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Analysis Of Students' Misconceptions About Energy Materials And Their Changes In The Classroom X Te SMKN 1 Ampelgading

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Abstract

Abstract: This research aims to describe the analysis of Kenda students' misconceptions about matter and energy and their changes in class X TE at SMKN 1 Ampelgading.This type of research is simple qualitative research. This research uses a simple descriptive method because it only aims to find out how big the percentage of student misconceptions regarding energy material and its changes in class X TE SMKN 1 Ampelgading. Data was obtained from a four-tier format multiple choice test instrument which can diagnose student misconceptions. The research results showed that the average misconception experienced by students regarding energy and its changes was 8.6%. The order of sub-concepts identified as misconceptions from those with the highest percentage is: examples of renewable energy sources (13.8%), energy concepts (8.4%), energy changes (8.4%), business concepts (5, 5 %), non-renewable energy sources (5.5 %).Based on the results of student observations and interviews, it was found that pThe causes of misconceptions are content, students, teachers, teaching methods, textbooks and context. The solutions given are providing examples of applications in everyday life, balancing teaching between concepts and arithmetic, providing re-explanations from textbooks, asking students about concepts before starting learning.
Keywords: misconception; energi; and its change.

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1. INTRODUCTION

In the Independent curriculum, the subject of the Natural and Social Sciences Project at SMK or the Science Project, learns and equips students to be able to solve problems in real life in the 21st century related to natural and social phenomena around them scientifically by applying science concepts. (M Muntamah, et al; 2023). After studying the subjects of the Science Project, students can gain the skills to make the right decisions scientifically in order to be better. (Natalia, D et al; 2023). The IPAS project is an integration between social sciences and natural sciences is the key to success in the learning process. (M.Muntamah et al, 2023) All aspects of social life in diversity, religious diversity, and mutual cooperation are covered in social sciences. The interaction between humans and nature, as well as seeing various phenomena that occur with nature, can be explained logically and scientifically with natural science so that we are able to utilize the wealth of natural resources wisely and wisely (Laila F. Umami, Karyadi Nugroho, and Zubedi, 2021).

It is important for educators to analyze any misconceptions that students may have, and take appropriate steps to help them correct these misconceptions. This can be done by asking questions that require critical thinking, providing relevant case examples, and providing constructive feedback. In overcoming misconceptions, educators need to pay attention to the fact that students have different backgrounds, experiences, and perspectives, and need to facilitate student-centered learning so that students can gain a better understanding. (Herman Anis, 2023).

Misconception is a mistake or misunderstanding of a basic concept or principle in a field of science. Well, this misconception can occur in individuals or groups of learners and can lead to difficulties in the correct understanding of the material. Misconceptions can be formed from a variety of factors, such as personal experiences,

individual perceptions, or influences from the social environment (Anis, 2023).

Misconceptions occur because they are triggered by students' difficulties in understanding a concept in the teaching and learning process. Misconceptions can take the form of faulty relationships between concepts, intuitive ideas or wrong views. (Suparno, 2013). Misconception is an interpretation of concepts in an unacceptable statement. In detail, misconceptions can be inaccurate definitions of concepts, incorrect use of concepts, incorrect classification of examples of the application of concepts, different meanings of concepts, confusion of different concepts, and hierarchical relationships of incorrect concepts (Wahyuningsih et al., 2013). Therefore, misconceptions can occur consistently in the minds of students.

Misconceptions in IPAS-project learning can be a serious obstacle for students, as it can hinder their ability to understand more complex scientific concepts later in life. Therefore, it is important for teachers to understand any misconceptions that their students may have, and to take appropriate steps to help students improve their understanding. To overcome misconceptions in learning IPAS projects, teachers can use strategies such as identifying misconceptions, providing appropriate feedback, facilitating discussion and reflection, and providing relevant case examples. In addition, teachers can also adjust teaching methods and learning strategies to ensure that students have a more complete and accurate understanding of scientific concepts (Herman Anis, 2023).

