UNDERSTANDING OF OPEN UNIVERSITY PGSD S1 STUDENTS AGAINST ELECTRICAL AND MAGNETIC CIRCUITS

(study of understanding electricity in elementary schools by teachers as UT students in the suburbs of Malang Regency)

Mujadi
Email: trimurtiadi@gmail.com
Open University Teaching and Education Faculty

Abstract

The basic concept of electricity and magnetism for elementary school teachers is simply expected to be able to provide knowledge to students about electric current on a scale that is more easily understood and understood. Children at the elementary school level must be able to remember and describe the situation if in a lighting device such as a flashlight that is filled in the battery will be able to turn on the light. Flashlights and batteries are a form of closed circuit and simply can be described very easily understood and understood. Likewise an iron object that can attract similar objects from metals called magnets has a concept that is easily understood and understood by elementary school students. Lights and the attraction of objects by other objects are phenomena that need to be understood and understood by elementary school students, why and how can they occur? A trial on Open University teachers / students S1 PGSD Open University in the suburbs of Malang Regency Java Eastern Province by providing questions about electricity and magnetism which have taken the Basic Concepts of Science in Elementary School and Science Learning Materials in Elementary School through questionnaires , interviews about the concept of electric current, and magnetic force have provided very diverse answers. How far is the mastery of the concepts of electric current and magnetic force by elementary school teachers? The results obtained from this study lacked encouraging information. The percentage of achievement of mastery and understanding of the concepts of electricity and magnetism is in the percentage range between 50% to 100%. These results will have an impact on students' ability to understand the concept of science both quantitatively and qualitatively. This means that in this case students must be given the right knowledge, easy, clear, and perfect both theoretically and practically. Independent learning by teachers (students) must produce intelligent and professional independence, so that students' abilities about simple direct current and magnetic forces produce better values.

Keywords: *the concept of electric and magnetic currents*

A. Background

Understanding factual knowledge by observing and asking questions based on curiosity about him, God's creatures and activities, and objects found at home, at school and playground are part of the basic competencies possessed by every elementary school student based on the

2013 curriculum While the core competencies of the basic competencies are seven competencies that must be possessed by every elementary school student, one of them is recognizing simple electrical circuits and magnetic properties and their application in everyday life.

The main role of understanding and mastering the material about electric current and the nature of magnetism is certainly on the shoulders of the teachers who provide the contents of this knowledge to students or students. Students must be given experience in accordance with the level of development and ability to receive knowledge. From the results of monitoring and observations, even direct interviews with students and teachers (students) of the PGSD S1 Open University in the suburbs of Malang Regency, East Java, Indonesia were found to be almost certain the mastery of simple electrical circuits and magnetic properties and their application in daily life was quite alarming. . Of the students themselves, especially fifth grade and sixth grade elementary school students the understanding of electrical circuits and magnetism is limited to verbalism. While from the side of the teacher who should have more knowledge, both theoretically and practically need to get serious attention. An experience in guidance activities on the use of science teaching aids in elementary schools with adequate facilities and equipped with a science laboratory has not been able to utilize it as a media aid in learning in the classroom by teachers.

The ability to use teaching aids and mastery of the science concept is one of the obstacles possessed by educators. Studying Natural Sciences is very useful so that we can know everything about the environment related to nature. What happens to educators who have not mastered material especially science related to physics about electricity and magnetism? . This answer will give a look on the face of education in elementary school. Furthermore, from the results of interviews with teachers (students) of the PGSD Open University S1 and filling out questionnaires relating to the understanding and mastery of simple electrical circuit material and the nature of magnetism and its application in daily life, it is very impressive.

B. Problems

Looking at the background above, it is necessary to explore the problems which include the following:

1. How big is the proportion of teachers (students) of the Open PGSD S1 University towards the material about simple electrical circuits in elementary schools?

2. How much is the proportion of teachers (students) of the PGSD S1 Open University understanding of the material about the nature of magnetism in elementary school?

