

## ANALYSIS OF MISCONCEPTIONS ON STATIC ELECTRICAL MATERIALS USING *CERTAINTY OF RESPONSE INDEX (CRI)*

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### Abstract

*This research aims to find out the understanding of concepts and misconceptions in the material of Static Electricity. This research includes qualitative descriptive research using purposive sampling techniques. The population in this study is class IX who have received Dynamic Electricity material. The sample in this study is class IX with a total of 25 students. Based on the results of the answers and the certainty response index given by the IX grade students of SMP IT Manufa Sragi Pekalongan. The data collection technique uses a concept comprehension test, analyzed using CRI analysis indicators based on answer criteria and calculated for each question. students were identified as having misconceptions in Dynamic Electricity material with a percentage of 44% of 25 students. And misconceptions occur in every test question given to students*

**Keywords:** Measurements, STEAM

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## 1. INTRODUCTION

Physical science has an important role in the development of science and technology. Given the importance of the role of physics, physics should be well understood by students who study physics. Students' efforts in learning physics often encounter obstacles due to the assumption that physics is a difficult subject to understand, and is supported by uninteresting physics teaching. Researchers in the field of physics education in Indonesia cited various reasons regarding students' lack of understanding of physics. Many parties say that one of the causes of students' lack of understanding of physics is the occurrence of misconceptions (Novitasari, 2019).

According to (Suwarna, 2013) Misconception is an important factor that affects students' understanding to understand a concept. This makes it important to know the misconceptions that students have. There are many methods that can be used to find out the understanding of concepts and misconceptions. There are several methods that are commonly used to find out students' understanding of concepts and misconceptions, namely open-ended questions, *two-tier diagnostic tests*, concept maps,

*prediction-observation-explanation*, interviews about an event or event, interviews about concepts, *word* associations and drawing.

Physics is a science that has an important role in the development of science and technology that can make human life easier. In other words, physics has many benefits if the application of the concept is carried out correctly. Therefore, it is hoped that every student can understand and master physics with good and correct concepts. However, what often happens is that most students think that physical science is very difficult to understand. This is supported by the teaching of physics that only focuses on memorizing formulas which basically physics is not a lesson that only memorizes formulas. Rather, physics learning requires students' ability to understand concepts and apply them.

One of the competencies that must be possessed by every physics teacher is to understand the concept of the material that will be taught, as well as the competence of the teaching material that will be taught to students. Competence in the teaching material is very close to understanding the concept. A teacher will find it easier to design a learning method or strategy

that will be used when the understanding of the concept can be said to be good. What often happens is that there are still many teachers who do not understand the concept, or are still misconceptions about the learning concept to be taught (Gumilar, 2016).

Physics textbooks are works that cannot be seen as works that cannot be separated from mistakes. Errors caused by authors, book editors, and during the printing process and so on. Mistakes made by the author are natural, but the author tries to correct mistakes continuously so that these mistakes can be minimized. One of the mistakes that must be watched out for is that misconceptions in textbooks can be one of the causes of misconceptions in students.

The causes of misconceptions can come from student development, learning interests, ways of thinking, the influence of friends, and the way teachers who are less able to deliver material are also the causes of misconceptions (Abbas, 2019). Misconceptions will be very disruptive in learning and will cause misunderstandings to continue about the topic so that in addition to being detected, they must also be minimized or eliminated in learning (Saputra, 2019).

In analyzing misconceptions, there is a problem that cannot be ignored, namely the problem of identifying the occurrence of misconceptions. Until now, there are still difficulties in distinguishing between students who are misconceived and do not know the concept. There are several ways that can be used to identify student misconceptions, including multiple choice tests with open reasoning. In the test, students not only choose the answers provided, but they also have to write the reason why they chose the answer (Suparno, 2005). To identify the occurrence of misconceptions, as well as to distinguish them from students who do not know the concept, an identification method known as *the Certainty Of Response Index* (CRI) has been developed. With CRI, it will be possible to reveal a comparison of misconceptions in the lucky guess class, a lack of knowledge, misconceptions, and really understand the concept. Furthermore, from the results of the analysis of the multiple choice test with open reasoning equipped with CRI, the factors that cause student misconceptions and solutions to overcome misconceptions can be determined. (Syuhendri, S., 2014) explained that CRI is a good instrument used to distinguish a person's

conception, whether they have the right concept, lack of knowledge or have a misconception.

