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Describe The Understanding of Mathematical Concepts in Class VII Junior High School Students Regarding Objective Questions

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Abstract

Understanding concepts is an important foundation for understanding principles and theories in various fields, including mathematics. Therefore, to understand principles and theories, students need to have a strong understanding of the concepts that form the basis of these principles and theories by using tests. The focus of this research is to analyze students' solutions to problems by looking at their ability to understand mathematical concepts in one of the state junior high schools in Pesisir Bukit district, Sungai Liuk. This type of research is qualitative research with a descriptive approach. Participants in this research were 16 class VII students. Data collection was carried out using concept understanding ability test instruments, observation and documentation studies. The results of the research show that there are differences in students' ability to understand mathematical concepts in solving the multiplechoice questions given.

Keywords: Ability, Mathematics, Multiple Choice, Understanding Of Concepts

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INTRODUCTION

Mathematics is a basic science that holds an important role in shaping students' thinking patterns. This is because mathematics has a strong and clear connection between its concepts which allows someone to think rationally. Apart from that, in the development of science and technology, mathematics also has an important role. Therefore, to master and create technology requires strong mastery of mathematics from an early age. Because it has a big role, mathematics is studied from lower education levels to higher education levels (Aldi & Yarman, 2019). Education has a very important role in human life. Because with education, humans will have a different outlook and direction in life clearer and more focused. Therefore, good education is good education not only prepare students for a profession or position, but how education can prepare students to be able solve problems they will face in everyday life and able to apply it under any conditions (Siagian, 2016).

Evaluation is the process of collecting data and information needed to evaluate the extent and how learning has taken place, with the aim of making assessments and identifying improvements needed to improve learning outcomes. Evaluation is an inseparable part of the learning process, which cannot be separated from the teaching process. Implementing evaluation in the educational context is very important, because evaluation functions as a tool to measure students' achievement of the teaching materials or materials that have been taught. Thus, evaluation helps in providing an accurate and convincing picture of the achievement of learning objectives (Idrus L, 2019).

Perkins and Uno (2009) argue that understanding is not just the ability to remember information, but rather a person's ability to use that information meaningfully. Understanding can be measured by several indicators, such as students' ability to explain concepts in their own words, their ability to apply information in new contexts, their ability to make new analogies and generalizations. Comprehension is different from simply memorizing or reading information without actual understanding. Thus, the level of depth of a person's understanding can vary, and true understanding refers to a person's ability to explain a concept or information with words that are different from those contained in the source text. Understanding concepts is an important foundation for understanding principles and theories in various fields, including mathematics. Therefore, to understand principles and theories, students need to have a strong understanding of the concepts that form the basis of these principles and theories. Therefore, it is crucial if students do not have a good understanding of mathematical concepts, as this will have a serious impact on their ability to understand more complex principles and theories (Diana et al., 2020). Students' ability to understand mathematical concepts is an important aspect in learning, where this understanding is not only limited to recognizing and understanding concepts, but also being able to express them again and apply these concepts with flexibility, accuracy, efficiency and precision in solving mathematical problems (Yani et al., 2022).

Kiswanto, Rahman, & Sulasteri explained that when a student understands the concept being taught, he can explain the concept in his own language and overcome problems or questions related to the concept. One of the causes of students having difficulty working on mathematics problems is difficulty understanding concepts and a lack of good reasoning skills in solving the questions or tests given. Therefore, it is important to have diagnostic tests that can measure the extent of students' understanding of mathematical concepts, because diagnostic tests are an effective tool for assessing students' understanding of mathematical concepts, which are often poorly understood when given tests (Mutmainna et al., 2018).

Understanding concepts is a person's skill in conveying the knowledge they have acquired, both orally and in writing, with the aim that other people can fully understand what they are conveying (Diana et al., 2020). Understanding concepts is a person's skill in conveying the knowledge they have acquired, both orally and in writing, with the aim that other people can fully understand what they are conveying (Suraji et al., 2017). Understanding concepts involves mastering learning material, where students not only recognize and know the concept, but are also able to explain the concept again in a simpler way and are able to apply it (Fajar et al., 2019). Understanding concepts has a crucial role in the mathematics learning process. If students misunderstand basic concepts, it is difficult to correct them, especially after the concepts have been applied in solving mathematical problems. Expertise in understanding concepts makes it easier to improve students' mathematical procedural knowledge (Hutagalung, 2017).

