Challenges Faced by Students in Learning Mathematics: A Case Study at Sixth Grade of Primary School

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ABSTRACT

This study describes the difficulties faced by a sixth-grade student in learning mathematics. The student always complains when going to school on days when there are mathematics lessons. Whenever math assignments are given by the school, the student consistently asks their parents why math is so difficult to understand and what the purpose of learning math is. This research is a qualitative study with a case study approach. Data collection techniques involved observation and in-depth interviews. The results of the study can be summarized as follows: 1) Lack of mastery of the material in the fourth grade, 2) Insufficient prerequisite knowledge to comprehend the sixth-grade material, and 3) Inability to utilize technology for self-guided learning. Furthermore, the difficulties in learning math are caused by several factors: 1) Not receiving satisfactory and accurate answers from the teacher, 2) Lack of support and guidance from the family in the learning process, 3) Holding a negative perception of math due to dissatisfaction with previous learning experiences, and 4) Being unprepared to accept individual differences in teaching styles and approaches.

Keywords: difficulties in learning mathematics, causal factors, sixth-grade student

INTRODUCTION

Humans worldwide have been enjoying the advancements in technology, which have greatly influenced the current development of society. The internet and smartphones are notable outcomes of such technological progress. Almost everything has harnessed the power of the internet, including the field of education. Since the outbreak of the COVID-19 pandemic in Indonesia, nearly all schools and universities have relied on internet facilities for various purposes such as student admissions, learning processes, school examinations, and more. Furthermore, the demands of the 21st century include digital literacy skills, which necessitate early preparation for students in utilizing technology. According to Salsabila (2020), technology plays a crucial role in facilitating learning, particularly during the current COVID-19 pandemic. Moreover, Kurniawan and Wanto (2023) assert that educational technology will continue to play an increasingly significant role in the field of education. The future of education will be shaped by communication networks that enable interaction and collaboration. In the realm of mathematics education, numerous applications have been specifically designed to assist both teachers and students in learning specific topics. Examples of such applications include Photomath, GeoGebra, Math Tricks, Mathway, Math Games, Math Kids, and more.

The utilization of these mathematics applications in the learning process has yielded positive impacts. For instance, a study by Wafiqni and Putri (2021) found that using the Wordwall application in teaching counting resulted in an 88.04% success rate on exams. Similarly, Hanipa's research (2019) on using the GeoGebra application to teach statistics in mathematics showed that eighth-grade students' interest in learning improved significantly, with an average response rating in the "strong" category, totaling 69.46%. Despite the positive outcomes of utilizing mathematics applications, they are primarily employed in middle schools and beyond. Elementary schools still tend to rely on general applications such as interactive videos created using Canva or PowerPoint. This is due to the limited self-directed learning abilities of elementary school students, as they often depend on others, such as teachers, peers, and parents, for their learning.

Although technological advancements have brought about significant positive impacts, it is not guaranteed that all teachers or students can benefit from these technological advancements. Many students still face difficulties and experience academic failures, especially in subjects perceived as difficult, such as mathematics.

Based on the INAP data from 2016, the national average in Indonesia indicated low mathematical abilities among students, with 2.29% classified as "good," 20.58% as "satisfactory," and 77.13% as "poor." Additionally, according to data from the Ministry of Education and Culture (Christy, 2020), mathematics is considered the most challenging subject for students. The Program for International Student Assessment (PISA) in 2018 ranked Indonesia 73rd out of 79 countries in terms of mathematical achievement, while the Trends in International Mathematics and Science Study (TIMSS) in 2015 placed Indonesia 44th out of 49 countries. These data clearly demonstrate the low level of student achievement in mathematics. This poses a challenge for all individuals involved in the field of mathematics education and education in general.

This research focuses on a sixth-grade student who consistently expresses complaints about mathematics. The author is interested in conducting an in-depth investigation into the specific conditions experienced by this student, employing a personal approach to establish a sense of security that encourages openness and the sharing of personal experiences. The student frequently complains before going to school on days when there are mathematics classes and, more seriously, often absents themselves from school, providing various reasons. When given mathematics assignments, the student always questions their parents about why mathematics is so difficult to comprehend and what the purpose of learning mathematics is. In response, according to information from a mother, she only provide answers without wanting to know the reason why the child has such questions. "You have to study mathematics, and a smart child is one who can do mathematics. If there's something you don't understand, ask the teacher, and you don't need to feel ashamed or afraid," quoted the mother's response during the initial observation.

