



**MISCONCEPTION ANALYSIS OF STATIC ELECTRICITY MATERIALS IN
CLASS IX JUNIOR HIGH SCHOOL**

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Abstract

This study was made to determine the level of misconceptions of junior high school students towards static electricity and what are the obstacles for students in understanding the material so that misconceptions occur. By using 7 students of SMPN 2 Hang Tuah Medan as research samples. The research method used is a qualitative method with a questionnaire technique with Gform and interviews conducted online. By asking 5 questions about static electricity, it was found that about 48.56% of the 7 students interviewed had misconceptions about static electricity. This happened because of several factors, namely (1) the learning method was only in the form of explaining material through group chats and independent study, (2) there was no evaluation conducted by the teacher on static electricity material. This is one of the limitations of online learning where the teacher focuses on explaining the material and does not provide opportunities for students to be involved in learning activities, resulting in the lack of self-confidence of students, and less than the maximum in achieving their knowledge. For this reason, further action is needed by the teacher in order to overcome the misconceptions of static electricity material that exist in students.

Keywords: misconceptions, static electricity, learning

Introduction

Science is related to how to find out about nature systematically, so that science is not only the mastery of a collection of knowledge in the form of facts, concepts, or principles but also a process of discovery (Islami, D., Munawaroh, F., Hadi, WP, & Wulandari, AYR, 2018). It takes a high level of understanding of concepts in studying this science. In learning, initial concepts are usually obtained from the environment of students, parents, and experiences in their daily lives (Khusniati, M., 2012). A person's interpretation of a concept is called a conception. However, sometimes the initial concepts that students get are different from the actual theoretical concepts of science. This incompatible concept is called a misconception (Daniati, S., Djudin, T., & Hamdani, H., 2018).

Generally Misconceptions experienced by students can last a long time and are difficult to correct. Because, even though the initial concept was wrong, students were able to explain the problems they faced (Didik, LA, & Aulia, F., 2019). In the research that has been done, in Indonesia related misconceptions can occur at all levels, ranging from elementary, junior high, high school and college which of course have the same or different misconceptions (Didik, LA, & Aulia, F., 2019). At the junior high school level, science subjects often experience misconceptions about static electricity. Often students have difficulty understanding concepts in static electricity material (Daniati, S., Djudin, T., & Hamdani, H., 2018). Learning planning is a teaching preparation that contains things that need or must be done by teachers and students in carrying out learning activities which include elements: selection of materials, methods, media, and evaluation tools (Simanjuntak, M. P., et al, 2020), so that misconceptions can be avoided.

This is evidenced by several studies that have been conducted. For example, (Sukadi, E., & Sari, IN, 2016) explains that misconceptions occur in the sub-material of electric charge and Coulomb's law which include: (1) misconceptions in understanding how objects are said to be electrically charged; (2) misconceptions in explaining the process of transferring charge by rubbing a ruler on wool and rubbing glass on silk; (3) the misconception that the properties of like charges will attract each other and unlike will

repel each other; (4) misconceptions in understanding the concept of coulomb's law, namely the relationship between coulomb force, charge and distance between two charges.

Another research that strengthens the assumption of students' misconceptions about static electricity is the data obtained that there are still many students who have misconceptions about this static electricity material. Through the results of this study, teachers can see the weaknesses of students in understanding concepts, especially on static electricity material. So that this can be used as a reference for teachers in improving or helping students to conceptually understand this static electricity material (Daniati, S., Djudin, T., & Hamdani, H., 2018).

Based on the description above, this research will explore students' misconceptions about static electricity in junior high school.

Research Method

This research belongs to the type of qualitative research, which uses structured questions only to obtain data (Rachmawati, I. N., 2007). The research was conducted through interviews and by using a Google Form questionnaire that was distributed in class IX-3 SMP Hang Tuah 2 Medan. The distribution of this questionnaire was accompanied by online interviews with video calls of several students who were asked for their statements about the misconceptions about Static Electricity material which was the topic of the research conducted.

Questionnaires were distributed to class IX-3 SMP Hang Tuah 2 Medan and interviews were conducted to determine students' conceptual understanding in studying static electricity and how teachers identify to see the occurrence of student misconceptions. Interviews were conducted virtually with 7 students in class IX-3 as research samples. If two objects are rubbed into each other, electrons and protons move to each other.

The scope of making the questionnaire can be seen in Table 1., while the questions and answers used to

Tabel 1. The Scope of Ssatis Electricity

The Scope	statement
Displacement and change of electrical energy.	If two objects are rubbed into each other, electrons and protons move to each other.
Electric charge and other types of electric charge.	Neutral objects become electrically charged when they come into contact with electrically charged objects, because they occur Load Transfer
Electric charge and other types of electric charge.	If the charge of an object after being rubbed is overloaded with electrons then the charge of the object is initially negative.
Electric force against an electric charge.	The interaction of two objects that have excess electrons will attract each other.
The magnitude of the electric force is inversely roportional to the distance between charged objects.	Charged Large electrical force inversely roportional to the distance between charged objects.

Table 2. Question Questionnaire Static Electrical Misconception

Questions	Answer
If two objects are rubbed into each other, electrons and protons move to each other.	WRONG Because the electric force line will be tenuous on strong electric field objects. As for tight force lines have a weak electric field.
Neutral objects become electrically charged when in contact with electrically charged objects, due to the transfer of charge.	TRUE Conduction is the transfer of charge from one object to another by touching.

