

## Analysis of Student Misconceptions in School Integer Theory Using Display Cards at Elementary School Level

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### ABSTRACT

Learning mathematics is a branch of various arithmetic and is dubbed The Queen of Science. Misconceptions or misunderstandings of concepts in transferring information obtained by students into their framework are things that are often encountered in elementary schools. Misconceptions that occur in students will result in errors also for concepts at the next level. Several previous research results show that there are many misconceptions experienced by students in understanding concepts and solving integer problems. This study aims to analyze various misconceptions that are often done by students in solving integer problems and to improve student learning outcomes on integer material through positive and negative number card props in addition. The type of research used is qualitative research, which aims to get a deeper understanding of the forms of misconceptions experienced by students in solving problems related to integers so as to be able to describe the causes of misconceptions at MI Bustanul Ulum Batu City on integer material. The subjects used in this study were third grade students who had misconceptions about integers.

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### 1. INTRODUCTION

Mathematics is a science of arithmetic which is very important for everyone. Because by studying and understanding the concept of learning mathematics from an early age, it can help humans in solving problems in everyday life. As important as learning mathematics is to learn and understand the concept of learning [1], absolute learning in education must be mastered by students by understanding the correct concepts. Because it is so important to understand mathematical concepts.

Mathematics is one of the subjects that must be followed by students from elementary school to high school. Mathematics is learning that contains exact science (exact) and abstract material. Mathematics is described as learning by manipulating numbers and solving problems in academics and everyday life. Mathematics as the basis of science is the foundation of various sciences and the world of work. Learning mathematics is not only intended so that students are able to perform arithmetic operations of addition, subtraction, multiplication and division, but students are able to use mathematics in problem solving.

The purpose of learning mathematics in elementary schools in general is for students to be able and skilled in using mathematics. In addition, learning mathematics can put pressure on reasoning in the application of mathematics. According Depdiknas (2001:9), intellectual abilities, especially high-level abilities of students;

(2) Forming students' ability to solve a problem systematically; (3) Obtaining high learning outcomes; (4) Train students in communicating ideas, especially in writing scientific papers; and (5) Developing students' character. The purpose of learning mathematics at the SD/MI level is for students to recognize simple numbers, simple arithmetic operations, measurements, and fields [2].

The concept of learning mathematics has a goal as stated in Permendiknas no 22 of 2006 which is to understand mathematical concepts, explain the interrelationships between concepts and apply concepts or algorithms widely, accurately, efficiently and precisely in problem solving. However, the abstract nature of mathematics causes many students to have difficulty understanding various mathematical concepts. Because many students do not build their own knowledge of mathematical concepts but tend to memorize existing concepts without knowing the meaning contained in them, even though they have been conveyed by the teacher but are not well received by students and are often called misconceptions [3].

According to Piaget, elementary school students are in the concrete operational phase. Mathematics learning at the elementary school level should be a strong foundation for students, especially the planting of basic mathematical concepts based on the characteristics themselves. Because a strong mastery of basic mathematical concepts is needed by students. If the basic concepts given are not appropriate and accepted by students, it is very difficult to change the concept of the student's mind. So in other words, teachers must continue to innovate, be creative in learning by conducting classroom action research, observing processes, analyzing results and thinking about and making improvements to learning so that learning objectives can be achieved.

Given that the current results of mathematics learning still do not meet expectations, it is necessary for continuous efforts to improve learning. Thus the role of the teacher in providing and providing a meaningful learning experience is very necessary. How a teacher finds the best way to convey teaching materials, so that students can understand and remember them longer. The problem faced is that many students complain that mathematics is a difficult subject, so most students do not like mathematics. So that their interest in learning is low and the desired learning outcomes are not achieved and mathematics lessons are identical with counting activities which make some students dizzy.

This misconception can be in the form of an initial conceptual error, in which there is an incorrect relationship between the concepts, and the presence of a wrong idea or view. According to Ikram, Suharto, & Setiawani [4] argues that students are said to have misconceptions if students make repeated mistakes. After digging deeper, it turns out that many students experience misunderstandings so that students are constrained in understanding and interpreting and implementing a concept contained in mathematics.