According to (Penabur, 2023), a psychological condition characterized by excessive anxiety related to mathematics is called Mathematics Phobia or Mathematics Anxiety. This is due to the child's inability to comprehend the mathematics lessons taught by the teacher. Individuals with mathematics phobia strongly dislike situations where they have to deal with the subject of mathematics. Meanwhile, according to (Yeni, 201 C.E.), learning difficulties are disorders that children experience related to internal and external factors, causing the brain to have difficulty following the normal learning process of receiving, processing, and analyzing information during learning. Based on these issues, the author is very interested in further exploring the difficulties faced by the child in learning mathematics and the underlying factors causing them.

METHOD

This research employed a qualitative descriptive approach with a case study design. According to J. W. et al. (2007), qualitative descriptive research with a case study approach is used to gain a deep understanding of unique problems to obtain new insights. The case study approach was chosen to explore the learning difficulties experienced by the subject and gain new insights into the factors contributing to these difficulties. The subject was asked several questions about their learning difficulties in mathematics and the root causes of these difficulties. The questions were unstructured and not scheduled but, adapted to the subject's circumstances and conditions. When the subject was in a happy mood and willing to engage in discussion, the researcher initiated the questions regarding the issues to be examined. Each question from the researcher and response from the subject were recorded and noted with specific codes.

The research subject was a sixth-grade elementary school student. The research was conducted from March to May 10, 2023, at the subject's place of residence in Bandung City. Since the second semester of the first grade until the first semester of the sixth grade, the subject consistently ranked first in class. However, starting from the fourth grade, the subject's mathematics scores began to decline despite still maintaining the top ranking. The subject belonged to a family where one of the parents, the mother, was a mathematics teacher, while the father was an employee in a private company in Central Sulawesi. The father returned home and gathered with the family three times a year during his vacation. The subject had two siblings, an older sister who was already in college, and a younger sister who was still a baby. Psychologically, the subject was closer to the father and often engaged in debates with the mother. The subject often studied with friends when there was homework from school, although during group study, the subject always took a more dominant role and explained more.

This research began by examining the mathematics grades recorded by the subject. Then, the daily grades obtained during mathematics lessons in the sixth grade were examined. After obtaining these data, the subject's mathematics notes, and printed mathematics books were reviewed. The research process involved becoming a friend who was ready to listen to all the subject's complaints about mathematics and assisting in explaining the material being studied at school during the research. This was followed by asking questions about the learning difficulties in mathematics experienced by the subject and the factors causing these difficulties.

According to the National Council of Teachers of Mathematics (NCTM, 2000), the fundamental abilities that students should possess in learning mathematics are problem-solving, reasoning, connections, representation, and communication. Additionally, according to the Ministry of Education and Culture (Permendikbud, 2016), the goals of mathematics learning in schools are as follows: 1) understanding mathematical concepts, describing the interconnectedness of mathematical concepts, and efficiently, flexibly, accurately, and precisely applying concepts or logarithms to solve problems; 2) reasoning about mathematical patterns, developing or manipulating mathematics in argumentation, formulating proofs, or describing mathematical arguments and statements; 3) solving mathematical problems, including the ability to understand problems, formulate mathematical solution models, solve mathematical models, and provide accurate solutions; and 4) communicating arguments and ideas using diagrams, tables, symbols, or other media to clarify problems or situations.

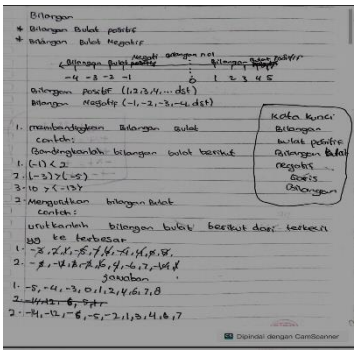
Furthermore, according to Yakub and Herman (2011), several factors contribute to children's difficulties in learning mathematics, including physiological factors, intelligence (IQ), motivation, interest, environment, teachers, and instructional media. Based on the mathematics learning goals from NCTM and Permendikbud, as well as the opinion of Yakub and Herman, the research was limited to several aspects inquired from the subject, namely: 1) the specific learning difficulties experienced in mathematics, 2) teacher-related factors, 3) family factor, 4) learning media factor. The questions were given through in-depth interviews while referring to the previously collected data, such as progress reports, daily grades, notebooks, and textbooks. The research was conducted without a fixed schedule but adjusted to the subject's availability. The interviews were guided by an interview script prepared by the researcher.

