

## **Analysis of Mathematics Learning Difficulties in V Graders of Elementary School of Fraction Material in Terms of Students' Cognitive Level**

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### **Abstract:**

This study aims to analyze the difficulties in learning mathematics in V graders of elementary school in terms of students' cognitive level. This study uses qualitative methods which took class V as subjects based on the classification of high subjects, medium subjects and low subjects. The data taken through learning outcomes, interviews and documentation. The results in this research can be concluded that (1) high subjects (AA) and (NF) do not meet all indicators of difficulty, this is evidenced that high subjects (AA) and (NF) don't have any difficulty in understanding concepts, principles or formulas and in solving fraction problems. (2) Medium subjects (LU) and (YL) did not meet the two indicators of difficulty. It can be seen they don't have any difficulty in understanding concepts and applying fractional principles, but they have problems in solving fractional problems in the form of stories. (3) Low subjects (MN) and (BA) fulfill all indicators of difficulty in learning mathematics fraction material by experiencing difficulties in understanding fraction concepts, fraction principles and solving fraction problems. Teachers can implement fun learning if they recognize students' characters and learning styles, use appropriate media or teaching materials, start and end learning with something interesting and fun.

**Keywords:** difficulties; mathematics; fraction

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## **Introduction**

Mathematics is an exact science that studies formulas, symbols, and numbers which have the aim of making students able to deal with various changes and developments in their daily life so that they have a broad mindset in various sciences. (Widyasusanti et al. 2022). Mathematics learning in elementary schools discusses various kinds of basic learning materials such as addition, subtraction, division, and multiplication. One part of learning mathematics is about fractional material. Fractions are part of something whole about the denominator and numerator that represent the value of the fraction (Heruman 2012). Fractions consist of one or more equal and larger parts of a whole (Indrawati and Suardiman, 2020).

Fraction material in elementary schools generally contains a variety of simple basic mathematics material, but there are still many students who think that mathematics is a difficult subject. (Alfiyah et al. 2021). Learning mathematics will be easy if planning is done before the learning process to achieve good learning objectives (Hasanah et al. 2021). In the process of learning mathematics, it is necessary to plan the learning process so that it goes as expected to avoid obstacles in the learning process (Alfiyah et al 2021). Barriers experienced by students with various characteristics in learning to the difficulties of interrelated factors (Utami and Cahyono 2020). Factors that affect students' difficulties in learning mathematics are caused by internal factors such as learning attitudes, learning motivation, health conditions, and sensory abilities. While external factors that influence such as the use of instructional media, school facilities and infrastructure, family environment, and associates (Andri et al. 2020).

There are various problems in learning mathematics that need further evaluation, one of which is the personality of the teacher as educator in guiding the learning process. Based on the results of Leli Sholihatunnisa's 2018 research that the low quality of personal, pedagogic, personality, and social competence of mathematics educators is one of the problems in mathematics learning (Sholihatunnisa et al. 2018). This causes students to easily feel bored and afraid when learning mathematics, because the teacher still dominates and the teacher's lack of creativity in the learning process (Wulandari 2020). A teacher needs to develop skills in teaching mathematics so that students become more interested and do not think that mathematics is difficult to learn (Permatasari 2021).

From the various difficulties experienced by students, one of them is difficult to understand the concept and difficult to determine between the numerator and denominator. The factors that cause difficulties in learning fractional material are due to a lack of understanding of the basic concepts of equivalent fractions, fractional operation algorithms, multiplication and division skills, and not calculating carefully (Yuni Astuty and Wijayanti 2005). There are many difficulties experienced by students in learning, one of which is in SD Negeri 13 Tempilang. Based on the results of interviews with the homeroom teacher for class V, in fractional material, there are still many students who do not understand the lesson being taught. This is evidenced by the achievement score which is still low under the Minimum Completeness Criteria (KKM).

Out of a total of 6 students, 2 students understood the material for learning mathematics in class V fractions. The low understanding of students in understanding mathematics learning in fractional material was the lack of teaching materials or supporting props in the learning process, the use of conventional learning models, as well as the lack of creativity from the teacher. This causes fifth-grade students to think learning mathematics is very boring and not interested in learning it, causing students to have difficulty understanding the concept of fraction material, the principle of applying problems, and most students have

difficulties in understanding questions in the form of stories. Some of the student's mistakes when solving fraction problems are not understanding fractions, errors in operations in calculations, errors in determining denominators, and confusion in algorithms (Ayu et al. 2021).

