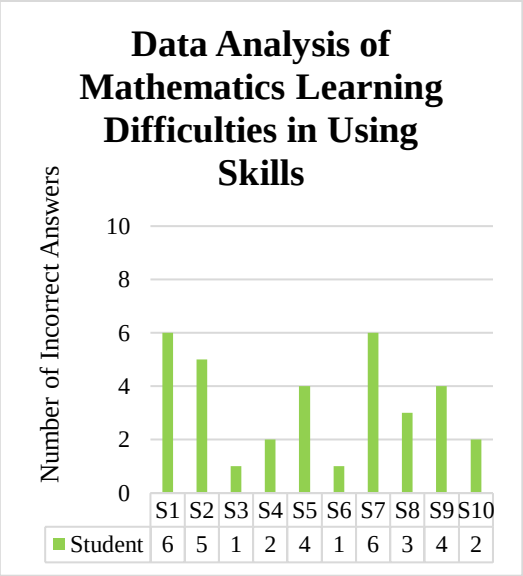
3) Description of Findings on Mathematical Learning Difficulties in Using Principles



Grafik 3 Data Analysis of Mathematics Learning Difficulties Using the Principles

Based on the documentation study and interviews, Figure 4 reveals that among students S1 through S10, two students namely S5 and S6 exhibit learning difficulties in applying principles in the topic of fraction operations. Both of them fail to appropriately relate the concept of fractions to the relational structure of arithmetic operations involving fractions.

4) Description of Findings on Mathematical Learning Difficulties in Using Skills



Grafik 4 Data Analysis of Mathematics Learning Difficulties in Using Skills

Based on the documentation study and interviews, Diagram 5 indicates that all ten students (S1 through S10) experience learning difficulties in applying skills within the topic of fraction operations. None of the ten students correctly follow the proper procedure when solving fraction problems, or they solve the problems without using the correct formula for fraction arithmetic.

Discussion

1. Difficulties in Using Facts

In fieldwork, the researcher conducted interviews (as reported above) and also carried out a documentation study, both of which were analyzed to identify mathematical learning difficulties based on the mathematical object (in this case, fact) in the domain of fraction arithmetic for Grade V students at SD Negeri Morkepek. The learning difficulties related to using factual knowledge were observed in students S3, S6, and S9. These three students could not translate story problems into correct symbolic fraction forms or write the problems using appropriate fraction notation. This is evident from their formative daily-test

(UH Formative) documents: they solved story problems by writing sentences rather than converting them into numbers or the correct fraction symbols. Furthermore, interviews with S3, S6, and S9 revealed that they struggled to write fractional numbers accurately. The teacher also confirmed these difficulties during the interview, validating the students' statements. From these findings, it is clear that these three students experience mathematical learning difficulties in using facts: they have trouble formulating the core of a mathematical problem using correct symbols and notation in the form of fractional numbers. This aligns with Jordan's theory, as cited in Yeni (2015: 4), which defines mathematical learning difficulty as the inability to solve relatively abstract problems related to numbers. Furthermore, this notion is supported by the theory of Wandini and Oda (2019: 20), which states that the difficulties experienced relate to the abundance of symbols, signs, and foreign terms. Such difficulties strongly contrast with the thinking habits of many learners, who are more accustomed to concrete objects. In the context of difficulties in using facts, the condition manifests as students' inability to correctly employ agreed-upon mathematical symbols, signs, and unfamiliar terminologies in fraction arithmetic.