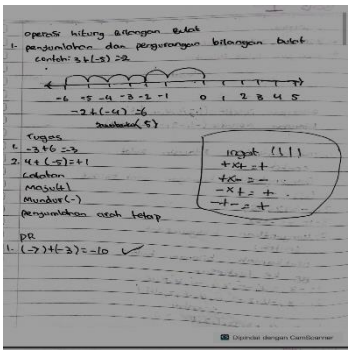
The data analysis in this case study followed a common analytical strategy prioritizing what and why to analyze (Creswell & Poth, 2018). The obtained results were categorized based on the aspects to be explored in this study.

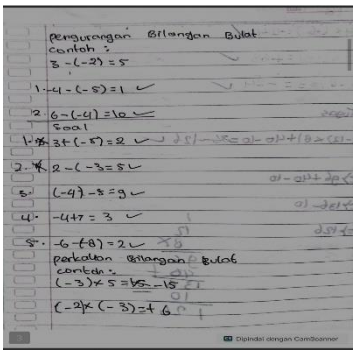
RESEARCH FINDINGS AND DISCUSSION

Mastery of Each Level's Material and Negative Perception

In the mathematics notebooks, the subject's notes are neatly written for every math class. Here are some excerpts from the respondent's notes:







Furthermore, the researcher interviews the respondents

Researcher : Your notes are very neat and comprehensive.

Respondent : Maybe because I rewrite everything the teacher writes on the board in my notebook.

Researcher : Does every teacher allow students to write everything from the board? Respondent: Sometimes yes, sometimes no. But when the teacher starts writing, I immediately write down everything.

Researcher : Do you pay attention when the teacher explains?

Respondent : If I haven't finished writing down everything the teacher writes on the board, I pay less attention to the teacher's explanations.

Researcher : Do you ask questions if there's something you don't understand in math class?

Respondent : Rarely. Sometimes I don't know which part to ask about because since fourth grade, I've started struggling with math. My math grades started declining, and since then, I've become reluctant to study math.

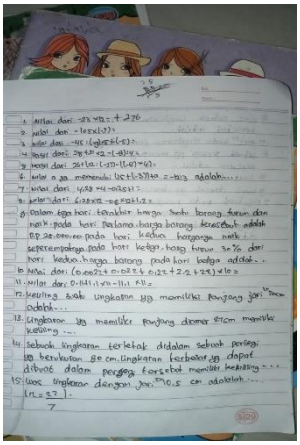
From the interview results, it can be observed that the subject's difficulty lies in a lack of mastery of the material from the previous levels, which has led to a negative perception of mathematics. The subject began expressing dissatisfaction with their math skills since fourth grade and developed a reluctance to study math. Each math topic in each grade is interconnected and builds upon the previous knowledge. Therefore, if a student does not grasp the math material from a previous grade, they will face difficulties in the subsequent grades.

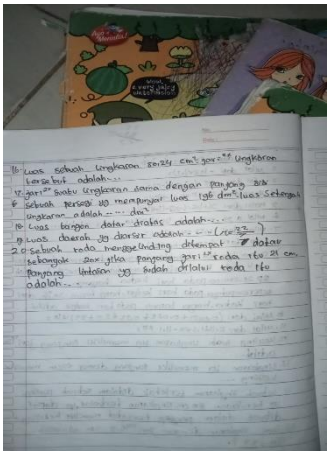
The scope of mathematics in elementary school (Mendikbudristek, 2022) includes concepts of numbers, arithmetic operations, pattern identification, plane and solid figures, measurement, and data interpretation. The curriculum (Kurikulum, 2013) further elaborates on the math content for each grade. Based on the scope and coverage of math in elementary school, it can be concluded that a student's ability in a previous grade will affect their performance in the subsequent grade. For example, the topic of fractions: in fourth grade, students are introduced to the concept of fractions, followed by fraction operations in fifth grade, and mixed operations and word problems involving fractions in sixth grade.

