

Three Tier Test in Analyzing the Misconceptions of Mathematics learning

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Abstract. The purpose of this research is to describe how students' misconceptions about the material of flat shapes in the fourth grade of SDN 050644 Bahorok on 2020/2021. Misunderstanding of the concept or the principle will have an impact on how students' ability to understand the learning material. Formal learning is a long continuous process must start with the right concept. This research was conducted by using descriptive methods. The research was carried out in the fourth grade of SDN 050644 Bahorok. The research instrument used the three-tier test or the test with three levels. The results showed that 29% of students have misconceptions, 12% of students have false positive misconceptions, and 14% of students have false negative misconceptions.

Keywords : Misconceptions, *Three Tier Test*, Flat Shape.

1 Introduction

Learning occurs when there is an interaction between the individual and the environment, both the physical environment and the social environment. The learning process must be carried out effectively where learning can take place smoothly, directed, and in accordance with the learning objectives. Learning objectives are not only the assignment of subject matter, but the process of changing students' understanding in accordance with the objectives to be achieved also needs to be considered. However, the current teaching view is only limited to conveying that knowledge. The success of a teaching process is measure by the extent to which students can master the subject matter presented by the teacher.

Education is a process of preparing human resources to run the life and fulfill life goals more effectively and efficiently. Thus, we can mean the education is an effort that is deliberately made to students to improve the personality and potential possessed by students. In mathematics, students are not only required to be fast in counting, but what is equally important is how to instill mathematical concepts in students. This is important so that students are able to understand the true meaning of mathematics. Mastery of student material is often hampered due to misunderstanding of concepts or misunderstanding of principles. Initial concepts that are not in accordance with the conception of science brought by students will have an impact on the formal learning process.

Various definitions of the concept have been put forward by experts. In the Ministry of Education and Culture's online KBBI (2016) a concept is a design, idea or understanding that is abstracted

from concrete events. The term concept comes from the Latin *conceptum* which means something that is understood. In general, the concept can be interpreted as a general picture to interpret an idea or understanding that is abstract. Misconception is an understanding of a concept that is not in accordance with the scientific understanding accepted by experts in the field of science (Abidin et al, 2019, p. 9).

Mathematics is a universal science that underlies the development of modern technology and is important in various disciplines and is able to develop human thinking power (Ganesis and Banjarnahor, 2017, p. 59). According to Mailani (2015, p. 9) there are many misleading myths about mathematics, these false myths play a major role in making some people feel allergic or even dislike mathematics. Flat shape is a geometric shape that is flat (flat) which has two dimensions, namely length and width but does not have height and thickness.

According to the Ministry of Education and Culture's online KBBI (2016), an investigation into an event (writing, deed, and so on) to find out the actual situation (cause, situation, and so on). Students' initial understanding is not always in accordance with existing theoretical concepts. Misconceptions will have a negative impact on the learning process. With students' misconceptions, it will be difficult to accept learning materials. Students who experience misconceptions if they are not detected will cause continuous conceptual errors. The existence of this misconception is caused by many things, both errors from the teacher, errors from learning resources, errors from learning methods, and errors from students themselves. In this case, students will find it difficult to distinguish one flat shape from another flat shape or one formula with another formula if students already have the wrong flat shape concept.

To find out the misconceptions that occur in students, we can do various ways including using concept maps, essay tests, interviews, class discussions, multiple choice, multiple choice with reasons (two tier test), to multiple choice with reasons accompanied by the level of confidence in the answers given (three tier test). The use of the three-tier test can make it easier to uncover misconceptions that occur in students well. With this test it is possible to identify the possibility of students answering by guessing, understanding concepts or the occurrence of misconceptions (Maulini et al. 2016, p. 43).

Three tier test is a test with three levels. The first tier is the usual multiple choice. The second level is the reason as reinforcement for the answer choices at the first level. The third level is the level of confidence in the answers given. From the combination of answers at these three levels, the percentage of students who understand, misconceptions, misconceptions (false positive), and misconceptions (false negative) will be obtained, the correct answer because of luck or the correct answer but not confident, and do not understand the concept.

2 Method

This research was conducted at SDN 050644 Bahorok, which is located at Jl. Ampera, Pekan Bahorok Village, Bahorok District, Langkat Regency, North Sumatra Province. This research was conducted in the even semester of the 2020/2021 academic year. This type of research is descriptive research with a qualitative approach. Qualitative research is often called a naturalistic research method because the research is carried out in natural conditions (natural settings).

Because the research principle is measurement, it is necessary to have a good measuring instrument. This measuring instrument is referred to as a research instrument. The research instrument is a tool used to measure the observed natural and social phenomena (Sugiyono, 2019, p. 146). The instrument used in this study was a test instrument in the form of 15 items of flat material. Data analysis is an effort to process data into information so that the characteristics or properties of the data can be easily understood and useful for answering problems related to research activities (Hartati, 2017, p.73). From the data obtained, the data were analyzed based on the combination of answers starting from the first level, second level and third level.

