

# Analysis of Understanding Mathematical Concepts in Junior High School Students on Integer Operation Material

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**Abstract.** This study aims to determine the conceptual understanding of students in junior high school in solving historical problems. The subjects of this study were students of Class VII Lamongan. The method used in this research is qualitative. Data collection techniques used are test and interview techniques. After the tests and interviews, there was 1 student with good grades, 2 students with good grades, and 1 student with bad grades, the average was 70%. Students with good category understanding can represent a concept in various mathematical representations, reformat a concept, and classify objects according to certain properties according to the concept. Eligible students can represent a concept in various mathematical representations and reformat a concept. And low-ability students can only present concepts in various forms of mathematical representation.

**Keywords:** *analysis, concept understanding, mathematics.*

**Abstrak.** Penelitian ini bertujuan untuk mengetahui pemahaman konseptual siswa sekolah menengah pertama dalam menyelesaikan masalah sejarah. Subjek penelitian ini adalah siswa Kelas VII Lamongan. Metode yang digunakan dalam penelitian ini adalah kualitatif. Teknik pengumpulan data yang digunakan adalah teknik tes dan wawancara. Setelah dilakukan tes dan wawancara, terdapat 1 siswadengan nilai baik, 2 siswa dengan nilai baik dan 1 siswa dengan nilai buruk, rata-ratanya adalah 70%. Siswa dengan pemahaman kategori yang baik dapat merepresentasikan suatu konsep dalam berbagai representasi matematis, memformat ulang suatu konsep, dan mengklasifikasikan objek menurut sifat-sifat tertentu sesuai dengan konsep tersebut. Siswa yang memenuhi syarat dapat merepresentasikan suatu konsep dalam berbagai representasi matematis dan memformat ulang suatu konsep. Dan siswa berkemampuan rendah hanya dapat menyajikan konsep dalam berbagai bentuk representasi matematis.

**Kata kunci:** *analisis, pemahamankonsep, matematika.*

## 1. Introduction

Mathematics is one of the basic sciences of life. Mathematics plays an important role in everyday life because mathematics can shape students' thinking. Learning mathematics is an exact science that requires more understanding than memorization (Suswigi dan Zanthy 2019). Mathematics consists of various concepts that are arranged hierarchically, so understanding mathematical concepts is a very important part of the learning process. As stated by Skeel (Dahar, 2006: 62) suggests that the concept is a mental abstraction that represents a class of

stimuli. That is, the concept is an abstraction of some objects that have the same characteristics, to be classified or grouped. Another opinion from Bahri (2008: 30) says a concept is a unit of meaning that has several objects that have the same characteristics. Learning activities carried out by each teacher put more emphasis on memorizing and getting answers and submitting the answer completely to the teacher to determine whether the answer is right or wrong, so that students' understanding abilities are low (Yanti, Melati, dan Zanty 2019). Integer Operation. Integer operations are very important material because they are closely related to everyday life. Therefore, it is necessary to have good understanding skills, especially the ability to understand concepts in integer operations.

Conceptual understanding is one aspect of assessment in learning. Assessment of conceptual understanding is intended to determine the extent to which a student can accept and understand the basic concepts of mathematics that have been accepted by students academically. Understanding concepts in elementary school is important because mastering concepts makes math easier for students and is the key to taking lessons to the next level. Students are said to have understood a mathematical concept if the student has been able to explain the concept in their own words.

According to NCTM (Nurjaman dan Sari 2017) the ability to understand concepts can be achieved with the following indicators: a) reformatting a concept; b) Classifying objects according to certain properties according to concepts; c) Give examples and not give examples of concepts; d) Presenting concepts in various forms of mathematical representation; e) Develop necessary or sufficient conditions for a concept; f) the use and selection of certain procedures or operations; g) Apply concepts or algorithms to solve problems. In line with the opinion above, Bloom (Susanto, 2014: 6) defines understanding as to the ability to absorb the meaning of the material or materials being studied. Furthermore, Bloom (Siregar 2013) said that understanding includes goals, behavior, or responses reflecting an understanding of written messages contained in one communication.

In understanding mathematical concepts, it is often found that high-ability students can understand and explain the interrelationships between concepts and apply concepts quickly. (Annajmi, 2016:2) argues that students are more likely to understand mathematical concepts if they can explain concepts or repeat what they have been taught, use concepts in various situations, and develop many consequences of the existence of a concept. However, the low ability of students to solve mathematical problems related to understanding concepts is a problem in learning mathematics. By mastering and understanding concepts, students will be able to identify and work on new, more varied questions (Rohana 2011:111). Unsteady understanding of concepts will result in students having difficulty in solving problems. Students are suspected of having difficulty in determining which formula to use in solving the problem if they only rely on memorizing the formula without understanding the concept. This often happens in most of the subjects of mathematics, one of which is the subject of the discussion of integers. Integers are one of the materials given at the junior high school level which discusses integer operations. An integer is a non-fractional number consisting of positive integers, zero, and negative integers, While in terms of operations, operations on integers include addition, subtraction, multiplication, and division.