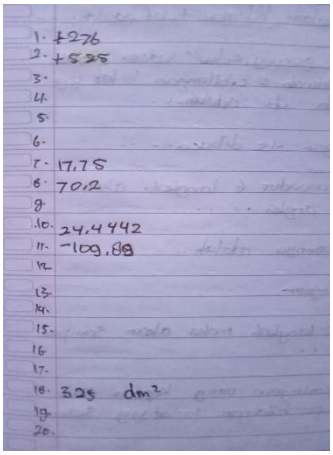
The subject's perception of mathematics started to develop when they became dissatisfied with their learning. According to Skinner, learning is a process of adaptive and progressive behavior adjustment. Dissatisfaction arises when the subject does not receive satisfactory answers while being in a state of curiosity and high interest in the subject matter being studied. Dissatisfaction with something can lead to a dislike for that particular thing. Therefore, the subject began disliking studying math due to the struggles faced in fourth grade. As their interest in learning math declined, their academic performance also declined. The research conducted by Sirait (2016) shows a significant relationship between learning interest and academic achievement.

Understanding Prerequisite Material

Based on the results of the mid-semester exam given at school, the author analyzed the given answers. The respondents did not answer questions related to mixed operations of integers, story problems, and geometry. Here are the results of the respondents' work:







Then the author conducted interviews with the respondents about each answer given.

Author	: Is this your work?
Respondent	: Yes.
Author	: Why were many questions left unanswered?
Respondent	: Because I didn't know how to solve them, I get really confused when doing math.
Author	: Why didn't you answer questions 3 to 6? They were all mixed operations of integers, right?
Respondent	: They were difficult, I always struggle when there are negative numbers involved.

From the respondent's answers, it is known that they have difficulty working on integer operations when negative numbers are involved. In other words, the respondent has a poor understanding of the concept of negative numbers. This is related to the lack of a strong foundation in prerequisite knowledge. According to Saepulrohman (2023), a lack of understanding of prerequisite math concepts can hinder the comprehension of more complex

mathematical concepts in the future. Mastering prerequisite material well allows students to avoid learning difficulties in the future and be better prepared to tackle more complex mathematical concepts, which can have a positive impact on their academic achievements. Awaludin et al. (2021) stated that concepts and principles are fundamental mathematical knowledge that students must master in order to solve mathematical problems correctly. In other words, students will struggle to understand higher-level material if they do not have a strong grasp of the material at previous levels.

Not Receiving Appropriate and Satisfactory Answers

Based on the collected report card grades, the researcher conducted in-depth interviews about the grade change in Grade IV. Here is an excerpt from the author's interview with the respondent:

Researcher : Looking at your report card grades from Grade I to Grade III, they were all high. Why did they decrease in Grade IV?

Respondent : Since I moved up to Grade IV, I didn't understand what the homeroom teacher taught, especially in math.

Researcher: How is that possible?

Respondent : Most of the time, we were given a printed worksheet and asked to write down the lesson and example problems. After writing them down, we were given different questions that were not in the book but similar to the example problems, and we were asked to solve them.

Researcher : Did the teacher never explain the math lessons on the board?

Respondent: Sometimes, but I didn't understand, and when I asked questions, sometimes the teacher answered and sometimes just said to treat it as homework.

Researcher: If the teacher said to treat it as homework, did they explain it again during math lessons?

Respondent: Never.

Researcher: Maybe the teacher forgot. Did you remind the teacher about the homework last week?

Respondent: No.

Researcher: What kind of teacher is the homeroom teacher?

Respondent: A new teacher.

From this interview, it is found that the respondent did not receive appropriate and satisfactory answers when learning math in Grade IV, and the respondent was not prepared for the teaching style and methods used by the teacher. Although it has been a common belief among students that math teachers have strict and intimidating faces, currently students focus more on how math teachers teach. If a math teacher is not engaging and clear in explaining the material, students become bored in class. Once the boredom sets in, students lose focus on learning math. Without focus, they won't understand the material. Moreover, math concepts are interconnected at each level. Research findings (Simamora, 2015) indicate that the higher students' perception of a teacher's pedagogical competence, the better their mathematics learning achievement. Another study (Wulandari, 2010) shows that both pedagogical and professional competence of teachers significantly contribute to the process and outcomes of mathematics learning. From these two research findings, it can be concluded that pedagogical competence and students' perception of a teacher's pedagogical competence have a significant impact on mathematics learning outcomes.