The difficulty of students in understanding the understanding of a learning material causes the results of learning to be categorized as low. In the process of learning mathematics fraction material in class V, the teacher only explains it on the blackboard without using an interesting learning model and learning media. Whereas learning media is a supporting tool in the learning process so that the material delivered by the teacher can be understood easily (Lestiyorini and Noviyanto 2019). A teacher does not just convey learning material to students, but the creativity and innovation of the teacher also need to be poured in to reduce learning difficulties, especially in mathematics. (Sholihatunnisa et al. 2018). For this reason, it is necessary to create a fun and enjoyable learning process both in terms of learning models and methods or the media used in the teaching and learning process.

### Research Method

This research method uses qualitative methods which are carried out in direct data collection and after completing data collection in a certain period (Sugiyono 2012). The subjects in this study were 6 students of class V SDN 13 Tempilang, namely students with high, medium, and low subject categories. The six students who have been selected according to the student's cognitive level are analyzed based on indicators in Bloom's Taxonomy (Erfan et al. 2020).

a. Remembering (C1)

At the level of remembering operational verbs include remembering, reading, mentioning, memorizing, composing, matching, selecting, stating, giving definitions, and reciting.

b. Understanding (C2)

Operational verbs in understanding include explaining, giving examples, summarizing, concluding, interpreting, telling, grouping, describing, explaining, differentiating, estimating, replacing, and interpreting.

c. Implementing (C3)

Operational verbs in this domain include implementing, determining, conceptualizing, determining, doing, connecting, adjusting, completing, using, demonstrating, and finding.

d. Analyzing (C4)

Operational verb analysis includes describing, finding, comparing, studying, associating, organizing, differentiating, diagnosing, contributing, selecting, detailing, separating, and selecting.

e. Evaluating (C5)

Operational evaluation verbs include proving, checking, criticizing, defending, validating, projecting, concluding, assessing, evaluating, suggesting, arguing, interpreting, and recommending.

f. Creating (C6)

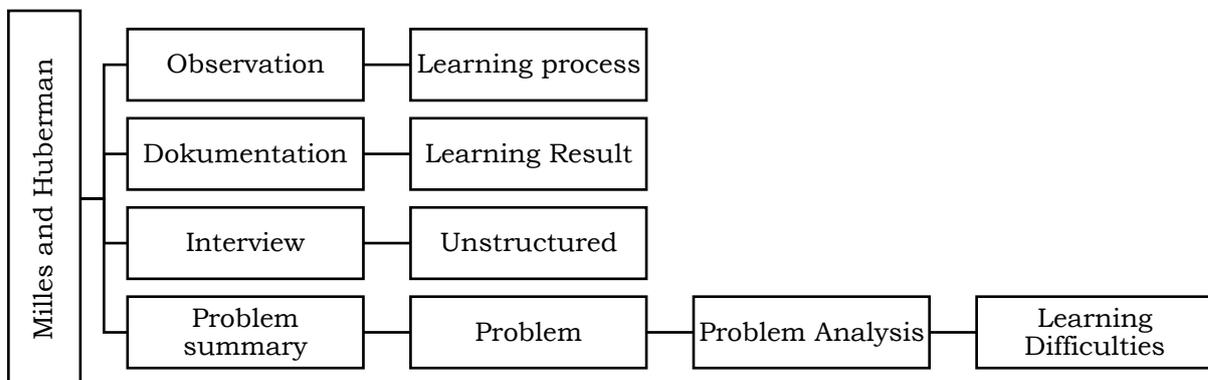
Operational creating verbs includes designing, combining, making, building, producing, creating, composing, creating, assembling, and compiling.

The Tabel 1 below is an identification of students' cognitive levels along with indicators in Bloom's Taxonomy.