Understanding mathematical concepts is one of several mathematical skills that is expected to be achieved through the mathematics learning process. This involves students' ability to demonstrate their understanding of the mathematical concepts being studied, explain how these concepts relate to each other, and be able to apply concepts or algorithms fluently, precisely, efficiently, and accurately when solving various mathematical problems. Meanwhile, according to Skemp and Pollatsek, there are two types of conceptual understanding that need to be considered, namely instrumental understanding and rational understanding. Instrumental understanding refers to understanding mathematical concepts in isolation, which involves memorizing formulas for simple calculations. Meanwhile, rational understanding implies the development of schemes or structures that can be applied in solving more complex problems. An idea, fact, or mathematical procedure will be understood thoroughly when connected by a strong network of connections (Kusumawati, 2008).

The ability to understand concepts is essential for every student. By understanding concepts, students can develop their thinking skills, starting from logical thinking, gathering information, linking ideas, to analyzing evidence to solve a problem. Apart from that, understanding concepts also has an important role in assessing the level of achievement of other competency standards. The ability to understand mathematical concepts is a very crucial aspect in the mathematics learning process. In learning mathematics, students' clear understanding of mathematical concepts is very important, because this becomes the basis for them to solve various types of problems and apply this knowledge in real-world situations. Inconsistency in understanding concepts will result in students having difficulty in overcoming various mathematical problems (Yanala et al., 2021).

The ability to understand concepts is considered the key to solving various mathematical problems, including everyday situations. The hope is that in learning mathematics at school, students can achieve a deep understanding of the significance of mathematics learning, and be able to understand the concepts of the material being taught (Oktaviani & Haerudin, 2022).

According to Jusniani, to examine students' ability to understand mathematical concepts in solving mathematical problems, including integers, algebra, linear equations, and kpk, we need to analyze the results of their work. This involves evaluating the way students answer the questions and their understanding of related concepts.

In analyzing students' solutions to math problems, we need to see whether they can:

1. Identifying relevant concepts: Can students recognize the concepts that need to be used in answering questions, such as integers, algebra, linear equations, or least common multiple (LCM).
2. Applying concepts correctly: Are students able to apply these concepts correctly and consistently in solving problems.
3. Understand the solution process: Can students explain the steps they took in solving the problem and provide logical reasons behind each step.
4. Evaluating and correcting errors: Are students able to identify errors if they make mistakes in solving and make appropriate corrections.
5. Generalization of concepts: Whether students can apply the concepts they learn in different or similar situations.
6. Provide accurate solutions: Finally, we need to assess whether students managed to achieve the correct answer according to the question requirements.

By analyzing students' solutions to various types of math problems, including integers, algebra, linear equations, and LCM, we can identify the extent to which they understand these concepts and where possible conceptual understanding problems lie (Septian et al., 2020).

In lessons about Least Common Multiples (KPK), students are expected to be able to identify multiples of a number, find common multiples of two numbers, and determine their smallest value. However, many students face difficulties in understanding the concept, because they do not have an adequate understanding of multiplication. This limitation makes it difficult for them to determine multiples of a number and ultimately understand the concept of KPK. If these obstacles are not addressed, they can have a negative impact on student learning outcomes, and mathematics learning goals will not be achieved. Apart from that, in KPK learning, the teacher's teaching of the material still uses a conventional approach (Nurhayanti et al., 2021).

In learning whole number operations, to facilitate students' understanding, they can use an approach that only involves the number line. Students who have difficulty understanding may only acquire abstract concepts because it is difficult to imagine the use of a number line in whole number calculation operations. One alternative medium that can help concretize the use of a number line in whole number calculation operations is to create a path like a number line (Wahyuningtyas, 2015).

Based on the descriptions above, the researcher aims to analyze students' solutions to mathematics problems, namely integers, algebra, linear equations, and LCM to see their ability to understand mathematical concepts.

METHODS

This research is qualitative research with a descriptive approach. The qualitative approach is a scientific method that aims to obtain data information for certain purposes. The research location is one of the state junior high schools in Pesisir Bukit district, Sungai Liuk. Participants in this research were 16 class VII students. Data collection was carried out using concept understanding ability test instruments, observation and documentation studies. The mathematical problem solving test given is in the form of 30 multiple choice questions. Multiple choice questions are a form of test that has one correct or fastest answer. Multiple choice tests are usually implemented by many teachers in evaluation activities after the learning process. A multiple choice test consists of an information section (stem), and a possible answer or

alternative section (options), consisting of one correct answer, namely the answer key and several distractors (Aminah, 2013).