### **1.1 Definition of Concept**

According to Djamarah (2011:30) it is interpreted as a unit of meaning that represents a number of objects that have the same characteristics. According to Amnirullah (2015) Concepts are the fruits of a person's or a group of people's thoughts that are stated in the definition so as to give birth to knowledge products including principles, laws and theories.

### **1.2 Conceptions and Misconceptions**

Conception is the interpretation of a concept by a person. Everyone's conception is not necessarily the same because everyone has a different ability to interpret each concept they learn in understanding the concept, so it can cause a difference in the conception they form themselves with the concept formed by experts (Didik and Aulia, 2019). Misconception can be interpreted as an interpretation of concepts in an unacceptable statement, but it can also be interpreted as an inaccurate understanding of concepts, the wrong use of concepts and wrong classifications in their explanations. According to (Paul, 2013) misconception is a distorted understanding of the concept of chaos, different concepts, and hierarchical relationships of disordered concepts.

#### **1.2.1 Causes of Misconceptions**

Misconceptions can occur in all fields in science, such as biology, comima, physics and astronomy due to a weak understanding of concepts (Ningrum and Budiarto, 2016) in addition to misconceptions in almost all existing fields, one of which is dynamic electrical materials. Students who do not understand concepts well they associate one concept with another with their own understanding which results in wrong conclusions (Sadhu et al., 2016). Other causes are students' abilities, interests and ways of thinking as well as the influence of friends. Not only coming from students, the cause of misconceptions can also come from teachers' mistakes, including lack of mastery of concepts, lack of

teaching preparation, inappropriate teaching methods of teachers and lack of teacher attitudes that result in a lack of relationship with students or it can also be teacher misconceptions experienced by teachers being taught to students so that they are followed again by students (Didik and Aulia, 2019).

### 1.2.2 How to Know Misconceptions

There are several ways that can be used to identify misconceptions that occur in students and teachers, one of which is by using IRK. The meaning of IRK itself is a technique to find out a person's misconceptions by measuring a person's level of confidence or certainty in answering each question given (Luzyawati and Hidayah, 2019). Another way to find out misconceptions in students is in the form of multiple choices, namely two tier diagnostic tests and three tier diagnostic tests. In two or three diagnostic tests, there are three stages of student answers, namely concept answers, reasons and confidence levels (Didik and Aulia, 2019). The way to find out misconceptions in the textbooks used is by analyzing the textbooks used with the correct understanding according to experts (Laksana, 2016).

### 1.2.3 CRI (Certainty Response Index)

CRI is a method used to identify misconceptions experienced by students with the level of confidence of students when answering the given questions. At the same time, it is used to distinguish students who have misconceptions and do not understand concepts. The CRI method is suitable for analyzing and can find out the dishonesty of students when filling out the CRI for the smallest possible question.

The analysis of misconception data was carried out in accordance with the CRI analysis carried out. CRI is a measure of the level of

confidence of students in answering the questions given. The more confident the student is in answering the questions, the higher the CRI score. CRI is developed on a scale of six (1 – 5) as shown in the Table 1.

Table 1. CRI Category

CRI	Kriteri
1	Almost Guess (hampir menebak)
2	Not Sure (tidak tentu)
3	Sure (tentu)
4	Almost Certain (hampir yakin)
5	Certain (sangat yakin)

In answering questions and asking for CRI scores, there are 3 possibilities experienced by students, namely the first is that students know the concept, the second is lucky guess students (who are lucky in answering questions) students do not know the concept, and the third is that students do not know the concept, and students experience misconceptions. To distinguish between knowing the concepts, and misconceptions of each student, there is a scale that distinguishes them as shown in this table.