If the charge of an object after being rubbed is overloaded with electrons then the charge of the object is initially negative.	TRUE Objects that are rubbed or close to other objects initially Negative charge and will move to positively charged objects that occur rubbing rub interactions (ruler and wool)
The interaction of two objects that have excess electrons will attract each other.	TRUE Negative electrically charged objects with positively charged rubbed objects with two opposite charges will become mutual attraction
The magnitude of the electric force is inversely roportional to the distance between charged objects.	According to coulomb law, the farther between electric charges will cause the coulomb force to get smaller. The closer the distance between charges, the greater the electric force.

The results of the research obtained are then processed by analyzing each answer result given by learners and calculating the percentage of each answer. So that later obtained research results in the form of descriptive and numbers that show the high misconceptions of students.

Result and Discussion

From the research that has been done, obtained a percentage of the results of learners' answers in Table 3. Table 3. Research Results of Static Electrical Misconceptions

No	Statement	Percentage
1.	If two objects are rubbed into each other, electrons and protons move to	True:42.9% Wrong: 57.1%

	each other.	
2.	Neutral objects become electrically charged when in contact with electrically charged objects, due to the transfer of charge.	True: 71,4% Wrong: 28,6%
3.	If the charge of an object after being rubbed is overloaded with electrons then the charge of the object is initially negative.	True: 42,9% Wrong: 57,1%
4.	The interaction of two objects that have excess electrons will attract each other.	True: 71,4% Wrong: 28,6%
5.	The magnitude of the electric force is inversely proportional to the distance between charged objects.	True: 28.6% Wrong: 71.4%

Based on the results of research that has been done, the average misconception of students in static electrical matter is 48.56% with 7 students sampled. Then conducted follow-up interviews with seven students to find out the student's understanding of the statements given regarding static electricity and the constraints experienced. In question number 1 found as many as four people out of seven people (57.1%) who experienced misconceptions. This happens because of a lack of understanding of the electrical charge on objects. Student still think that two things are each other. Electrons and protons move to each other. Students should understand that the charge that moves is only electrons. In question number 2 found as many as two people out of seven people (28.6%) experienced misconceptions. Conduction is the transfer of charge from one object to another by touching. In question number 3 as many as four people out of seven people (57.1%) students experience misconceptions in objects that are rubbed or close to other objects initially negative charge and will

move to positively charged objects that occur rubbing rub interactions (ruler and wool). Based on indicators about describing the relationship between the charge of the object and the electric force and the distance between the charged object. In question number 4 as many as two people out of seven people (28.6%) experience misconceptions. Students should be given an understanding of negative electrically charged objects with positively charged rubbed objects with two opposite charges will be mutual attraction On question number 5, Charged objects are close to each other. The rebuffing force occurs in charged objects, while the attraction force will occur in non-similarly charged objects (Islamic, D., Munawaroh, F., Hadi, W. P., & Wulandari, A. Y. R., 2018). Charged objects are close to each other. The rebuffing force occurs in charged objects, while the attraction force will occur in non-similarly charged objects (Islamic, D., Munawaroh, F., Hadi, W. P., & Wulandari, A. Y. R., 2018).

The existence of misconceptions on learning materials depends on the learning process in the classroom and the learning outcomes of learners (Sara, Y., Munawaroh, F., & Hadi, W. P., 2018). When providing material teaching using direct learning models and assignments as teachers do in general, during the teaching and learning process in the classroom, with still many incompetence in students such as attitude assessments, students are embarrassed when asked to go to the front of the classroom, learners are not confident in expressing opinions, do not dare to read the results of their discussions in front of the class. Learners are more passive in the learning process (Taufiq, A. H., Muhiddin, N. H., & Yunus, S. R., 2019).

The factors that cause misconceptions in the learning of Static Electricity in class IX-3 are: (1) The learning method used by teachers to teach in the classroom in online learning situations is to explain the material in whatsapp groups and self-study. When studying static electricity in the odd semester last year learning was done online so that the learning process took place online where the teacher only gave explanations and asked students to work on the problems given by

the teacher. (2) Learning outcomes obtained by learners have a standard understanding in accordance with the teaching of their IPA teachers in whatsapp groups with offline and online combination learning in the classroom. From the results of interviews to learners regarding the scope of student misconceptions on static electrical material with some important points, the teacher has never identified the student's misconceptions on static electrical matter. This is due to the online learning process. The teacher only gave evaluation tests from a few books so that it was not too exposed experiencing misconceptions on the same material (Daniati, S., Djudin, T., & Hamdani, H., 2018). Another study came from Sukadi and Ira who positively stated that 10% of learners also experienced misconceptions on the same material (Sukadi, E., & Sari, I. N., 2016). For this reason, further action is needed by teachers in order to overcome the misconceptions of static electrical matter in learners.

Conclusion

Misconceptions that occur in grades IX-3 in static electrical matter is a form of reasoning and understanding of students who are lacking and incomplete and have an effect on student learning. Students' thinking is intuitive or based on guesswork and lack of activity in the learning process such as asking teachers about materials and answering questions given by teachers about static electricity is also an internal factor in the misconceptions experienced by students. Misconceptions that often occur can be individually and also in groups because there are some students who draw conclusions incorrectly. This misconception also causes students to be wrong and not on target in answering questions and statements related to static electrical matter. Interview conducted This has shown that misconceptions have occurred in class IX-3 against static electrical matter and more optimal review and learning is required in static electrical matter with the aim of not causing prolonged misconceptions of static electrical matter.

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PEMBELAJARAN DISCOVERY
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