C. Purpose

As explained above the obstacles to learning science-physics in schools is not new for teachers or students. One side of the teacher must have more material mastery skills, always try through

various methods, techniques, and teaching approaches. The ability of students is greatly influenced by the ability of teachers, on the contrary the ability of the teacher will provide the value and face of the quality of education in elementary school. Point to the problem above the purpose of writing this paper

1. Improve teacher understanding and ability about simple electrical circuits

2. Increasing the teacher's understanding and ability of simple electrical circuits.

D. Theoretical Foundation

1. Definition of Direct Current Electricity

Direct Current (DC) is the flow of electrons from a point where the potential energy is high to a lower point. In general, unidirectional electric sources are batteries such as batteries and voltaic elements as well as solar panels. In addition to direct current source batteries, it is also obtained through alternating current which is converted into direct current, namely by using a rectifier. A direct current usually flows to a conductor. In the past, direct current was considered as a positive current flowing from the tip of the positive source to the negative end of the source. More recent observations find that direct current is a negative current (electron) that flows from the negative pole to the positive pole. This electron flow causes positive charged holes, which "appear" flow from the positive pole to the negative pole. Unidirectional electricity is widely used in household appliances, this is because most electronic components are direct current.

Series and parallel series of obstacles

In practice there is often a series of complex components. But in general the series can be grouped into two, namely: series and parallel circuits.

First, review the series of obstacles. What are the obstacles to substitute for the obstacles?

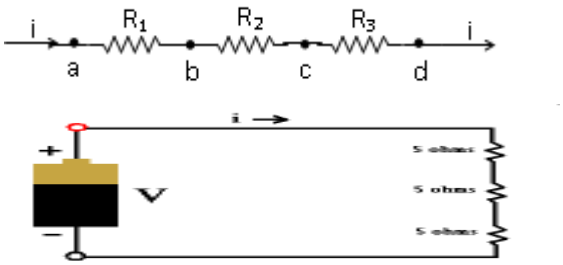


Image: Series Series

In the above series it can be seen that the current flowing in all obstacles is the same i. The potential voltage between points a and d is:

$$V_{ad} = V_{ab} + V_{bc} + V_{cd}$$
$$= iR_1 + iR_2 + iR_3$$
$$= i(R_1 + R_2 + R_3)$$

Barriers to substitute Rs for the three obstacles are

$$R_s = \frac{V_{ad}}{i}$$

Thus it is obtained that the three barriers can be replaced by one substitute obstacle, namely:

Rs = Vad / i = R1 + R2 + R3 ...

In general it can be written

$$R_s = \sum_{i=1}^{N} R_i \text{.....}$$

with N is the number of obstacles coupled with series.

Second, review the parallel sequence of obstacles. What are the obstacles to substitute for the obstacles?

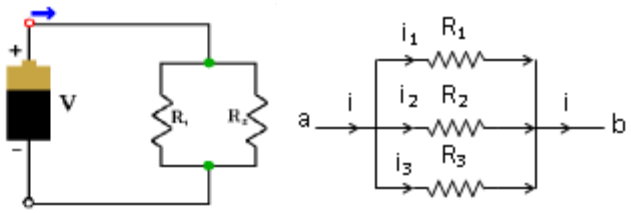


Image: Parallel Circuit

In the series above the potential difference for each obstacle is the same as Vab. The current that goes to point a is the same as that which comes out at point b, namely:

$$I = i_1 + i_2 + i_3$$
$$\frac{V_{ab}}{R_{ab}} = \frac{V_{ab}}{R_1} + \frac{V_{ab}}{R_2} + \frac{V_{ab}}{R_3}$$
$$\frac{1}{R_{ab}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

Rab is a Rp. Replacement obstacle for the three obstacles. So that it can be rewritten:

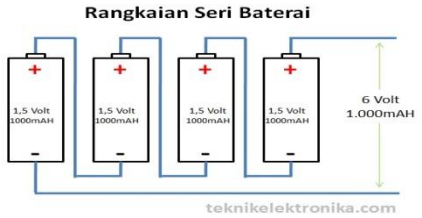
$$\frac{1}{Rp} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

or in general substitute barriers can be written for the N pieces of obstacles that are arranged in parallel, namely:

$$\frac{1}{Rp} = \sum_{i=1}^{N} \frac{1}{R_i} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

Battery Arrangement

Battery Series Series



Picture: Series Battery Series

Battery Series Series From the Image Series Battery Series above, 4 batteries each produce the same current or electric current capacity (Ampere) as the Electric Current on 1 battery, but the voltage generated becomes 4 times the Voltage of 1 battery. What is meant by Voltage in Electronics is the difference in electrical potential between two points in an Electric Circuit which is expressed in units of VOLT.