Family Support

The researcher continued to interview the respondents about the support they receive from their families when facing learning difficulties.

Researcher : If you have difficulty doing math assignments, is there anyone at home who helps you?

Respondent: Sometimes my mom, but she always gets angry.

Researcher: What do you mean by getting angry?

Respondent: When she tries to help, she teaches me how to solve it, but if I still don't understand after the explanation, she explains again while getting angry and often calls me stupid. Researcher: I see. Does your sibling help explain as well?

Respondent: Rarely. And sometimes my sibling says they don't know either.

From the interview results, it can be concluded that the respondent lacks support from the family when facing learning difficulties. As a result, the difficulties experienced by the respondent increase, and no solutions are obtained to address their learning difficulties. According to (Awaludin et al., 2021), factors influencing a child's learning difficulties include external factors and internal factors. Internal factors include intellectual aspects influenced by difficulties in abstraction, memory, problem-solving, motivation, and neurological functions. External factors include the environment, learning styles, and physiological factors. Furthermore, according to (Di & Pandemi, 2021), a child's learning without family support can hinder their learning activities and pose several obstacles, making it challenging to achieve academic success.

Utilization of Technology in Mathematics Learning

After obtaining information from the respondents regarding difficulties in understanding the teacher's explanations and lack of attention from the family, the researcher suggests some examples of YouTube videos and mathematics applications that can be used for learning mathematics. The researcher only provides the YouTube links and suggests downloading the applications without accompanying the respondents when they use YouTube and the applications for learning mathematics.

Image of YouTube video and application materials

After one week, the researcher conducts an interview with the respondents.

Researcher: Do you understand the materials after watching the YouTube videos or using the applications?

Respondent: I don't understand the explanations from the YouTube videos, and I have difficulty understanding the results from the application.

Researcher: Maybe it's because you didn't pay enough attention?

Respondent: I've watched them several times, but I still don't understand. I also struggle to comprehend the results shown in the application.

From the interview results, the researcher concludes that the sophistication of technology does not guarantee that an elementary school student can overcome their learning difficulties without guidance. Research findings (Tasaik & Tuasikal, 2018) indicate that elementary school students are not yet capable of learning independently, and they struggle to complete assignments on their own. Thus, the role of teachers in fostering students' independent learning skills is crucial. Moreover, the results of an engagement project (Sekolah et al., 2021) suggest the need for collaboration between parents and schools in monitoring the use of Android smartphones during online learning to prevent children from freely accessing prohibited websites. Therefore, based on the research and engagement findings above, it can be concluded that even though students are provided with YouTube video examples and mathematics applications, they may still face learning difficulties due to their limited ability to learn independently.

So, from the above research and engagement findings, it can be concluded that even though children have been provided with examples of YouTube links on how to solve mathematics problems and several mathematics applications, they will still experience learning difficulties because they are not yet capable of learning

independently. Furthermore, if they use Android devices without supervision, there is a possibility that they will access preferred websites rather than focusing on their studies.

CONSCLUSION AND SUGGESTIONS

Based on the research findings and discussions, it can be concluded that the learning difficulties in mathematics experienced by the subjects are as follows: 1) Lack of mastery of the material in the fourth grade, 2) Very limited prerequisite knowledge to study the material in the sixth grade, and 3) Inability to utilize technology for learning without guidance. Additionally, the learning difficulties in mathematics are caused by several factors: 1) Not receiving accurate and satisfying answers from the teacher, 2) Insufficient support or guidance from the family in learning, 3) Holding a negative view towards mathematics due to dissatisfaction with the learning process, and 4) Inability to adapt to individual differences and teaching styles of teachers. It is important to note that this study did not delve into the difficulties associated with all topics. It is recommended that future research explores the specific learning difficulties experienced by students in each topic to identify the various challenges faced in elementary school.

Based on the mathematics learning goals from NCTM and the Ministry of Education and Culture (Permendikbud), as well as the opinions of Yakub and Herman, the research focused on several aspects inquired from the subject, namely: 1) specific learning difficulties experienced in mathematics, 2) teacher-related factors, 3) family-related factors, and 4) instructional media factors. The questions were presented through in-depth interviews while referring to the previously collected data, such as progress reports, daily grades, notebooks, and printed books. The research was conducted without a fixed schedule but adapted to the subject's conditions. The interviews were guided by an interview script prepared by the researcher.

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