FINDINGS AND DISCUSSION

The results of the research showed that of the 16 seventh grade junior high school students who took the mathematical problem solving ability test by giving 30 multiple choice questions, the questions contained several materials, namely integers, algebra, linear equations and LCM. One multiple choice question contains a score of 3.3. The following is a table of student scores in understanding mathematical concepts. The following table shows the results of students' understanding of mathematical concepts.

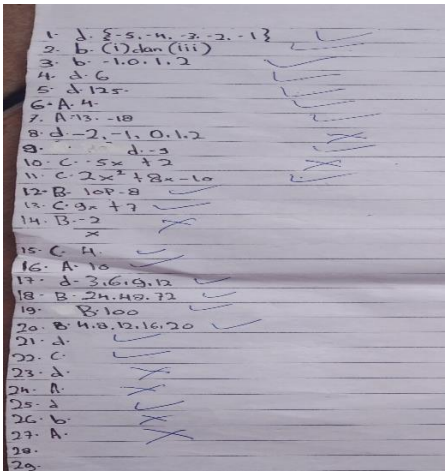

Figure 1. Student Completion Results a

In picture (a), the student was able to answer 27 questions out of 30 multiple choice questions where this student answered 20 questions correctly and answered 7 questions incorrectly. This student was able to give examples of whole numbers and when looking for answers the student was able to determine the location of whole numbers on the number line but this student did not understand the order of largest and smallest negative integers. In algebra problems and linear equations, this student is able to carry out operations of adding, subtracting, and multiplying integers including mixed operations, but this student still does not understand the division operation of an equation and is still mistaken in solving operations for equations with one variable. In the LCM problem, this student was able to find multiples of a number or numbers, whether one digit or more.

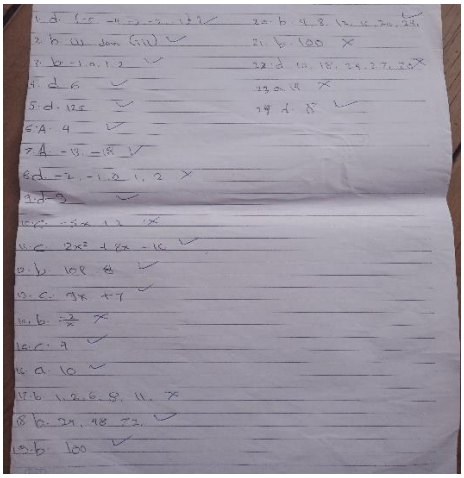

Figure 2. Student Completion Results b

In picture (b), the student was able to answer 24 questions out of 30 multiple choice questions where this student answered 17 questions correctly and answered 7 questions incorrectly. This student was also able to give examples of whole numbers and was able to determine the location of whole numbers on a number line, but this student did not understand the value of numbers in positive numbers and negative numbers. In algebra questions, the same as the student's results in figure (a). The student in picture (b) is able to carry out the operations of adding, subtracting and multiplying integers, including mixed operations, but this student still lacks understanding and does not understand how to solve problems using the division operation of an equation. In linear equation questions, this student only answered one question. In the KPK problem, this student is able to find the multiple of two numbers but this student is still unable to determine the multiple of three numbers and the student can determine the LCM of one number by limiting the LCM to two numbers.

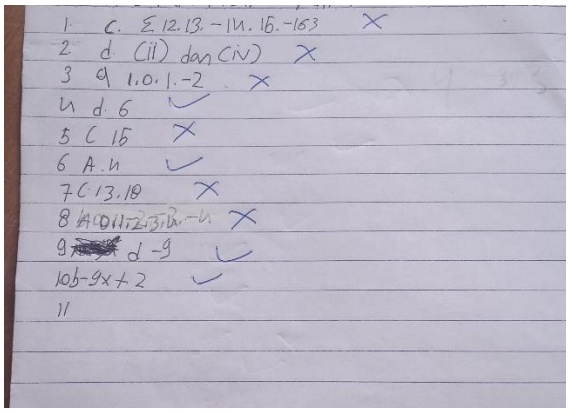

Figure 3. Student Completion Results c

In picture (c), the student was able to answer 10 questions out of 30 multiple choice questions where this student answered 4 questions correctly and answered 6 questions incorrectly. The student can perform operations of adding and subtracting from integers and students can calculate squares, roots and powers of integers. But this student cannot give examples of whole numbers, cannot determine the location of whole numbers on a number line, and cannot order the largest and smallest numbers from positive or negative numbers. For algebra questions, this student only completed two problems where this student was able to understand the properties of an equation and began to know how to operate addition in an equation.