2. Difficulties in Using Concepts

Mathematical learning difficulties in employing conceptual knowledge in the domain of fraction operations were observed in students S2, S3, S4, S5, S6, S8, S9, and S10. These eight students are unable to properly solve addition and subtraction problems involving fractions according to the underlying fraction concept. Conceptual calculation in addition and subtraction requires equalizing denominators specifically by determining their least common multiple (LCM) before

performing the operation. Based on the documentation study, these eight students added or subtracted denominators directly, without first making the denominators the same or finding the LCM of the denominators to be operated on. This implies that they have not mastered the prerequisite conceptual knowledge of fraction operations, namely determining the LCM. Interviews with these students confirmed that they indeed struggle to compute the LCM and have difficulty solving fraction addition and subtraction problems. In addition, the Grade V teacher affirmed that students' conceptual understanding of the LCM is still far below expectations. From the above findings, it can be interpreted that these eight students experience mathematical learning difficulties in using concepts because they are not able to recall the prerequisite concept of LCM that they had previously learned. This is consistent with the theory of Wandini and Oda (2019), which posits that student difficulties in the cognitive domain relate to knowledge including the ability to remember previously learned material (concepts, processes, methods, and structure). Weaknesses in remembering these concepts prevent students from correctly solving mathematical problems.

3. Difficulties in Using Principles

Mathematical learning difficulties in applying principles were identified in students S5 and S6, particularly on item number 8 of the test. Both students struggled to correctly connect the concept of fractions with the relational structure of fractional arithmetic operations. This is evidenced by the documentation of their work on the formative test: neither S5 nor S6 demonstrated mastery of the multiplication principle, specifically in adjusting the position of a denominator in a fraction during the operation.

Moreover, in solving problems, S5 failed to apply the correct order of operations: she prioritized addition over multiplication when working with mixed-fraction expressions. These issues are consistent with the teacher's observations made during interviews: both S5 and S6 frequently face difficulty in solving mixed fraction operations. It can be concluded that these students encounter problems because the item (no. 8) demands the use of multiple interrelated conceptual principles for example, the concept of order of operations, division, and addition of fractions but they fail to interconnect these concepts in a coherent and conceptually accurate manner. This aligns with Wandini and Oda's (2019) theory of mathematical principles, which are statements expressing the validity of relationships among several mathematical concepts. In mathematics, principles often take the form of theorems or laws: a theorem is a logically formulated statement whose truth can be demonstrated. In the context of learning difficulty, students' inability to correctly relate different formula concepts indicates a failure to apply principles in the correct relational form.

4. **Difficulties in Using Skills**

In Grade V, all ten students (S1 to S10) exhibited mathematical learning difficulties in applying skills in the domain of fraction operations. The documentation study shows that none of these students solved fraction problems according to the established procedures or using the correct formulas: they failed to follow the step by step method when working out their answers. This is evident in the students' formative test work, where many responses consist of simple answers without showing the proper method or reasoning. Interviews with S1-S10 further revealed that they struggle to use the correct calculation steps, often

responding without a clear or correct procedural structure. Their teacher confirmed this by noting that these students frequently submit their assignments late, often because they do not understand the correct steps or how to perform the fractional operations. From these results, it is evident that these students lack procedural fluency: they cannot execute the correct procedure for fraction arithmetic, nor can they write down a well-structured final answer. This is consistent with Wandini and Oda's (2019) theory, in which skill refers to the mathematical procedures sequences of steps or methods used to complete tasks. Their difficulty lies in their inability to employ the proper procedures and formulae, resulting in poor or incomplete final solutions

E. Conclusion

Based on the findings of this research, mathematical learning difficulties are significant obstacles for students when engaging with mathematical problems, especially in terms of their understanding and application of core mathematical objects. In the case of the Grade V students at SD Negeri Morkepek, the following difficulties were identified in the topic of fraction operations, categorized by the type of mathematical object: Facts: Students struggle to write the core of a mathematical problem using correct fraction symbols and notation, Concepts: Students are unable to recall and apply the prerequisite concept of the least common multiple (LCM), which is essential for performing addition and subtraction of fractions; this results in incorrect fraction computations, Principles: Students fail to connect different conceptual elements such as division, addition, and the proper order of operations into a coherent relational structure appropriate for fraction operations, Skills: Students cannot carry out the procedural steps correctly; they often do not use the correct formula, or they fail to follow the correct order of operations, leading to incorrect or poorly structured solutions.

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