

MISCONCEPTION ANALYSIS OF MATH CLASS VII USING THREE TIER-TEST

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Abstract:

This study aims to find out what misconceptions are experienced by students in mathematics material for class VII SMP and to find out what factors cause students' misconceptions in mathematics material for class VII SMP. This type of research is qualitative research using a descriptive method. The research subjects in this study were 8 students of class VII B students of SMPN 46 Makassar with data collection techniques consisting of three tier-test diagnostic tests, interviews, and documentation. Data analysis techniques in this study consisted of data reduction, data presentation, and conclusion drawing. The results of this study indicate that based on the results of the Three Tier-Test given to class VII B students, it was identified that students experienced misconceptions in algebraic material with the categories of misconceptions and misconceptions (false positive). The majority of misconceptions occur in all algebraic materials, namely: algebraic concepts, algebraic elements, addition operations, subtraction operations, multiplication operations, and division operations. In addition, it was also found that the factors causing the misconceptions of class VII B students of SMPN 54 Makassar, namely the lack of students' ability to understand algebraic concepts in-depth, lack of interest in learning specifically for algebra students, the method often used by teachers, namely the lecture's method, these making students difficult to understand algebraic material and pre-algebraic concepts.

Keywords: Misconception, Mathematical Materials, Three Tier-Test

ANALISIS MISKONSEPSI MATERI MATEMATIKA KELAS VII MENGUNAKAN THREE TIER-TEST

Abstrak:

Penelitian ini bertujuan untuk mengetahui miskonsepsi apa saja yang dialami siswa pada materi matematika kelas VII SMP dan untuk mengetahui faktor apa saja yang menyebabkan terjadinya miskonsepsi siswa pada materi matematika kelas VII SMP. Jenis penelitian ini merupakan penelitian kualitatif dengan menggunakan metode deskriptif. Subjek penelitian pada penelitian ini adalah 8 orang siswa kelas VII B SMPN 46 Makassar dengan teknik pengumpulan data yang terdiri dari tes diagnostik

three tier-test, wawancara, dan dokumentasi. Teknik analisis data pada penelitian ini terdiri dari reduksi data, penyajian data, dan penarikan kesimpulan. Hasil dari penelitian ini menunjukkan bahwa berdasarkan hasil Three Tier-Test yang di berikan kepada siswa kelas VII B, teridentifikasi siswa mengalami miskonsepsi pada materi aljabar dengan kategori miskonsepsi dan miskonsepsi (fals positif). Miskonsepsi mayoritas terjadi pada semua materi aljabar yaitu: konsep aljabar, unsur-unsur aljabar, operasi penjumlahan, operasi pengurangan, operasi perkalian, dan operasi pembagian. Selain itu juga ditemukan bahwa faktor-faktor penyebab miskonsepsi siswa kelas VII B SMPN 54 Makassar yaitu kurangnya kemampuan siswa dalam memahami konsep aljabar secara mendalam, kurangnya minat belajar siswa khusus aljabar, metode yang sering digunakan oleh guru yaitu metode ceramah, sehingga membuat siswa kesulitan memahami materi aljabar, dan prakonsep pra-aljabar.

Kata Kunci : Miskonsepsi, Materi Matematika, Three Tier-Test.

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INTRODUCTION

Education is a process that includes three dimensions, namely the individual, society, or national community of the individual, and the entire content of reality, both material and spiritual, which plays a role in determining nature, destiny, human form, and society (Nurkholis, 2013). Education is the learning of knowledge, habits, and skills that often occurs under the guidance of others, but is also possible self-taught. One of the subjects that play an important role in the world of education is mathematics, because mathematics is one of the basic sciences that can be used to support other sciences such as physics, chemistry, computers, and economics (Cahyani & Sutriyono, 2018).

Currently, teachers in schools have used a lot of varied learning media in teaching mathematics subjects so that the teaching and learning process can be carried out as well as possible. However, it is still found that students often experience misconceptions in understanding mathematical material as written by Gradini (2016) who found misconceptions experienced by elementary school students in mathematics material.