2. METHOD

This type of research is asimple qualitative research. This research uses a simple descriptive method because it only aims to find out how much percentage of students' misconceptions about energy materials and their changes in class X TE SMKN 1 Ampelgading. This research was carried out in the odd semester of the 2023/2024 school year in class X of Electronic Engineering SMKN 1 Ampelgading, Pemalang Regency. The sample in this study is class X TE as many as 36 students with the following research population.

Table 1. Data of students in class X TE SMKN 1 Ampelgading

NO	CLASS	NUMBER OF STUDENTS
1	X TE 1	36
2	X TE 2	35
3	X TE 3	36
4	X TE 4	36
TOTAL AMOUNT		143

The independent variable in this study is class X TE SMKN 1 Ampelgading. The variable bound in this study is students' misconceptions about Energy and its Change. The data collection technique in this study uses diagnostic and observation tests. The diagnostic test here serves to find out how students' misconceptions about Energy and its Changes material. Diagnostic tests are used using the centainty of response index (CRI) method.

The centainty of response index (CRI) is shown to determine the degree of confidence or certainty of students in answering each question shown. A diagnostic test is a concept comprehension test given to students to find out how well they have understood the concept. Diagnostic tests are made in the form of multiple-choice and reasoned tests that are marked with certainty of response index (CRI) criteria in answering the questions tested. Multiple choice and reasoned questions are given to students to find out between students who know concepts, misconceptions and do not know concepts. The number of diagnostic tests used in this study is 5 questions. In this study, the data analysis technique uses the following tables:

Table 2 Degrees of Students' Confidence in Answering Each Question Tested

Value of CRI	Criteria
0	Totally guessed answer (menebak)
1	Almost guess (hampir menebak)
2	Sure (yakin)
3	Not sure (jawaban ragu-ragu) 3
4	Almost certain (jawaban hampir pasti)

Table 3. Modification of the Categories of Student Understanding Level. (Sumber: Mustaqim, 2014)

Answer	Reason	CRI Value	Description	Code
True	True	>2.5	Understand the concept well	PK
True	True	<2.5	Understand concepts but are not confident	PKKY
True	Wrong	>2.5	Misconceptions	M
True	Wrong	<2.5	Don't Know the Concept	TTK
Wrong	True	>2.5	Misconceptions	M
Wrong	True	<2.5	Don't Know the Concept	TTK
Wrong	Wrong	>2.5	Misconceptions	M
Wrong	Wrong	<2.5	Don't Know the Concept	TTK

Information:
PK = understand the concept
PKKY = understanding the concept of not being sure
M = misconception
TTK = don't know the concept

The results of the test conducted by students will be analyzed with the formula:

$$Percentage\ of\ misconceptions = \frac{number\ of\ correct\ concepts}{number\ of\ concepts} \text{ x } 100\ \%$$

(Suwarto, 2013)

3. RESULTS AND DISCUSSION

Based on the results of the research and analysis of misconception data of students in class X TE SMKN 1 Ampelgading on the Energy Concept material, the researcher obtained the results of the percentage of student misconceptions from all the number of question items as evidenced by Table 4.

Table 4. Percentage of student misses

Indicator	Question Number	Percentage		
		Understand the Concept	Misconceptions	Not Understanding the Concept
Explaining the concept of energy in everyday life	1	91,6 %	8,4 %	0%
Explain the concept of the business	2	94,5 %	5,5 %	0%
Explain examples of non-renewable energy sources	3	94,5 %	5,5 %	0%
Explaining renewable energy sources	4	86,2 %	13,8 %	0%
Explaining energy changes	5	91,6 %	8,4 %	0%

Based on the data of table 4, it can be seen that the percentage of students in each question item from question items number 1 to 5 with each category which is divided into 3 categories, namely PK (understanding the concept), M (misconception), TPK (not understanding the concept). To be clearer, a bar chart is made so that you can clearly see the high and low value of the misconception percentage.

