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# The Understanding Identification of Electrical Concept Students at Senior High School in Central Aceh

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**ABSTRACT**

This study aims to identify and differentiate the level of understanding of the electrical concepts of students Grade XII Senior High Schools in Central Aceh. The population of this study was all students of Science students Grade XII Senior High Schools in Central Aceh which consisted of 19 senior high schools. The sample in this study were 115 students from six senior high schools in Central Aceh. Determination of the sample is done by purposive sampling. The approach which used is a qualitative approach with the type of descriptive research. Data collection techniques in this study used the test method. The form of the test instrument used is in the form of a three tier test with a total of 12 items. The technique of data Analysis was used in this study is percentage analysis. The percentage of the results shows there were 7.72% of students understood the concept, 51.52% of students lacked understanding of the concept, and 40.72% of misconceptions students. Thus, it can be concluded that the level of understanding of the electrical concepts of students senior high school in Central Aceh is at level 5 means very poor. As further recommendation for similar research it is best to not only identify the understanding of concepts, but also to overcome the lack of understanding of concepts and misconceptions in students so that students' understanding of concepts increases, especially in electrical concepts.

**Keywords**: understanding concept, electrical, descriptive, percentage

## INTRODUCTION

Physics is a branch of Natural Sciences or Science that studies natural phenomena that are focused on the relationship between energy and matter in a systematic manner, in order to obtain concepts in the form of laws or theories of nature, and their development and application in everyday life. through simple or sophisticated science and technology. Regarding the understanding of concepts at the level of high school students, several research results indicated that students' understanding of physics concepts was still low.

There are two factors that lead to a lack of understanding of the concept by students, namely (1) students misinterpret the symptoms or events they encounter in their lives and (2) the learning process has not been able to lead students to understanding the natural phenomena being studied, resulting in student misconceptions in understanding a concept (Mentari,

2014:79). The ability to memorize causes students to be unable to analyze, evaluate and synthesize subject matter so that they are unable to apply it in real life. Students who are accustomed to memorizing cause low reasoning ability. Especially for concepts that are abstract in nature, students' difficulties in understanding them are higher (Viajayani, 2003: 3). Learning is said to have been completed if each student can understand every concept, both simple concepts and complex concepts with good understanding (Eriana et al, 2019: 177). Therefore, students are required to understand the concept well so that learning can be said to be successful.

Good understanding of concepts, can be seen based on students' abilities in solving problems related to the concepts that have been learned. With a good understanding of the concept, students will be able to represent the same concept even with different formats or multiple representations (Furwati et al, 2017: 80). Thus, the level of understanding of the concept for each student needs to be reviewed in order to know the extent of the student's ability to master a concept that has been learned. So, teachers or educators can consider taking follow-up actions or efforts that can form a good understanding of the concept for each student.

**Problem of Research**

One of the abstract physics concepts that have high complexity is the concept of electricity; one of the subjects of this material is a series of direct current. In the 2013 curriculum, the material is taught to class XII students, odd semesters. The misconception experienced by students is because they think of the battery as a constant voltage source in a closed circuit, so the current will flow constantly. The state of understanding the concept of students in understanding the concept of electricity as found from previous studies was: 12.1% of students were able to understand the concept well, 40.3% of students understood but experienced misconceptions, 18.1% of students were included in the error category and 29, 4% of students are unable to understand concepts (Agustin et al, 2018: 144-145). Another study found the percentage of students' understanding of the concept of unidirectional electric circuits based on graphical representations, namely that 49% of students had low understanding, 45% of students had moderate understanding, and 7% of students had high category understanding. Meanwhile, on the verbal representation questions, 69% of students had moderate understanding, 32% of students had low understanding, and 0% of students had high understanding (Handayani, 2014: 48).

The low understanding of the concept of electricity students senior high school has reportedly inspired research at public high schools throughout Central Aceh district. The assumption is that a similar condition also occurs in students in these schools. Thus, it is obtained the identification of conditions (1) students who understand the concept, (2) do not understand the concept, and (3) misconceptions.

**Research Focus**

This research focus on to the electrical concept of direct current circuits. This research needs to be done in order to identify the level of understanding of the concept of direct current electricity from students of class XII senior high school in Central Aceh regency.