This misconception is common in learning mathematics, including multiplication numbers. This is in line with the results of research [5] which shows that there are errors in the concept of multiplication numbers that are often experienced by students. There are many misconceptions that are often found, one of which is students' misconceptions in multiplying odd and even numbers. This is considered very difficult for students. For example, when students are given a question like the following: "Compute the multiplication fraction of  $3 \times (-4)$  !". Some students answered that  $3 \times (-4) = -12$  (Pinahayu, 2015). Furthermore [5] stated that there were errors made by students in solving problems of powers, roots and logarithms consisting of conceptual errors and procedural errors, and there were many more studies that found misconceptions experienced by students in the multiplication number material.

Learn [6] revealed that misconceptions are categorized into four types of misconceptions, namely: misconceptions about letter understanding, notation misconceptions, generalization misconceptions, and rule application misconceptions. Meanwhile, Nutasari, Jamiah, & Suratman (2017) revealed that the misconceptions experienced by students include generalization misconceptions, specialization misconceptions and notation misconceptions. Meanwhile, according to Cangelosi [7] misconceptions also occur in exponent material, namely language misconceptions, grouping misconceptions and notation misconceptions. Based on the theory of the types of misconceptions, the types of misconceptions taken in this study are generalization misconceptions, notation misconceptions, specialization misconceptions and language misconceptions [5].

## 2. RESEARCH METHOD

The research method used in this study is a qualitative research method. The qualitative research method is a research method used to examine the condition of natural objects, where the researcher is the key instrument (Sugiono 2017), based on the object of study, this research includes library research. Library research is a research conducted by collecting data, information, and various other data contained in the library [8]. Sources of data used in this study are books, journals, articles, and other scientific works that are relevant to the object of study in this research. The subject of this research is learning mathematics in addition and subtraction of integers in the lower grades of elementary school (SD/MI).

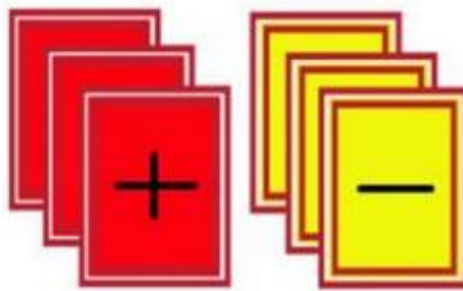
The data collection technique in this research is documentation. Furthermore, to process and analyze the data, the author uses the content analysis method, which is an analysis of the content that focuses on the interpretation of cognitive theories of elementary age children [9]. Sources of data used in this study are books, journals, articles, and other scientific works that are relevant to the object of study in this research. The subject of this research is theories related to the cognitive development of elementary age children and their implications in teaching and learning activities. The data collection technique in this research is documentation. Furthermore, to process and analyze the data, the author uses the content analysis method, which is an analysis of the content that focuses on the interpretation of cognitive theories.

### 3. RESULTS AND DISCUSSION

Based on the problems that researchers found that the use of teaching aids in elementary schools is still low, so learning is still conventional. Student learning outcomes are influenced by various factors supporting the success of learning, including teaching aids used by teachers during the learning process. Likewise with student learning outcomes in Mathematics in class III SD Negeri Mojorejo 01 Batu where researchers use number card props

Props are part of the media, therefore the term media needs to be understood first before discussing the meaning of teaching aids further. Teaching media are defined as all objects that mediate the learning process, which can be in the form of software or hardware. Based on its function, teaching media can be in the form of teaching aids and facilities. Teaching aids are teaching media that contain or convey the characteristics of the concepts being studied [10].

Use of Props in Integer Operations The props referred to in this paper are cards made of cardboard. Red cards represent positive integers, while yellow cards represent negative integers.