## **2. Methods**

This research was conducted at the Learning House, precisely in the City of Lamongan. The research was carried out during the 2021/2022 academic year in the odd semester. The method used in this research is qualitative, namely, research that investigates the circumstances, conditions, or other things mentioned, the results of which are presented in the form of a research report. In the opinion of Sugiyono (2015: 15), Qualitative research is a research method based on the philosophy of procrastination, the researcher acts as a key instrument for researching the condition of natural objects. 4 students with high, medium, and low learning levels.

Variable is a symptom that varies, which is the object of research. The research variable is the object of research or what is the point of attention of a study. Based on the problem formulation or definition, in this study, there is only one variable that involves understanding mathematical concepts. In this study, the tools or tools used are tools in the form of guided tests and interviews to improve information about students' abilities in understanding mathematical concepts in arithmetic operations on integers. Tools to test the understanding of mathematical concepts are measured from indicators that (1) present concepts in various mathematical representations, (2) present a concept, (3) classify objects according to certain properties (conceptually), (4) apply concepts or solving algorithms problem.

The data collection process in this study took place in two stages, namely the test stage and the interview stage.

### **2.1. Test**

The test is an instrument or procedure used to find or measure something in the atmosphere, in a way and according to predetermined rules. This test was created to obtain information related to students' initial mathematical abilities. Giving tests as a tool to collect data on mathematics learning outcomes for class VII at the Learning House on integer operations. The test is an assessment intended to measure the knowledge, abilities, or talents of an individual or group. For this reason, in this study, researchers used tests to measure students' understanding of mathematical concepts in solving problems math integers The initial activity was prepared for a set of tests in the form of a description with 2 story questions that met the indicators of understanding mathematical concepts in the integer operations material.

### **2.2. Interview**

According to SuharsimiArikunto, interview or interview is a method or method used to get answers from respondents by way of one-sided question and answer. The interview is an instrument to collect data in the form of several questions asked orally. The interview consists of questions that will be asked to the subject at the time of the interview. Considering that this research was conducted to describe students' understanding of mathematical concepts in solving given problems, this interview was intended to add and enrich information about

students' learning abilities to understand mathematical concepts in integer operations.

The research instrument used a mathematical understanding test with a descriptive/essay written test and an unstructured interview. The index of mathematical clarity used in this study is the ability to reformat the concepts studied. The ability to classify objects based on whether they meet the requirements of a concept, the ability to apply concepts algorithmically, and the ability to relate different concepts. The data analysis technique is by assessing the answers to the tests that have been carried out, using the formula:

The score of students' understanding ability refers to opinions (Huda dan Kencana 2013), which can be seen in Table 1 below this.

**Table 1.**A score of Students' Comprehension Ability.

Score (in percent)	Category
86 – 100	Very Good
76 – 85	Good
60 – 75	Fair
55 – 59	Less
<54	Very Poor

### 3. Results and Discussion The

The data for this research is in the form of written test scores in the form of a description/essay with a maximum of 2 questions in the form of a story that refers to indicators of student understanding. In addition, 3 students with high, medium, and low academic achievement were also interviewed to get good, sufficient, and poor comprehension test results. The indicators used to describe students' understanding of mathematical concepts include (1) presenting concepts in multiple mathematical representations, (2) restating concepts, (3) analyzing object classes according to certain properties according to concepts, (4) applying concepts or solving algorithms. problem. The table below presents the results of the comprehension tests conducted by grade VII students.