## METHODOLOGY OF RESEARCH

**General Background of Research**

This research was conducted at senior high school in Central Aceh regency. The approach used in this research is a qualitative approach with descriptive research type. The study was conducted for five days, namely on 14,15,17,19 and 20 February 2020.

**Subject of Research**

The population in this study were all students of class XII-IPA senior high school in Central Aceh, which consisted of 19 public high schools. The sampling technique used was purposive sampling technique. So that the research sample was determined to be six senior high school Takengon representing the school population. These schools were selected based on three criteria, namely schools in urban areas, around cities and in rural areas. Senior high school 1 and senior high school 8 Takengon represent schools in urban areas. senior high school 3 and senior high school 15 Takengon represent schools in the area around the city. senior high school 9 and senior high school 10 Takengon represent schools in rural areas. In each of these schools, 20 students of class XII-IPA were selected, except for senior high school 10 Takengon, which only had 15 students and all students at the school were selected as samples. The total sample was 115 students from six Takengon Senior High Schools.

**Instrument and Procedures**

Data collection techniques in this study used the test method. The form of the test instrument used is in the form of a three tier test with a total of 12 items (Kucukozer and Sabri, 2007). The research was carried out by providing test questions that had been compiled to students who were the research samples. Then the test results data processing was carried out to determine the level of students' understanding of the concept of electricity on the subject of direct current circuits.

**Data Analysis**

Processing is carried out by analyzing the combination of students' answers diagnosed in Table 1.

**Tabel 1.** Analysis of Combined Answers on the Three Tier Test

| Category | Answer Types |
|---|---|
| Understand of concept | Correct answer + correct reason + sure |
| Lack of understanding of the concept | Correct answer + correct reason + not sure |
| | Wrong answer + correct reason + not sure |
| | Correct answer + wrong reason + not sure |
| | Wrong answer + wrong reason + not sure |
| | Wrong answer + correct reason + sure |
| Misconception | Correct answer + wrong reason + sure |
| | Wrong answer + wrong reason + sure |

(Paramitha, 2014)

After all the test result data has been collected, then an analysis of students' answers is carried out to differentiate between students who do not understand concepts, misconceptions, and understand concepts by using the calculation of the assessment results at each level with the formula:

$$P = \frac{f}{n} \; x \; 100 \; \%$$

Description:

P    = percentage value of students who understand concepts, do not understand concepts, and misconceptions

f    = The number of times students understand concepts, do not understand concepts, and misconceptions

n    = The number of students who answered the test questions

(Arikunto, 2005:73)

Furthermore, a recapitulation of the average percentage level of understanding of all students was made, starting from the percentage of students who understood concepts, did not understand concepts, and misconceptions. From the average percentage, then determine the criteria for understanding the concept based on Table 2:

**Tabel 2.** Criteria for understanding the concept

| Nu. | Mastery Level (%) | Predicate |
|---|---|---|
| 1 | 86-100 | Very good |
| 2 | 76-85 | Good |
| 3 | 60-75 | Enough |
| 4 | 55-59 | Less |
| 5 | $\leq 54$ | Very Less |

(Purwanto, 2013)

## RESULTS AND DISCUSSION

Overall, the average percentage of concept understanding is obtained. electricity, the subject of direct current circuits for public high school students in Central Aceh is presented in Table 3 below.

**Tabel 3.** Understanding the concept of electricity, the subject of direct current circuits for public high school students in Central Aceh

| Nu. | School Name | School Category | PK (%) | KPK (%) | MK (%) |
|-----|-------------|-----------------|--------|---------|--------|
| 1 | Senior High School 1 Takengon | Urban | 11,04 | 40,42 | 48,54 |
| 2 | Senior High School 8 Takengon | | | | |
| 3 | Senior High School 3 Takengon | Around the city | 6,46 | 54,38 | 39,17 |
| 4 | Senior High School 15 Takengon | | | | |
| 5 | Senior High School 9 Takengon | Rural | 4,93 | 59,79 | 35,28 |
| 6 | Senior High School 10 Takengon | | | | |
| **Average** | | | **7,75** | **51,52** | **40,72** |

Description:
PK     = Understanding of concept
KPK   = Lack of understanding the concept
MK     = Misconception