This misconception has a negative impact on students. Students will have difficulty understanding the concepts conveyed by the teacher so the new knowledge that students will receive is hampered. The misconceptions

experienced by each student in one class can be different from one another with different causes. Therefore, the role of the teacher is very important to recognize misconceptions and the causes of misconceptions that occur in students. In addition, teachers must be able to find ways to overcome these misconceptions (Savitri, Mardiyana, & Subanti, 2016)

Based on an initial study conducted with several seventh-grade students of SMPN 46 Makassar, it was found that there were still some students who did not understand the concept of grade VII mathematics. For example, in the algebraic material, some of the errors found were incorrect in adding dissimilar terms. Students are suspected of having arithmetical misconceptions related to the operation of similar tribes, this is because students are wrong about operating similar tribes. Students assume that $15x + 3 = 18x$. The student's answer is wrong because different terms cannot be added or subtracted. In addition, in interviews, students also assumed that variables were letters in mathematics that started from A to Z. However, students' answers were wrong because variables were symbols of a number that had variations in value. This indicates that students' understanding of the operation of algebraic forms is still low due to students' own mistakes, such as counting errors, conceptual errors, and answering not by following procedures that will lead to misconceptions in students.

The preliminary study above shows that exploration still needs to be done regarding why a misconception in students can occur and what causes the misconception. So in this study, the focus is on analyzing the misconceptions of seventh-grade students in mathematics, especially algebra.

Misconception can be interpreted as a misunderstanding and misinterpretation which comes from an inaccurate meaning. Misconception as a concept that is not in accordance with the scientific understanding or understanding accepted in the related field (Ojose, 2015). A misconception is an interpretation of a certain concept that is inaccurate or not in line with the generally accepted understanding.

Misconceptions can be caused by several things, for example, the teacher who conveys a wrong concept, the students themselves, and it can also be from an inappropriate teaching method. The causes of misconceptions are the condition of students, teachers, teaching methods, books, and context (Taufiq, 2012).

Based on the Three Tier-Test Diagnostic indicators, there are 3 types of misconceptions that can be experienced by students. The first, misconceptions

with student indicators are said to be misconceptions if the combination of answers obtained is S-S-Y. The second is a false positive misconception, that is if the combination of answers is B-S-Y and the third is a false negative misconception with an indicator of the combination of S-B-Y answers (Silviani, Mulyani, & Kurniawan, 2017).

Misconception is an error in comprehending concepts that a person owns and still accepted even though one's has been taught the correct scientific concepts (Ibrahim, 2019). There are various factors that cause students to misconceptions, one of them teachers method in teaching, textbooks, and contexts (Hidayat, Irianti, & Fathurrahman, 2020; Tridayanti & Yuliani., 2017). Misconceptions that occurred in students must be addressed immediately in view of the fact that they can prevent students from grasping the concepts to be studied next and in the end (Ritonga, Halimah, & Novi, 2017). Students need to understand the concept completely in order to avoid misconceptions (Harahap & Ristono, 2019).

Misconceptions as one of the causes of experiencing difficulties in learning, so the teachers need to know students' misconceptions. Here's how to find out students' misconceptions, namely: The Certainty Response Index is usually based on a scale and is given together with each answer to a question. The level of certainty of answers is reflected in the given CRI scale, a low CRI indicates a lack of confidence in the respondent's self-concept in answering a question, in this case, the answer is usually determined based on mere guesses. On the other hand, a high CRI reflects the respondents' high confidence and certainty in the concept of answering questions, in this case, the element of guessing is very small. A respondent who has a misconception or does not know the concept can be distinguished simply by comparing whether the answer to a question is correct or not (Taufiq, 2012).

This diagnostic test is intended to measure students' misconceptions. This test component consists of the first Tier which contains answer choices, and the second Tier contains answer choices. The advantages of using this instrument are: Lowers the possibility of guessing, allows the combination of several aspects in one phenomenon, where the first tier is a monological domain, while the second tier is a conceptual domain, easier to manage and calculate than other methods, so it is very useful to use in class.

Student conceptions can be identified specifically utilized the Three-tier test method which is a valid diagnostic tool consisting of questions, reasons, and the level of confidence of students (Milenkovic, Hrin, Segedinac, Mirjana,

& Horvat, 2016). The Three-Tier Test is able to present a more realistic and valid instrument than the Two-Tier Test to identify student conceptual understanding (Khairaty, Taiyeb, & Hartati, 2018). Three-tier Test has three levels, the first is to ask about students' knowledge of the concept of multiple choice. The second level is the students' reasoning from the process of answering at the first level. The third level is a question about students' beliefs about the answers to the first and second levels. How to identify misconceptions with the Three-tier Test requires precision and takes time in making and correcting (data processing), because it combines three answers from each level to analyze misconceptions (Maulini, Kurniawan, & Mulyani, 2016).