Table 2. CRI Description

Answer Criteria	Low CRI <3)	High CRI >3
True	Don't know the concept (lucky guess)	Master the concept well
False	Don't know the concept	There is a misconception

Table 2 explains that there will be several possibilities that will occur from the students' answers, namely, if the student's answer is correct but the IRK is low (3) the student has mastered the concept, if the student's answer is wrong and the CRI is low (3) it means that the student has a misconception.

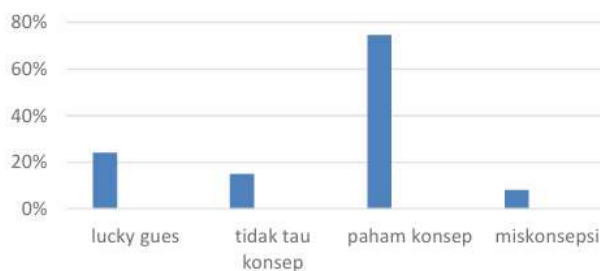
## 2. METHOD

This research took place at SMP IT Manufa Sragi District, Pekalongan Regency and was carried out on Monday, November 20, 2023. This research includes qualitative descriptive research using

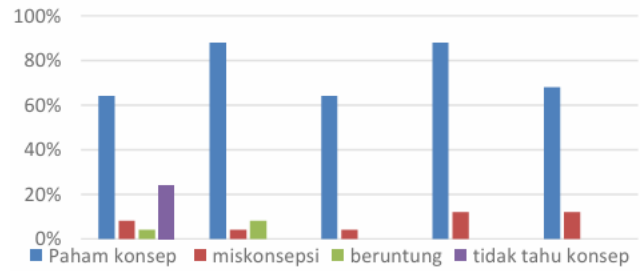
purposive sampling techniques. The population in this study is class IX who have received Dynamic Electricity material. The sample in this study is class IX with a total of 25 students. The data collection technique uses a concept understanding test which will later be analyzed using CRI analysis indicators based on the answer criteria in the table which will later be interviewed to students who are identified with misconceptions and look for the causes of misconceptions experienced by students.

### 3. RESULTS AND DISCUSSION

Question number 1, there are 4% lucky guess students, namely 1 out of 25 students, students who experience misconceptions as much as 8%, 2 out of 25 students, 64% of students who know the concept, namely 16 out of 25 students, and 24% of students who do not know the concept, namely 6 out of 25 students. Question number 2, there are 8% of lucky guess students, namely 2 out of 25 students, students who experience misconceptions, 4%, namely 1 out of 25 students, and students who know the concept as much as 88%, namely 22 out of 25 students. Question number 3, there are 4%, namely 1 out of 25 students who have misconceptions, students know the concept 64%, namely 16 out of 25 students, and students who do not know the concept 32%, namely 8 out of 25 students. Question number 4, there are 12%, namely 3 out of 25 students who experience conception missions, and students who know the concept as much as 88%, namely 22 out of 25 students. Question number 5, there are 12%, namely 3 out of 25 students who experience misconceptions, students know the concept 68%, namely 17 out of 25 and students do not know the concept as much as 20%, namely 5 out of 25 students.



Graph 1. Level of Student Understanding



Graph 2. Level of Student Understanding for Each Question

Based on the results of the study, when viewed from the existing question items, the total misconception obtained was 8%. When viewed from the number of students, there are 11 out of 25 students who experience misconceptions, which means 44% experience misconceptions. Dinsmkis Electrical Materials are indeed included in the material that is difficult for students to understand because it requires a deep understanding or the right learning model is needed so that the material is easy for students to understand (Sariani et al., 2020). Out of a total of 5 diagnostic test questions, there are students who experience misconceptions. In question item number 1 there are 2 students who experience misconceptions, question item number 2 there are 1 students who experience misconceptions, question item number 3 there are 2 students who experience misconceptions, question item number 4 there are 3 students who experience misconceptions, question item number 5 there are 3 students who experience misconceptions. The most misconceptions were found in question items 4 and 5, which were 12 students, and the least misconceptions were found in question items 2 and 3, namely 2 students.