Picture 1 Color Card Media Number

Cards consist of two sets of rectangular cards with two different colors, red represents positive numbers and yellow represents negative numbers. The rules are as follows:

1. Make an agreement to assign a positive card (red card) and negative card (yellow card).
2. Define the number zero as all paired cards, meaning that the number of red cards is the same as the number of yellow cards.
3. Define a positive integer as the number of unpaired red cards.
4. Define a negative integer as the number of unpaired yellow cards.

#### Operasi Penjumlahan

Is to combine two sets. The rules:

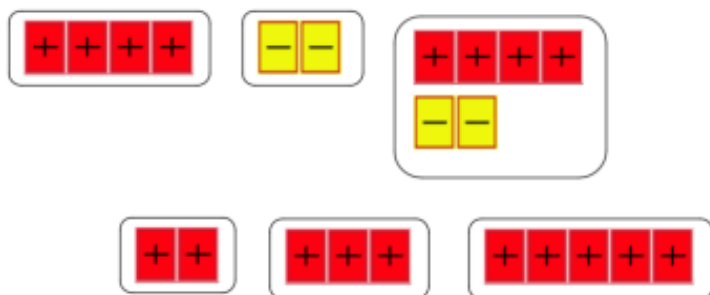
<div style="border: 1px solid black; background-color: red; color: black; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 2px;">+</div>	= dibaca 1 (positif satu)
<div style="border: 1px solid black; background-color: yellow; color: black; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 2px;">-</div>	= dibaca -1 (negatif satu)
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<div style="display: flex; align-items: center; justify-content: center; margin: 2px;"> <div style="border: 1px solid black; background-color: yellow; color: black; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 2px;">-</div> <div style="border: 1px solid black; background-color: red; color: black; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 2px; margin-left: 5px;">+</div> </div>	= Netral (0)

sum of two positive integers can be illustrated by combining two groups of positive red cards. For example,  $2 + 3$  is tantamount to combining 2 red cards (+) with 3 red cards (+).

**Based on the demonstration, it can be seen that the sum is positive, namely 5 or  $2+3=5$ .**

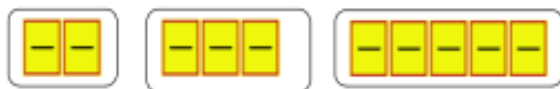
The sum of different signs, namely positive integers and negative integers, can be illustrated by combining two groups of cards, each group consisting of a type of card that represents the summed numbers. For the addition of integers with different signs, the result of the sum is the number of cards that do not have pairs. Because the positive and negative card pairs have a value of zero [2].

For example,  $4 + (-2)$  is the same as combining 4 red cards (+) with 2 yellow cards (-).



The results of the different sums of the above cards produce 2 pairs of zero cards and a positive card. So it can be concluded that  $4 + (-2) = 2$ .

The addition of two negative integers is basically the same as the addition of two positive numbers. Because the numbers that are added up have the same card color. For example  $-2 + (-3)$  means combining two groups of 2 yellow cards with 3 yellow cards.



The result of the sum of the cards above produces 5 negative cards. So it can be concluded that  $-2 + (-3) = -5$ .

After doing the test experiment. The results showed that from 2 class III children who took the pretest and posttest, there were significant differences in scores. Whereas the pretest scores have not used teaching aids in the positive and negative number cards are lower than the post test results after using the positive and negative number card props. The conclusion obtained is that the results of research on the effect of using Kotif card props on students' mathematics learning outcomes, there is an effect of using Kotif card props on students' mathematics learning outcomes in integer arithmetic operations material.

### 3.1. Learning Mathematics and Integers Using Aids

#### 1. Teachin Learning Mathematics

In the education process in schools, teaching and learning are two interrelated activities and cannot be separated from each other. Learning is an activity for each individual which is marked by a change in the person who does it. Changes as a result of the learning process are shown in various forms such as changes in terms of knowledge, attitudes and behavior, understanding, skills, abilities, abilities and other aspects that exist in the person who learns. This is in line with Hudojo's opinion, that learning is an active process in gaining new experience or knowledge so that it causes changes in behavior that are shown in various individual forms and lasts a lifetime. For example, after learning mathematics, students are able to demonstrate their knowledge and mathematical skills where previously they could not do it (Juwantara 2019).