**Table 2.**Results of Students' Concept Understanding Ability Test.

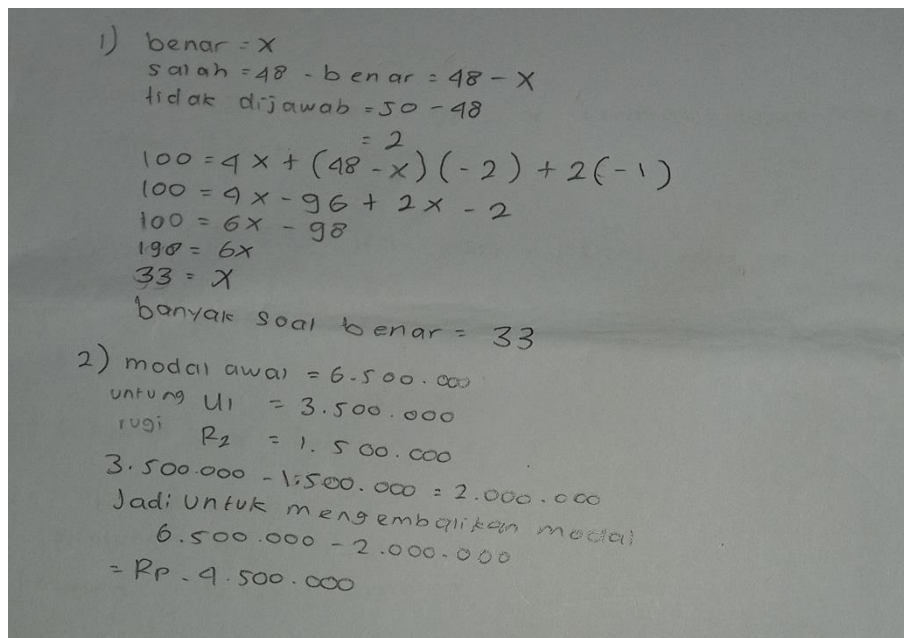
No	Research Subject	Score (in percent)	Category
1	SK1	85	Good
2	SK2	72	Enough
3	SK3	69	Enough

4	SK4	54	Poor
	<b>Average</b>	<b>70</b>	<b>Enough</b>

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Based on Table 2, there is 1 student with good grades, 2 students with sufficient scores, and 1 student with less value. The result of the conceptual understanding test in the form of a complete activity history documentary as shown in the table shows an average score of 70%, so it is included in the sufficient category.

The following are some of the tests carried out by students.



1. Ability to restate concepts that have been learned.  
In the student's answer, it can be concluded that the student has understood what is being asked in the question. After being interviewed, it turned out that the students had understood the question.
2. Ability to classify objects based on whether or not the requirements that make up the concept are met  
Problem number 1: In the math ability test, the total score is determined by rules, a score of for correct answers, for wrong answers, and unanswered questions. . Of the questions given, Adel only answered questions and got a score of. Many of the questions that Adel answered correctly were... These problems can be solved with integer operations. From the students' answers above, students were able to restate the concept by writing down what was known in the problem but did not write down what was asked in the question. This shows that students are quite good at restating a concept.  
After being interviewed, it turned out that students forgot to write down what was asked in the question.
3. Ability to apply concepts in an algorithmic manner

Question number 2: Mr. Deni is a household furniture seller, he uses an initial capital of. On the first day of selling, he made a profit. However, the next day he suffered a loss of so, to return the initial capital he had to get a profit of...

From the answers of the students above, the students were able to make mathematical models correctly and could calculate the answers correctly. After being interviewed students can explain how to calculate using the mathematical model that he made.

In addition, students with a sufficient level of understanding can explain (1) represent a concept in various mathematical representations, (2) restate a concept, but cannot classify objects based on certain properties with concepts and apply concepts or problem-solving algorithms.

Students with poor understanding can only explain the representation of concepts in several mathematical representations, cannot reformat a concept, classify objects according to certain properties according to concepts, and apply concepts or problem-solving algorithms.

Based on some of the research findings above, several things are in line with previous studies, (Ananda 2018) Conceptual error, this error is made because students do not understand well what is being asked in the question so that when solving questions students tend to misinterpret what is being said. prompted by the question. This is due to the lazy habit of students in reading, especially in reading story questions. Students are also less careful in reading the questions so they do not understand what is being asked.

This is by research findings (Hikmah, Roza, dan Maimunah 2019) which showed that low-performing students struggled with prior knowledge or prior understanding of the subject. This is by the results of (Rahmawati 2019) that the difficulties faced by students are writing mathematical symbols, writing wrong terms, not using the correct method, errors in identifying final results, and drawing conclusions.

#### **4. Conclusion**

The results of the analysis show that the understanding of mathematical concepts in integer operations is sufficient. Of the students who got a score, 1 student was able to understand the concept of good grades, 2 students were in good grades, and 1 student was in bad grades with an average percentage score of 70. This shows and supports based on the results of indicators which together with the description of the results of the evaluation of indicators, has all similar indicators which are sufficient to conclude that the understanding of mathematical concepts. In integer operations, the documentation from Class VII SMP at RumahBelajarLamongan is quite complete. These results indicate that students' understanding of mathematical concepts needs to be improved. (Utari, Fauzan, dan Rosha 2012) To improve this situation, teachers must be able to create a learning process that can actively involve students and help apply concepts to their real-life experiences so that they understand concepts better and can see the benefits of mathematics.

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