Based on Table 3 it is known that the level of understanding of the concept of students on the subject matter of electrical direct current circuits. Students are said to understand the concept if they choose the right answer, give the right reasons, and are sure of the answers and reasons. The data obtained from the research results can be detailed as follows: 7.75% of students understood concepts, 51.52% of students did not understand concepts, and 40.72% of students experienced misconceptions. Based on Table 2 regarding the score criteria for the concept understanding test results, students' understanding of the concept is considered very inadequate because the percentage score of concept understanding obtained is below 54% of the total students. Several previous studies have also found a lack of understanding of the concept of electricity on the subject of direct current circuits. In previous studies of the 68 students studied 35.76% of students understood concepts, 31.82% of students experienced misconceptions, and 32.42% did not know concepts (Hamdani, 2013). Another study found 7% of students with a high understanding of the concept of electricity on the subject of direct current circuits (Handayani, 2014). This lack of understanding of students' concepts is the result of several factors, both the difficulty of students understanding the questions, the influence of the large number of questions, the students do not properly understand the material so that there are misconceptions, and the concept of electricity is difficult to understand because it requires imagination power of students (Zulfadli and Iffah, 2016). Misconceptions that occur in students can be overcome by applying learning methods that present cognitive conflicts to students. Some of these learning methods include learning cycles, conceptual change theory,

demonstrations and discussions, laboratory activities, and teaching-with-analogy (Hamdani, 2013).

From the identification results of students' understanding of the concept of electrical concepts on the subject of direct current circuits, there are still many students who do not understand the concept and experience misconceptions. As for the students' understanding of the concept of belonging misconceptions and understand the concepts presented in Table 4.

**Tabel 4.** The misconception and understand the concept of high school student in Central Aceh electrical materials subject direct current circuit that has been identified

| Question | Misconception | Understood Concept |
|---|---|---|
| 1 | Light bulb with two batteries or with a larger number of batteries will light up brighter. | Batteries arranged in series will increase the voltage, batteries arranged in parallel will increase the electric current and reduce the voltage while the power generated remains the same as one battery. |
| 2,3,4, 5 | The electric current flowing in the circuit is influenced by the voltage source pole which is connected to the resistance. If the resistance at the positive pole is enlarged, the light bulb brightness will increase and vice versa. Whereas in the resistance connected to the negative pole of the voltage source, the light bulb brightness will decrease and vice versa. | The relationship between electric currents is inversely proportional to a closed electric circuit $I = V / R$. So that if the resistance is enlarged, the light bulb brightness will decrease and vice versa if the resistance is reduced, the light bulb brightness will increase in the circuit. |
| 6 | The light bulb in a circuit that has one battery and one light will be brighter because the battery voltage is sufficient to light the bulb. | - |
| 7 | When the switch is closed, all light bulbs will not turn on. | The light will turn on when the switch is closed because current can flow to the bulb. |
| 8 | When the switch is opened, all the light bulbs in the circuit will be connected so that all the light bulbs can light up. | The light does not turn on when the switch is open because there is no electricity. |
| 9,10 | When the circuit is connected to a voltage source, the potential difference will flow in the circuit. | The potential difference is the difference in the amount of electron flow in an electric circuit. This difference only exists in each electrical component and does not flow in the circuit. |
| 11 | Electric current will quickly flow in the light bulb connected to the positive pole of the battery so that the strong current is greater than the light bulb connected to the negative pole of the battery. | The electric current flowing in the series will always be the same. |

| Ques tion | Misconception | Understood Concept |
|---|---|---|
| 12 | When using an ammeter and a voltmeter, the installation position does not affect the electric current in the circuit, whether installed in series or parallel the bulb will remain on. | When using an ammeter, it must be connected in series in the circuit to determine the electric current flowing. Meanwhile, when using a voltmeter, it must be connected in parallel to the components in the circuit to determine the potential difference or voltage. |

## CONCLUSIONS

Students 'conceptual understanding at public high schools in Central Aceh in urban areas is higher when compared to students' conceptual understanding at public high schools in suburban / around urban and rural areas. This can be seen from the percentage of students' conceptual understanding in each region, namely: urban areas 11.04%, areas around cities 6.46%, and rural areas 4.93%. Overall, the percentage of students' understanding of the concept of electrical concepts on the subject of direct current circuits was obtained, namely 7.72% of students understood the concept, 51.52% of students did not understand the concept, and 40.72% of students experienced misconceptions. This shows that the level of understanding of the electrical concept of students on the subject of direct current circuits is at level 5 with very poor concept understanding criteria because the percentage of students' conceptual understanding is below 54%.

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