Based on the problems and descriptions above, the authors are interested in conducting research by analyzing the misconceptions experienced by students of SMPN 46 Makassar, especially in class VII with algebra subject matter by using a three-tier test that aims to find out what misconceptions are experienced by students at SMPN 46 Makassar. mathematics material for class VII SMP and to find out what factors cause student misconceptions in mathematics material for class VII SMP.

METHOD

The type used in this study is a type of qualitative research using descriptive methods. The research subjects in this study were 8 students of class VII B SMPN 46 Makassar, having their address at Jl. Sahareng Dg. Sese No. 31, Tamalate District, Makassar. This research is qualitative so the research subjects used to obtain data are not chosen randomly but are carried out selectively in accordance with the objectives to be achieved in the study, namely to find out students' misconceptions on mathematics material for class VII SMP/MTS. The data collection technique was carried out by using a diagnostic three tier-test, interviews, and documentation.

This study uses triangulation of data sources by testing the validity of the data through 4 steps, namely credibility, in this study the test used was triangular data. Transferability is external validity in qualitative research. External validity indicates the degree of accuracy or applicability of the research results to the population in which the sample is taken. Dependability and reliance also known as a reliance audit show that research has the nature of obedience by demonstrating the consistency and stability of data or findings that can be replicated and confirmability.

The data analysis technique uses data reduction, this stage of data reduction is part of the analysis that sharpens, categorizes, directs, discards unnecessary data, and organizes the data in such a way that the conclusions can be drawn and verified. Data display, the presentation of the data in question is to simplify complex information into a simplified and selective form or configuration that is easy to understand and conclusions and verification, at the final stage of drawing conclusions carried out is to provide conclusions on the results of the analysis/interpretation of activity evaluation data which includes searching for meaning and providing explanations from the data that has been obtained.

RESULTS AND DISCUSSION

Based on the results of the Three Tier-Test given to class VII B students, it was identified that students experienced misconceptions in algebraic material with the category of misconceptions and misconceptions (false positive). The majority of misconceptions occur in all algebraic materials, namely: algebraic concepts, algebraic elements, addition operations, subtraction operations, multiplication operations, and division operations.

1. Misconception

Students who are indicated to have misconceptions in the category of misconceptions are found in items no. 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, and 15. Indicators of item numbers 1, 2, 3, and 4 are to explain the concept of algebra. In item number 1, 6 students answered incorrectly and students who were identified had misconceptions and misconceptions (false positive). The understanding of students identified as having misconceptions in items numbers 1, 3, 4, and 5 are shown from the answers of students who choose B-S-S. The answer explains that many students are wrong about the basic concepts of algebra, students think that algebra is a mathematical science that uses symbols and numbers. Therefore, it can be concluded that students experience misconceptions related to algebraic concepts.

Item number 5 and item number 6 determine the terms, coefficients, and constants. Test question number 5, there were no students who answered correctly and 8 students who answered with wrong answers, students who were identified had misconceptions. The understanding of students who have misconceptions in number 5 is shown from the answers of students who choose S-S-Y. The answer shows the students' lack of understanding of the definitions of terms, coefficients, and constants.

In item number 6, 8 students answered incorrectly and none of the students answered correctly. In this item, the identified students have misconceptions. The understanding of students identified with this misconception is shown in the answers of students who choose S-S-Y answers. The answer shows that students have difficulty in determining similar tribes, so it can be said that students are wrong in distinguishing between similar and dissimilar tribes.

Silviana suggests that many misconceptions come from within students. Misconceptions that come from within students can be collected in several ways, namely student interests and student abilities. This is in line with the misconceptions experienced by students in the indicators of identifying algebraic elements caused by the lack of student interest in learning and the low level of student understanding.

The indicator for completing algebraic addition and subtraction operations consists of 3 questions, namely items number 8, 9, and 15, and also determines the simple form of algebra in item number 7. In item number 7, students who answer with wrong answers are 7 students. Students who identified misconceptions were 5. The understanding of students identified with misconceptions was shown from the answers of students who chose S-S-Y answers. The answer explains that students find it difficult to unite the same or similar variables due to a lack of students' understanding of algebraic concepts.

In item number 8 students answered with wrong answers 8 students and no students answered with correct answers. 5 students identified misconceptions. The understanding of students identified with this misconception is shown in the answers of students who chose the S-S-Y answer. The answer shows that in item number 8 students also have difficulty in integrating the same or similar variables.