**Table 1. Tingkatan Level Kognitif**

No.	Cognitive Level	Identification	Indicator
1.	High	Students who have skills in thinking logically	Evaluating (C5) and Creating (C6)
2.	Medium	Students who have skills in applying	Implementing (C3) and Analyzing (C4)
3.	Low	Students who have standard skills	Remembering (C1) and Understanding (C2)

Technique collecting data in this study uses interviewer, observation, and documentation of students' learning result. Technique in analyzing data uses Milles and Huberman which consists of four steps. First, data collection; data collected from student learning outcomes and interviews with students and teachers of class V SDN 13 Tempilang. The learning outcomes data were obtained from the recapitulation of fractional material values by the homeroom teacher, then the interviews conducted were unstructured interviews. The data that has been obtained is then analyzed and described to make it easier when reducing existing data. Second, data reduction, in data reduction means summarizing, choosing the main things, focusing on the important things and removing things that are not too important which are then reduced to get clear data and make it easier for researchers to conclude data regarding difficulties in understanding fractional material fifth grade students. The third presentation of data, the process of presenting data in this study is presented in the form of a brief description of the data that has been obtained from the previous stages. The fourth is drawing conclusions, in drawing conclusions resulting from the data that has been collected based on learning outcomes and interviews as well as an analysis of students' difficulties in learning mathematics material for class V fractions. The figure 1 below is a flowchart of data collection.



**Figure 1. Data Collection Techniques**

### Research Results and Discussion

This study seeks to answer questions or describe findings in the field with various existing theories. This discussion includes various processes experienced by students. After that, the researcher analyzed the difficulties in learning mathematics in class V fraction material at SD Negeri 13 Tempilang. The subjects of this study were 6 students who were classified as high, medium and low subject categories. This study discusses the analysis of the difficulty of learning mathematics in fraction material based on students' cognitive levels.

Based on the results of interviews with students and teachers that students with high subject categories tend to be easy to understand learning compared to

students in the medium and low categories. Students with high subject categories are able to explain the concept of fraction material, remember fraction formulas and are able to solve word problems regarding fraction material. Students in the moderate category can understand the concept of fractions and remember formulas about fractions, but are constrained in solving problems in the form of stories. Whereas students in the low category had difficulty understanding the concept of fractions, it was difficult to remember fraction formulas and had difficulty solving word problems about fractions.

The learning outcomes of students in the high subject category are that students understand the concept of fractions so that it is easy to answer questions related to fractions. Students with moderate subject categories already understand the concept but if the questions are in the form of stories in fractions students have difficulty solving them. Whereas students with low subject categories experience difficulties in all matters regarding fractions such as difficulties in learning concepts, formulas or principles of fractions and difficulty answering questions. The Table 2 is data from student learning outcomes in fractional material.

**Table 2. Students' Learning Outcomes**

No.	Initial	Score	Category
1	AA	80	High
2	NF	75	High
3	LU	65	Medium
4	YL	60	Medium
5	MN	40	Low
6	BA	45	Low

Mulyadi (2010) explained that if the results of the student learning process are low, then there are difficulties in learning. Based on the identification of the problem, there are difficulties in solving fractional material that has been studied by students (Pajarwati et al. 2019). In the learning process, ideally an educator must know the models and media used in order to create learning that is easily accepted by students. Learning process activities include observing, asking, communicating and analyzing (Nurdyansyah 2019). For this reason, an educator must know the conditions and potential understanding of students in learning so that the knowledge conveyed can be well received. The Table 3 is the acquisition of data from study results and interviews of fifth grade students at SDN 13 Tempilang based on high, medium and low subject classifications.

**Table 3. Analysis of Fractional Material Difficulties**

No.	Subject (Initial)	Indicator			Conclusion
		Fraction Concept	Fraction Principle	Question in form story	
1.	High subject (AA) and (NF)	Have no difficulty in understanding the concept of fractions being studied	Able to remember the principles and apply them to fractional math problems	There is no difficulty in solving questions about fractions, both questions that solve in the form of numbers and stories	High subjects (AA) and (NF) are already capable of understanding concepts, principles and solving word problems about fractional material. However (NF) sometimes got fooled by word problems

					because they were not careful when reading story problems about fractions.
2.	Medium subject (LU) and (YL)	No difficulty in understanding the concept of fractions	Understand the principles and provisions regarding fractions	Having difficulty solving story problems	Medium subjects (LU) and (YL) did not experience difficulties in understanding the concepts and principles of fractions, but had difficulties in solving word problems. Here is an example of a fraction story problem. In a village lived Javanese, Madurese and Sundanese. The Javanese make up $\frac{5}{8}$ of the population, the Sundanese make up $\frac{3}{16}$ , and the rest are Madurese. What is the share of the Madurese population in the village?
3.	Low subject (MN) and (BA)	Not yet able to understand the concept	Difficulty in remembering the principle of fractions	Not able to solve problems about fractions	Low subjects (MN) and (BA) have not been able to understand concepts, principles and solve fraction problems properly. This causes low learning outcomes regarding fractional material because the basic concept of fractions cannot be understood, causing continuous difficulties. But for simple fraction questions (MN) and (BA) they can do quite well.