Question number 1 has 2 students who have misconceptions, namely Najwa and M. Gyats. After the interview, the cause of the misconception in question number 1 Najwa and M. Gyats answered the cause of the misconception, namely the misunderstanding of dynamic electricity. Najwa and M. Gyats replied that the circuit in dynamic electricity is just a series of circuits. According to Suparno

(2013:61), the cause of students' misconceptions occurs due to wrong reasoning, namely where the reasoning possessed by students is wrong and erroneous. Najwa experienced a misunderstanding of the various circuits in dynamic electricity. The correct concept is that the circuit in the electrical system has two circuits, namely series and parallel circuits. In this case, the cause of misconceptions in students is the preconception owned by students. Wrong preconception is where the initial concept is not right where this concept has been owned by students (Astusi et al., 2016).

Question number 2 there are 3 students who experience misconceptions, namely Rahmad, Fizza. After the interview, the cause of the misconception in Fizza is that he does not understand how to calculate the strength of the current in dynamic electricity. Fizza replied that the concept of strong current is the same as the total calculation of the network. The concept that. In this case, wrong reasoning is the cause of misconceptions in students. This incomplete reasoning often dominates the cause of misconceptions in students (Astusi et al., 2016). Chess does not experience misconceptions because students understand the concept and at the time of the interview, students can correctly state the answers. However, in answering, students are careless and less observant in choosing answers. Students' carelessness is not included in the cause of misconceptions, but students who know the concept are careless in doing it (Syahrul and Seryasih, 2015). It is not uncommon for students to be careless in doing problems.

Question number 3 has 1 student who has a misconception, namely Najwa. After the interview, the cause of the misconception in Najwa was that she was confused about the difference in electrical voltage with the electrical circuit and was wrong in deducing/interpreting the concept. experienced a misunderstanding of the concept, namely in the sense of the relationship between electrical voltage and electrical circuits. Both have an understanding that an electrical circuit is the path of electric current while various

types of electrical voltage are types of voltage in electricity. In the research of Monita and Suharto (2016), the reasoning given by students is misunderstood and understood so that students who give improper reasoning will be a misconception.

Question number 4 has 3 students who have experienced misconceptions, namely Manda, Melisa, and Nur Zulfa. The cause of the misconception of Manda, Melisa, and Nur Zulfa is the same associative thinking from students when facing a concept that sometimes combines its meaning with other concepts. Manda, Melisa, and Nur Zulfa consider that the switch and fuse have the same function and understanding. This kind of thinking is almost similar to the findings of Monita and Suharto (2016), namely that sometimes students consider that an equation is an equation with something that they themselves conclude. That will make students misconceived.

Question number 5 there are 3 students who experience misconceptions, namely Melisa, Fizza, M. Giyats After being interviewed by Giyad, the students answered that when doing the questions, they came from doing the questions and did not know how to do the questions given. The same thing was also raised by Fizza that when working on the problem, the origin in doing the given problem and using the wrong formula in doing the given problem. So it can be said that the cause of the misconception that they are the lack of interest in learning students to learn the concepts that have been given by the teacher. Lack of student interest is very influential in the learning process and also student understanding which is the cause of misconceptions in students. The lack of interest in learning students is due to the fact that students have not been able to connect the initial concept with the new concept given, as well as the lack of talent and ability of students to understand the material (Lestari et al., 2015). This was also revealed by Astuti et al. (2016) that the cause of misconception is also caused by wrong intuition, students express their ideas about a concept in a stone-tone manner before learning it

first and students tend to follow their feelings in determining the choice of answer.

#### 4. CONCLUSION

Based on the results of the research and discussion, it can be concluded as follows:

- a. Based on the results of the answers and the certainty response index given by the IX students of SMP IT Manufa Sragi Pekalongan, the students were identified as having misconceptions in the Dynamic Electricity material with a percentage of 44% of 25 students.
- b. Misconceptions occur in every test question given to students.

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