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ANALYSIS OF STUDENTS' UNDERSTANDING OF CONCEPTS IN SUBSTANCES AND THEIR CHANGES AT SMPN 2 SOCAH

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Abstract

This research analyzes students' conceptual understanding of substances and their changes using test answers as the leading indicator. Each question indicator is assessed and broken down based on the students' conceptual understanding percentage, with completeness set at an average score of ≥ 70. Of the 13 research subjects, almost all students reached the level of completeness, with a percentage of students completing at 87.7%, while students who have not yet reached completeness at 12.3%. This shows an excellent overall understanding of the concept. However, several students had difficulty understanding the difference based on the location of the particles, which may have been influenced by a lack of attention to the teacher's explanation. Understanding the concept of chemical and physical changes reached an average of 83%. Although most students could identify chemical changes, some were still confused and did not pay attention to the characteristics of chemical changes. Understanding the concept of physical changes also needs to be improved, with some students assuming that physical changes involve the formation of new substances. The understanding of the concept of mixture separation reached 90%, indicating that students can explain mixture separation experiments. Overall, SMPN 2 Socah seventh grade students showed.

Keywords*: Analysis, Concept Understanding, Subtances*

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INTRODUCTION

Natural Sciences (IPA) is a method for systematically studying nature, including facts, concepts, and principles, and is a process of discovery. In learning at school, science is an important subject that introduces students to the universe and the phenomena that occur around it. A good understanding of concepts in science is fundamental because it can make it easier for students to learn further material. Difficulty understanding basic concepts can lead to difficulties in understanding more complex concepts. Science subjects are a field of research that introduces students to descriptions of the universe and various kinds of events that occur in the natural environment (Azizah et al., 2023). Substances and their changes are one of the concepts studied in science. In this case, it is essential to note that science learning material at the junior high school level emphasizes conceptual understanding and physical analysis of the problems students must solve (Sugo et al., 2021).

Understanding the concept is very important because good mastery will make it easier for students to study a subject. If students experience difficulties and do not understand basic concepts, then students will have difficulty understanding subsequent concepts. Critical thinking skills help students assess the truth, reliability and relevance of the information found. This will help avoid misinterpretations and wrong conclusions in understanding concepts, especially regarding substances and their changes. The characteristic of discussing material and its changes is that various kinds of abstract concepts can make students experience difficulty and confusion in learning and understanding these concepts. If students' understanding is low, it will affect the learning outcomes of the students themselves (Nurhafizah at al., 2018). This research aims to get an overview of students' conceptual understanding of substances and their changes. Along with technological developments, modules are felt to be less practical in learning activities because students tend to be less interested in using modules as teaching materials because they are less practical in their use. One effort to overcome this problem is the need for a learning process using new teaching methods, which are more challenging and exciting, so that learning will be more meaningful and reduce incorrect concepts. This research aims to get an overview of students' conceptual understanding of substances and their changes.

RESEARCH METHODS

This quantitative descriptive research aims to describe students' conceptual understanding of substances and their changes. The population in this study were all class VII students at SMPN 2 Socah,

totaling 13 students. The instrument used is a test of understanding the concept of material substances and their changes, with data collection techniques through tests. Each question answer is assessed and scored 1 for the correct answer and 0 for the wrong answer. The instrument used is a test of understanding the concept of matter and its changes. The data collection technique used is the test method. The test method is used to obtain data on students' conceptual understanding. The question grid for the student concept understanding test can be seen in the Table. 1

Table 1. Concept understanding score criteria

Sub material	Question items
properties and characteristics of substances	1,2,3,4,5,6
physical and chemical changes	7,8,9
Simple mixture separation	10

Students' ability to understand concepts is assessed based on student test results. The rubric for assessing understanding of the concept of substances and their changes can be seen in Table 2.

Table 2. Rubric for assessing students' conceptual understanding of substances and their changes

Answer	Reason	Score
Correct	Correct	1
Correct	Wrong	0
Wrong	Correct	0
Wrong	Wrong	0

Then the student's score is calculated using the following formula:

$$NS = \frac{n}{SM} \times 100$$

Information :

NS: student grades

n: score obtained by students

SM: maximum score of the test in question

Students' conceptual understanding is then analyzed, and each answer is assessed and categorized. The assessment is shown in Table 2, while the categories of student conceptual understanding are interpreted in Table 3, namely as follows:

Table 3. Interpretation of the value of the ability to understand concepts

No	Value	Criterion
1	85,00 – 100	Excellent
2	70,00 – 84,99	Good
3	55,00 – 69,99	Enough
4	40,00 – 54,99	Low
5	0,00 – 39,99	Very low

Source: (Adaptasi Ningsih, 2010)

RESEARCH RESULTS AND DISCUSSION

After conducting research on class VII students of SMPN 2 Socah regarding mastery of the concept of substances and their changes, by giving ten question-based questions, the data in Table 4 was obtained as follows:

Table 4. Results of students' understanding of concepts

No	Student name	Score
1	AS	7
2	AA	8
3	AR	9
4	AM	9
5	EH	9
6	HA	10
7	IA	9
8	MD	9
9	NA	8
10	S	9
11	SA	10
12	SY	10
13	PR	7
Rata-rata		**87,7**

Based on Table 4, which shows the results of students' correct and incorrect answers on the material on substances and their changes, it can be concluded that the average understanding of students' concepts on the material on the forms of substances and their changes is in the high category, with an average score of 87.7%. However, some students get a score of 7, which is caused by a lack of attention and active participation during class learning. This is influenced by the student's attitude when in class the student is less attentive and less active.

Table 5. Average Percentage of Student Scores and Categories for Each Concept

No	Concept	Conceptual understanding (%)	Category
1	properties and characteristics of substances	90%	Excellent
2	physical and chemical changes	83%	Good
3	Simple mixture separation	90%	Excellent

Students' conceptual understanding of substances and their changes is analyzed using their answers to the test questions given. Each question indicator is analyzed and then categorized according to the percentage of student understanding of the concept. Students' understanding of concepts can be seen from their completeness. Students can be said to be complete if the student's average score reaches ≥ 70. This score of 70 is a reference in determining the completeness of the student's learning process as determined by the school. The results of the data analysis showed that only 2 out of 13 students had a score ≥ 70. The percentage of students who completed this test was 87.7%, while the percentage of students who did not complete it was 12.3%, meaning that most students already understood the concept. Overall. A more detailed explanation regarding students' understanding of concepts in working on the questions given is as follows.

The concept of the state of matter

According to Syukri (2008), one of the identities of chemical substances easily recognized is their form, namely solid, liquid, and gas. Substances in gaseous form have very tenuous particles, and the attraction is very small or almost non-existent. In solid substances, the attraction between the particles is powerful and very close together. Meanwhile, liquids are between gases and solids regarding particle distance and attraction. Based on the results of the concept understanding test that has been carried out, the average percentage of students' understanding in explaining the concept of the differences between solid, liquid and gas based on their shape is 90%. The results of the analysis of student answers, almost all students understand the concepts of solid, liquid and gas. Gas. These students could explain the characteristics of solids based on their shape, the location of the constituent particles, and the strength of their attractive forces.

In contrast, if they only looked at their shape, it was found that three students needed help understanding the differences between solids, liquids, and gases. Based on the results of interviews with the wrong students, the students said they needed help understanding the meaning of the questions, so they answered by guessing. Students who understand the concept of liquids can explain the characteristics of liquids based on their shape, the location of the constituent particles, and the strength of their attractive forces. In contrast, if we look at the location of the particles, it is known that almost all students understand the concept of the differences in the states of solid, liquid, and gas. Based on the results of interviews with the wrong students, students said they were confused about differentiating between the location of particles and what makes up solid, liquid, and gas because, during the lesson, they did not listen to the teacher's explanation, students also admitted that they did not study it again at home. Almost all students can explain the different states of matter.

Concept of chemical and physical changes

A change in matter that produces different types and properties of matter from the initial substance is called a chemical change. Based on the results of the conceptual understanding tests that have been carried out, it is known that the average understanding of students' concepts in determining chemical changes is 83%. The analysis of student answers showed that most students were correct in determining chemical changes, but some students still said that rotten fruit was not a chemical change. Based on interviews with students who said rotten fruit was not a chemical change because it only changed shape. Students ignore the characteristics of chemical changes, such as changes in color, taste, or smell, because students need to understand the concept of chemical changes. Physical change is a change in a matter not accompanied by forming of a new type of substance. Based on the results of the conceptual understanding test that has been carried out, it is known that the average understanding of students' concepts in determining physical changes is 83% in the excellent category. The analysis of student answers shows that some students still need to be corrected in determining physical changes. The results of interviews with students said that water becomes ice undergoes a chemical change because this change involves a chemical process, namely freezing. Students think that physical changes are changes that cannot return to their original form, even though physical changes are changes that do not produce new types of substances. This shows that some students still need to understand the concept of physical change.

The concept of separating mixtures is simple

A mixture is a combination of two or more substances in arbitrary proportions. Based on the results of the concept understanding test that has been carried out, it is known that students' understanding of mixed concepts is 90%. The analysis of student answers shows that almost all students understand the concept of mixture. This can be seen by many students who correctly answered the questions about separating mixtures. The student can explain the experiment that oil cannot mix with water.

CONCLUSIONS AND SUGGESTION

Based on the research results and discussion, class VII students at SMPN 2 Socah demonstrated an understanding of substances and their changes in the excellent category with an average of 87.7%. The best understanding is seen in the concepts of changing states of matter and separating mixtures, each with a percentage of 90%.

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