In item number 9, 5 students answered incorrectly and only 3 students answered correctly. Students who identified misconceptions were 3 students. The students' understanding of this misconception is indicated by the answers of students who chose the S-S-Y answers. The answer shows that in item number 9 students also have difficulty in uniting the same or similar variables, so it can be said that students misinterpret the way of completing the operations of addition and subtraction of algebraic numbers.

On item number 15 students who answered with wrong answers 8 students and no students answered with correct answers. Students who

identified misconceptions were 7 students. The students' understanding of this misconception is indicated by the answers of students who chose the S-S-Y answers. The answer shows that in item number 15 students also have difficulty in uniting the same or similar variables, so it can be said that students misinterpret the way of completing addition and subtraction operations on algebraic numbers.

The indicator for completing multiplication and division operations consists of 5 questions, namely questions number 10, 11, 12, 13, and 14. Items numbered 11 and 12 students are faced with algebra problems in everyday life, items numbered 10, 13, and 14 students were asked to determine the result of algebraic numbers.

Question number 11 students who answered with wrong answers 8 students and no students answered correctly. In this item, 7 students were identified as having misconceptions. The students' understanding of this misconception is indicated by the answers of students who chose the S-S-Y answers. The answer shows the students' mistakes in changing the story questions into algebraic form.

In item number 10, 8 students answered incorrectly and none of the students answered correctly. In this item, the students who were identified had misconceptions by 4 students. The students' understanding of this misconception is indicated by the answers of students who chose the S-S-Y answers. The answer is that the student is wrong in determining the product of the variable.

In item number 12, 8 students answered incorrectly and none of the students answered correctly. In this item, 6 students were identified as having misconceptions. The students' understanding of this misconception is indicated by the answers of students who chose the S-S-Y answers. The answer shows that students are wrong in determining the product of algebraic numbers.

In question item number 13 students answered with the wrong answer 8 students and none of the students answered with the correct answer. In this question item, the identified students experienced 4 misconceptions. The number of students identified as misconceptions is shown from the answers of students who chose the S-S-Y answer. The answer indicates that the student made an error in the multiplication operation between the variables.

In item number 14, 8 students answered incorrectly and none of the students answered correctly. In this item, 3 students were identified as having

misconceptions. The students' understanding of this misconception is indicated by the answers of students who chose the S-S-Y answers. The answer shows that students are wrong in determining the product of algebraic numbers.

2. False Positive Misconceptions

Students who are indicated to have misconceptions in the category of false-positive misconceptions are found in items no. 1, 2, 3, 4, and 5. In item numbers 1, 2, 3, and 4 students are faced with problems explaining algebraic concepts. On items 1, 2, and 3 students gave a combination of answers B-S-Y which indicated students had misconceptions in the category of false-positive misconceptions. The understanding of students who have misconceptions at number 5 is shown from the answers of students who choose S-S-Y and students who are identified as having misconceptions (false positive) at number 5 are shown from the answers of students who choose B-S-Y. The answer shows the students' lack of understanding of the definitions of terms, coefficients, and constants.

The results of the Three Tier-Test test that have been carried out have shown the occurrence of misconceptions in all indicators of algebraic material. This is in line with the results of interviews conducted with students and teachers identified the causes of misconceptions from students, namely lack of understanding of algebraic concepts, lack of interest in learning algebra, feeling uncomfortable when learning algebra due to narrow classrooms, and pre-algebra concepts, while from the teacher the method lectures are not suitable for use in the learning process of algebraic material. Where in special mathematics lessons, algebraic material is needed teaching methods that can make students interested so that it will increase student learning interest. Teachers also do not understand what misconceptions are and the causes of misconceptions so teachers will have difficulty tackling misconceptions. Both of these things will cause students to experience misconceptions.

CONCLUSION

Based on the results of research and discussion, it can be concluded as follows Based on the results of the Three Tier-Test given to class VII B students, it was identified that students experienced misconceptions in algebraic material with the category of misconceptions and misconceptions (false positive). The majority of misconceptions occur in all algebraic materials, namely: algebraic concepts, algebraic elements, addition operations,

subtraction operations, multiplication operations, and division operations. The factors that cause misconceptions in class VII B SMP Negeri 46 Makassar, namely Lack of students' ability to understand algebraic concepts in-depth, Lack of interest in learning for special algebra students, The method that is often used by teachers is the lecture method, thus making it difficult for students to understand algebraic material, and pre-algebra.

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