As illustrated in the Battery Series Series above, 4 Batteries each with a voltage of 1.5 Volt and 1,000 milliamperes per hour (mAh) will produce 6 Volt Voltage but the Current capacity will remain which is 1,000 milliamperes per hour (mAh)

$V_{tot} = V_{bat1} + V_{bat2} + V_{bat3} + V_{bat4}$

Battery Parallel Circuit

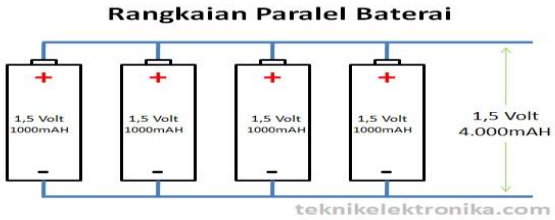


Image: Parallel Battery Circuit

Battery Parallel Circuit The second image is a Parallel Circuit consisting of 4 Batteries. The voltage generated from the Parallel Circuit is the same which is 1.5 Volts but the Current or electric current capacity produced is 4,000 mAH (miliampere per Hour) which is the total of all electric current capacities in the Battery.

$$I_{tot} = I_{bat1} + I_{bat2} + I_{bat3} + I_{bat4}$$

Switch

The switch is a breaker and a connector for the flow of electric current. This electrical component is intentionally designed to have two states, namely a closed state, namely a closed state (connected) and an open state (not connected). These two conditions can be changed so that the circuit can be changed from open to closed, or vice versa, according to our wishes. Electrical circuits can be converted into open or closed circuits by opening or closing the switch. If the switch is closed (closed circuit is formed), electric current will flow in the circuit. Conversely, if the switch is opened (an open circuit is formed), the electric current stops flowing. So, the function of the switch is as a breaker and an electric current connector in the circuit

Image: Switch

E. Methodology

The data obtained in this study are mostly in the form of qualitative data. Quantitative data is limited to information in the checklist so that quantitative data are analyzed descriptively. While for qualitative data analyzed using content analysis procedures (content analysis for data reduction), starting from grouping, coding, coding results (intercoder reliability), and descriptive analysis.

The processed data is then analyzed descriptively using the formula.

Score = average choice weight / highest weight x 100%

or

proportion = total score / highest score x 100%

To be able to provide meaning and decision-making, the following criteria are used.

Table, Level of Achievement and Qualification

Achievement level	Qualifications
90% - 100%	Very good\
75% - 89 %	Good enough
55% - 74%	Poor
<54%	Not good

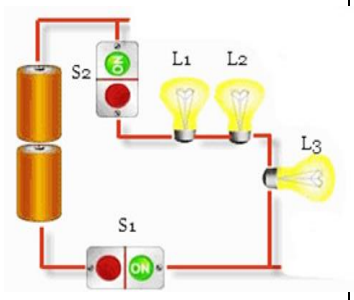
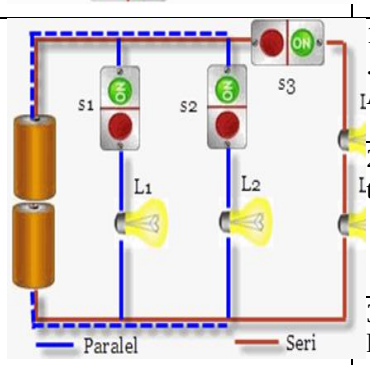
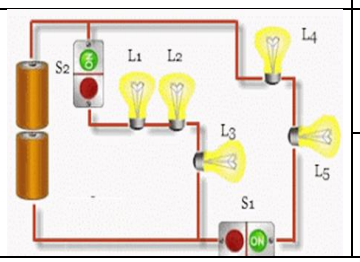
Right

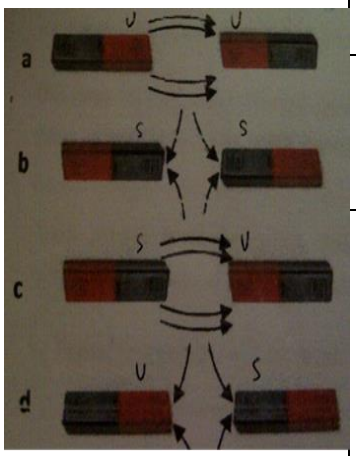
Wrong

Information

F. Presentation of Data

This data is obtained from the results of questionnaires and interviews from teachers (students) of the PGSD S1 Open University as PTTJJ (25 open distance distance education).