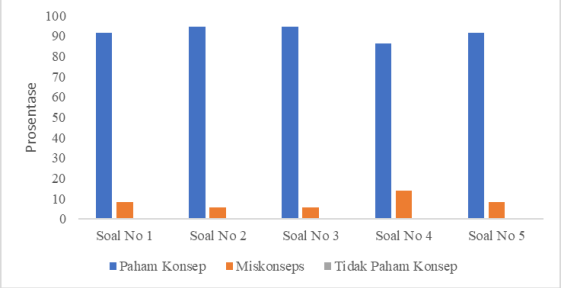

Figure 1. Misconception Analysis

From diagram 1, it is explained that students who experience PK (understanding the concept) are blue, students who experience M (misconception) are red, and students who experience TPK (do not understand the concept) are gray. Each has a different percentage number for each question item. From figure 1, it can be seen that many students have experienced concepts and many have misconceptions and there is no one who does not understand concepts.

The research analyzed students' misconceptions about Energy and its Changes in class X of SMKN 1 Ampelgading which aimed to find out misconceptions on Energy and its Changes material. The data obtained in this study from the results of the multiple-choice test reasoned by affixed certainty of response index (CRI) with many 5 questions. The research data was then described with basic competencies with the student's instrument considered to have a misconception if the answer was correct for the wrong reason and the certainty of response index (CRI) value was high, if the answer was wrong for the correct reason and the certainty of response index (CRI) value was low and if the answer and reason were wrong but the certainty of response index (CRI) value was high. Based on the results of the research, it turns out that in the material Energy and its Changes, there are misconceptions in students.

The description of the results of the research on the test questions shows that students in class X TE SMKN 1 Ampelgading are still

experiencing misconceptions or wrong concepts. Students experience misconceptions in almost all question indicators. The magnitude of the misconception number varies in each question. Question number 1 with the indicator of energy concept in daily life has a misconception of 8.4%. Question number 2 with indicators of business concept questions with positive values, 0 values and negative values have a misconception of 5.5%. Question number 3 with the indicator of the question explaining the example of non-renewable energy sources has a misconception of 5.5%. Question number 4 with the indicator of the question explaining that the renewable energy supply has a misconception of 13.8%. And question number 5 with the indicator of the question Explaining energy changes has a misconception of 8.4%.

Based on further data analysis of student answer sheets, the average percentage of students who experience misconceptions in each type of misconception questions shown by Table 6 is obtained.

Table 5. Percentage of Students Who Experienced Misconceptions in Each Indicator

Question Indicators	Percentage of misses
Explaining the concept of energy in everyday life	8,4 %
Explain the concept of the business	5,5 %
Explain examples of non-renewable energy sources	5,5 %
Explaining renewable energy sources	13,8 %
Explaining energy changes	8,4 %

In Table 5, it can be seen that the highest percentage of misconceptions occurs in indicators explaining renewable energy examples, which is 13.8%. On the other hand, misconceptions with a low percentage occurred in indicators explaining business concepts and explaining examples of non-renewable energy, which was 5.5%.

Figure 2. Percentage of students who experience misconceptions in each indicator

Furthermore, to find out the cause of misconceptions in students, the researcher conducted observations through interviews with students. Based on observations and interviews with students, it is known that the factors that cause misconceptions are content, students, teachers, teaching methods, textbooks and context. The solutions provided are providing examples of applications in daily life, balancing teaching between concepts and calculations, providing re-explanations from textbooks, asking students about concepts before starting learning.

4. CONCLUSION

Based on the results of the analysis and discussion, it can be concluded, namely: Misconceptions in Energy material and its changes in class X TE SMKN 1 Ampelgading. The order of sub-concepts identified misconceptions from those with the highest percentage are: examples of renewable energy sources (13.8%), energy concepts (8.4 %.), energy changes (8.4 %.), business concepts (5.5 %), non-renewable energy sources (5.5 %). Based on the results of observations and student interviews, it was found that the causes of misconceptions were content, students, teachers, teaching methods, textbooks and context.

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