Based on the Table 3, the difficulties in learning mathematics in class V fraction material at SDN 13 Tempilang experienced by fifth grade students on high, medium and low subject fraction material are as follows:

1. High Subject (AA) and (NF)  
High subjects have no difficulty in understanding concepts, principles or formulas and in solving fractional forms.
2. Medium Subject (LU) and (YL)  
The subject is having no difficulty in understanding concepts and applying fractional principles, but has problems solving fraction problems in the form of stories.

### 3. Low Subject (MN) and (BA)

Low subjects experience difficulties in understanding the concept of fractions, principles of fractions and solving fraction problems, causing continuous difficulties.

From these results it can be concluded that low subjects experience all categories of difficulties in terms of understanding concepts and solving story problems. This can be identified because of the low cognitive abilities of these students. Educators must be able to recognize the learning characteristics of their students in order to overcome the difficulties experienced by students (Maryati 2016). The low cognitive level of students in learning mathematics is due to the low interest in learning it. Various kinds of factors that cause low student interest in learning mathematics are due to factors from culture, the education system, assessment systems, parents or family, and factors from the teacher himself (Sukasno 2012). If students have an interest in learning, then they will explore the learning they are interested in, so that it is certain that their knowledge of something they are interested in will increase, this also applies to learning mathematics. (Friantini and Winata 2019).

The use of media in the learning process is also very necessary, so that every material studied by students can be understood properly. The selection of learning media depends on the material being taught and the characteristics of the students themselves as well as the conditions of the school environment that support the learning process (Sugriani 2019). The media chosen must also be consistent with the material and characteristics of the students, because if it is not appropriate it will cause more confusion for the students themselves (Lisnani 2019). To develop a media according to the situation and conditions that can be disseminated, it can go through four important stages. The four stages are needs analysis, product design, development, and implementation and evaluation. It is important to go through these four stages if the developed learning product is to be disseminated (Hamzah 2019). Some things that can be applied by a teacher in learning mathematics to make it more interesting and fun, namely:

1. Recognize the character and learning styles of students. This can make it easier for teachers to use methods or strategies that are appropriate to the characteristics and environment of the school so that students feel interested when learning takes place.
2. Provide a conceptual understanding of the material to be taught by inviting students to learn with concrete objects in the surrounding environment. Avoid forcing students to memorize formulas, but invite students to explore knowledge that is close to daily activities.
3. Using interesting and fun learning media so that it can become the center of students' attention in the learning process. This can make students focus on the material being taught, but must adjust the student learning environment.
4. Provide various practice questions or solutions, students can work independently, in groups or together with teachers and other students.
5. Begin and end learning with something interesting and fun, such as luring students to be curious about the learning that will be studied or you can also talk about interesting, newest and latest topics that are currently hotly discussed and then linked to learning.

### Conclusion

Based on the results of the study, it can be concluded that (1) high subjects (AA) and (NF) do not meet all indicators of difficulty, this is evidenced that high subjects (AA) and (NF) have no difficulty in understanding concepts, principles or

formulas and in completing fraction form. (2) Medium subjects (LU) and (YL) did not meet the two indicators of difficulty seen by not having difficulty understanding concepts and applying fractional principles, but having problems solving fractional problems in the form of stories. (3) Low subjects (MN) and (BA) fulfill all indicators of difficulty in learning mathematics fraction material by experiencing difficulties in understanding fraction concepts, fraction principles and solving fraction problems. Difficulties in learning mathematics can be triggered by various factors, such as factors from within the student including interest, motivation and body condition. While external factors include family factors, the surrounding environment, school culture, the assessment system, and the teacher's own factors. The many factors that affect difficulties in learning mathematics can be overcome by using media or teaching materials to support learning, not only that but the teacher must also always evaluate every process of the course of learning. This is also important to note because the teacher is the captain in the success of learning. With this research it is hoped that it can overcome some of the difficulties experienced by students and teachers in learning mathematics, especially in fractional material.

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