Of the total number of students at SMP Negeri 7 Sungai Full, there were 3 student completion results where the students were different in solving the questions and with different grades.

DISCUSSION

Mathematics is a very important subject for all students, especially considering increasingly modern technological advances. In this era, critical, logistical and systematic thinking skills in mathematics are very necessary to meet the needs of the times (Komariyah et al., 2018).

Evaluation is a process that involves collecting, analyzing and interpreting information with the aim of assessing the extent to which students have achieved learning objectives (Magdalena et al., 2023). Evaluation or assessment basically has the aim of measuring the effectiveness and efficiency of learning activities, with the main focus on achieving predetermined learning objectives. The results of this evaluation then become feedback that is used to improve and develop the teaching and learning process in the future (Suardipa & Primayana, 2020). Junior High School (SMP) has a role as a basic level of

education which has the aim of laying the foundation of intelligence, knowledge, personality, noble morals and skills for living independently and continuing higher education. At this level, mathematics teaching aims to develop students' abilities to understand mathematical concepts, explain relationships between concepts, and apply concepts or algorithms flexibly, accurately, efficiently and precisely in solving problems (Mawaddah & Maryanti, 2016).

Errors in understanding concepts in mathematics learning can come from a number of factors, both from the teacher and student side. One factor for teachers is a lack of understanding regarding appropriate learning approaches and methods for delivering material. Apart from that, the teacher's inability to understand in depth the essence of the material presented can also trigger conceptual errors. Therefore, every teacher should have strong mastery of the material they teach. If teachers do not have an adequate understanding of concepts, then they will likely convey wrong information to students. Apart from that, the lack of variation in the use of learning media in the context of mathematics learning can also be a cause of conceptual errors. On the student side, errors in understanding concepts can also be caused by a lack of interest in mathematics subjects. This disinterest can result in students not focusing on the material being taught and ultimately not understanding the concepts well. Additionally, there are cases where students are more likely to memorize formulas or concepts than truly understand them. In situations like this, students may not be able to apply the concept in a different context (Novitasari, 2016).

Analyzing the ability to understand mathematical concepts from previous research, as carried out by Fajar et al. in 2019, is an effort to evaluate in depth students' ability to understand mathematical concepts. This research was carried out using description questions, and the results of the analysis grouped students into three categories, namely high, medium and low. The main goal is to understand how students from various categories face and solve given mathematical problems.

Along with the context of this research, there is another research conducted by Mutmainna et al. in 2018. The focus of this research is to identify students' conceptual understanding regarding objective questions. The approach taken involves a series of Tessmer model development phases, which include the preliminary stage, self-evaluation, prototyping stage (expert review, one-to-one, small group), and field tests. The results of this research provide not only students' conceptual understanding of objective questions but also produce quality criteria for test instruments. This research classifies students into three categories, namely students who understand the concept, students with misconceptions, and students who do not understand, providing a more detailed picture of the diversity of students' understanding in dealing with mathematical problems.

Thus, students' understanding of mathematical concepts can be explored through various evaluation methods, either using essay questions as in the research of Fajar et al. as well as objective questions as in the research of Mutmainna et al. The results of this research provide valuable insight into developing more effective learning strategies appropriate to students' varying levels of understanding.

CONCLUSION

From the research results above, it can be concluded that understanding mathematical concepts is a very important foundation for understanding principles and theories in various fields, including mathematics. The ability to understand mathematical concepts is a very essential element in the mathematics learning process.

And from the results of research on mathematics questions, namely integers, algebra, linear equations, and kpk which are in the form of multiple choices where the form of the test has one correct or fastest answer and is an evaluation activity after the learning process. The multiple choice questions were given to students to analyze the students' conceptual understanding

abilities in solving problem questions and there were three students who had different conceptual understanding abilities. The first student, namely in picture (a), has a high ability to understand concepts. Because this student has the ability to give examples of integers. They can also identify the position of whole numbers on a number line. In addition, students are able to perform addition, subtraction and multiplication operations on integers, including mixed operations. he can also look for multiples of a number or number, whether consisting of one digit or more. The second student, in picture (b), has moderate conceptual understanding because the student already has the ability to give examples of integers and identify the position of integers on the number line. They are also proficient in carrying out addition, subtraction, multiplication of integers, including mixed operations. Apart from that, students are able to find multiples of two numbers. The third, namely in figure (c), has a low ability to understand concepts because the student has the ability to carry out addition and subtraction operations with integers. They can also calculate squares, roots, and powers of whole numbers. These students also have an understanding of the properties of an equation and begin to understand how to perform addition operations in the context of an equation.

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