From the three tier test data, it was analyzed and calculated the percentage of misconceptions in each item. The researcher then concludes from the data obtained in the form of the results of the analysis of misconceptions that occur. For the classification criteria, the researcher refers to the classification of the results of the three-tier test according to Arslan, Cigdemoglu & Moselay (2012, pp. 1667-1686) in Istiyani, Muchyidin & Raharjo (2018, pp. 228).

Tabel 1. Classification of the results

First Grade	Second Grade	Third Grade	Category
True	True	confident	Understand of concept
True	False	confident	Misconcept (<i>false positive</i>)
False	True	confident	Misconcept (<i>false negative</i>)
False	False	confident	Misconcept
True	True	Unconfident	Lucky guess, lack in confidence
True	False	Unconfident	Lack understand of concept
False	True	Unconfident	Lack understand of concept
False	False	Unconfident	Lack understand of concept

3 Result and Discussion

The three-tier diagnostic test given to the fourth-grade students of SDN 050644 Bahorok, totaling 20 people, namely 10 male students and 10 female students. From the implementation of the test, a combination of student answers was obtained on each question with three levels (three tier test). The identification results from the results of student answers, it is known that as many as 29% of students understand the concept, as many as 55% of students experience misconceptions, 2% of students answer correctly because they guess lucky or are not confident, and as many as 14% of students do not understand the concept. For the classification criteria, the researcher refers to the classification of the results of the three-tier test according to Arslan, Cigdemoglu & Moselay (2012, pp. 1667-1686) in Istiyani, Muchyidin & Raharjo (2018, pp. 228).

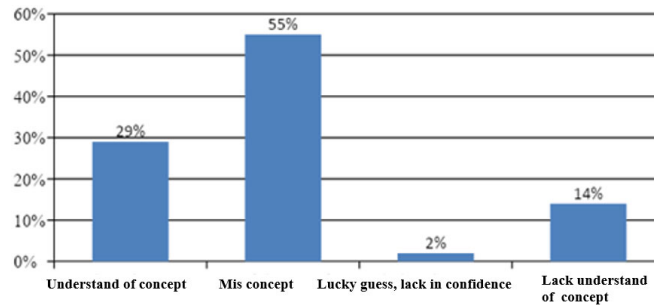


Fig 1. Diagram of level of student understanding in Flat shape

From the level of student understanding, it is known that 55% of students have misconceptions. The misconceptions experienced by students are divided into 3 categories, namely misconceptions (conditions when students are not right in answering questions and give inappropriate reasons as well), false positive misconceptions (conditions where students answer correctly at the first level but cannot provide appropriate scientific reasons to strengthen the answer), and false negative misconceptions (conditions when students have determined the right reason but are careless in determining the correct answer at the first level). In each question, the level of misconception experienced by students in the flat wake material is different.

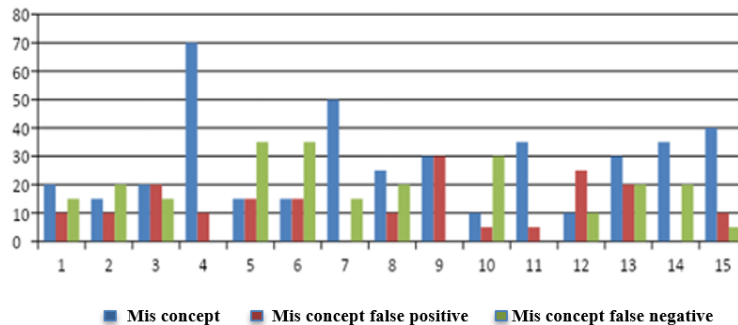


Fig.2. Diagram of level of Mis concept Every Item Question

This research has differences and advantages from previous relevant research, namely it can identify the occurrence of misconceptions more precisely and can be done in a more effective time. In addition, this study is able to identify misconceptions in a large number of students and can classify students' misconceptions without having to generalize to all students. The combination of answers from the three levels of the three-tier test in this study is the key in determining the level of students' understanding of the material being tested. The alternative solution presented by the researcher in this discussion is the result of a literature review that the researcher conducted on several previous relevant studies and has not yet been tested when the researcher conducts the research..

4 Conclusion

Based on the results of the research above, the following conclusions can be drawn.

- a. The results of the student test with the three tier test showed that as many as 55% of the 20 fourth grade students of SD Negeri 050644 Bahorok had misconceptions.
- b. Types of misconceptions experienced by students are as many as 29% of students have misconceptions, 12% are identified as having false positive misconceptions, and 14% are identified as having false negative misconceptions.
- c. The misconceptions that occur in students are found in each flat material.

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