According to Hudoyo, Mathematics is concerned with abstract ideas or concepts arranged hierarchically and deductive reasoning. This opinion emphasizes that the target of mathematics is more focused on basic ideas or concepts and logically arranged relationships so as to create links with abstract concepts. In the learning process students often have difficulty in solving math problems well. This happens because the facts, concepts and principles of mathematics are not well mastered, such as the subject of arithmetic operations on integers.

#### 2. Teaching Aids Props

Teaching aids Props can be interpreted as tools used by teachers as intermediaries in the teaching and learning process with the aim that the lessons given become clearer so that students will more easily understand and understand. According to Sudjana, teaching aids are a tool to educate or teach so that what is taught is easy for students to understand [11]. Furthermore, Usman said, teaching aids as audio and visual instruments are used to help the learning process become more interesting and arouse students' interest in exploring a material [12].

According to Roseffendi, there are several functions of using teaching aids in mathematics teaching, including the following:

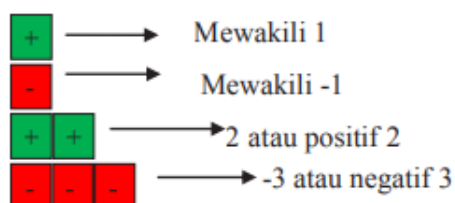
- a.
- b. With the use of teaching aids, children will be more enthusiastic about participating in math lessons, so that their interest in learning mathematics will be even greater. Children are happy, stimulated, then interested and have a positive attitude towards learning mathematics.
- c. By presenting abstract mathematical concepts in a concrete form, students at lower levels will more easily understand and understand.
- d. Children will be aware of the relationship between learning and the objects around them, or between science and the natural surroundings and society.
- e. Abstract concepts presented in concrete form, namely in the form of mathematical models can be used as research objects and can also be used as tools for researching new ideas and new relationships [13].

The use of teaching aids in learning mathematics is very meaningful because mathematics is abstract and elementary school students still tend to focus on concrete. Therefore, in learning mathematics, it is necessary to use teaching aids to further concrete ideas and concepts that are abstract. Using teaching aids in teaching mathematics means providing a learning experience for students starting from something concrete to something abstract.

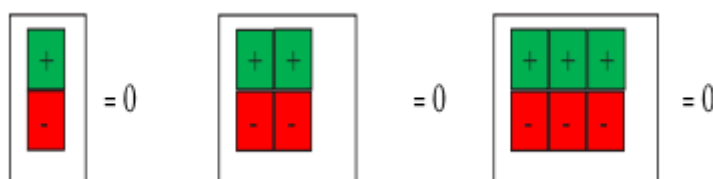
### 3.2. Integers and their Operations

Integers are an extension of whole numbers. The set of integers consists of the set of natural numbers, namely  $\{1, 2, 3, 4, \dots\}$  hereinafter referred to as positive integers, zero, and the set of opposites of natural numbers, namely  $\{-1, -2, -3, -4, \dots\}$  hereinafter referred to as the set of negative integers [14].

The props referred to in this paper are cards made of cardboard. Green cards represent positive integers, while red cards represent negative integers.



and so on. The zero is represented by a pair of positive cards and negative cards.



## 4. CONCLUSION

From the results and discussion, it is concluded that the types of misconceptions in solving addition and subtraction problems of integers in terms of the lack of understanding carried out by students are: (1) Wrong in operating sign operations when met with number signs, (2) Wrong in changing story problems into mathematical sentences, (3) False positive or negative sign of numbers in the final result of the arithmetic operations carried out, (4) The factors that cause misconceptions are students do not understand the material for adding and subtracting integers, students are less able to understand the steps solving story problems, students are not careful in doing calculations, students are embarrassed to ask the teacher when they have difficulty in learning the material during the learning process.

The causes of misconceptions found in students come from within the students themselves, including lack of interest in learning, incomplete reasoning, poor student numeracy skills, class conditions that are not conducive to learning, monotonous learning methods, and unattractive learning media.

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