No	picture	Question	Right	Wrong	Information
1		1). The picture next is an electric circuit ... A. Series B. Parallel	25	0	
		2). If S1 is On and S2 is off, then the lights are L1, L2, and L3 ... A. Dead B. Light up	5	20	
		3). Jika S1 On dan S2 off, maka lampu L1, L2, dan L3... A. Mati B. Menyala	25	0	
2		1). The picture next is an electric circuit ... A. seri-parallel B. Parallel-parallel	18	7	
		2). If S2 is Off, S1 and S3 are On, then the lights ... A. L1, L3 and L4 are lit. B. L1, L3, and L4 die	21	4	
		3). If S1 and S3 Off, S2 On, then the lights ... A. L1, L3 and L4 are lit. B. L2 lights up	16	9	
3		1). The picture next is an electric circuit ... A. series - parallel B. Parallel	0	25	
		2). If S1 is Off and S2 is On, then the lamp ... A. L1, L2 and L3 are lit. B. L1, L2, and L3 die	17	8	

		3). The current coming out of the battery flows through S1 and S2, if ... A. S1 and S2 On B. S1 On and S2 Off 13	13	12	
4		1). The picture on the side that shows the correct line of style is ... A. a, c, and d B. b is correct	15	10	
		2). The picture on the side that shows the wrong line of force is ... A. a, c, and d B. b is wrong	20	5	
		3). The picture on the side that can cause attraction is ... A. c and d B. a and b	25	0	
5	Every month you are required to pay electricity bills every month. For those who use smart electricity, Mr. and Mrs. must fill it with a pulse (token) system, while those who still use the meter system will be recorded in the electricity bill. According to you in the payment of electricity, what do you actually pay for? Give answers briefly and clearly:		0	25	
	Total				

G. Data Analysis

Analysis of this data is done by looking at the proportion level of each number and the results of the statement of students / teachers of OPEN UNIVERSITY PGSD S1 semesters nine and ten as respondents. In question No. 1, there are three questions which include the form of the circuit and the function of the switch in the circuit and in which several lights are arranged.In general, the series is well understood to reach an average of 73%, while 27% understanding of the function of the switch as a circuit breaker is not well understood. In detail for each question number 1, as follows;

Question 1. About series series is well understood and correctly reaches 100%.

Question 2. About the application of the switch function only reaches 20%

Question 3. Regarding the application of the switch function to different positions it is understood to reach 100%

The level of difficulty in understanding the form of the circuit is more difficult than the understanding of the function of the switch, the competence of teachers / students of OPEN UNIVERSITY PGSD S1 lacks skills in the field of Science Physics.

In question No. 2 there are three questions which include the form of the circuit and the function of the switch in the circuit and in which several lights are arranged. In general, parallel-series series are quite well understood, reaching an average of 73%, while 27% consisting of 9% do not understand parallel-series circuits, and 18% switch functions as circuit breakers and current connectors are not well understood. In detail for each question number 2, as follows;

Question 1. About series series - parallel is well understood and correctly reaches 72%.

Question 2. About the application of the switch function only reaches 84%

Question 3. Regarding the application of the switch function to different positions it is understood to reach 64%

The level of difficulty in understanding the form of the circuit is more difficult than the understanding of the function of the switch, the competence of teachers / students of OPEN UNIVERSITY PGSD S1 lacks skills in the field of Science Physics.

Next is the question number 3. there are three questions which include the form of the circuit and function of the switch and the flow of electric current in which several lights are arranged. In general, parallel circuits are poorly understood, reaching an average of 40%, while 60% consisting of 23% do not understand parallel circuits, and 37% of switch functions as circuit breakers and current connectors are not well understood. In detail for each question number 3, as follows;

Question 1. Regarding parallel circuits wrongly understood, the correct answer reaches 0%.

Question 2. About the application of the switch function only reached 68%

Question 3. About the application of current flow in branched circuits reaching 52%

The level of difficulty in understanding the form of the circuit is more difficult than understanding the function of the switch and the branching, competency of the teacher / student of the Open UNIVERSITY PGSD S1 lacks skills in the field of Science Physics.

In question number 4 about magnetism there are three questions which include, magnetic force lines, magnetic forces occur. In general, the three questions of magnetism are understood to

reach an average of 80%, while at least 20% understanding of magnetic force lines is still very lacking. In detail the proportion of each question number 4 is as follows:

Question 1. The direction of the magnetic force is understood to reach 60%

Question 2. Understanding the lines of magnetic force from different magnetic poles reaches 80%

Question 3. The tensile strength of the magnet reaches 100%

For question number five is a very applicable and very general question, this can be said because every house in the village and urban areas every month does an electricity bill payment transaction. This transaction can also happen to the students themselves by making electricity bill payments both monthly and using system pulses or tokens. In the account of the accountant, the form of a meter is stated which states the use of electricity in KWh (kilo watt hours). On this issue one hundred percent of respondents answered that electricity bill payments were of great use. Even though the electricity used is constant. Achievement of understanding in this matter reaches 0%.

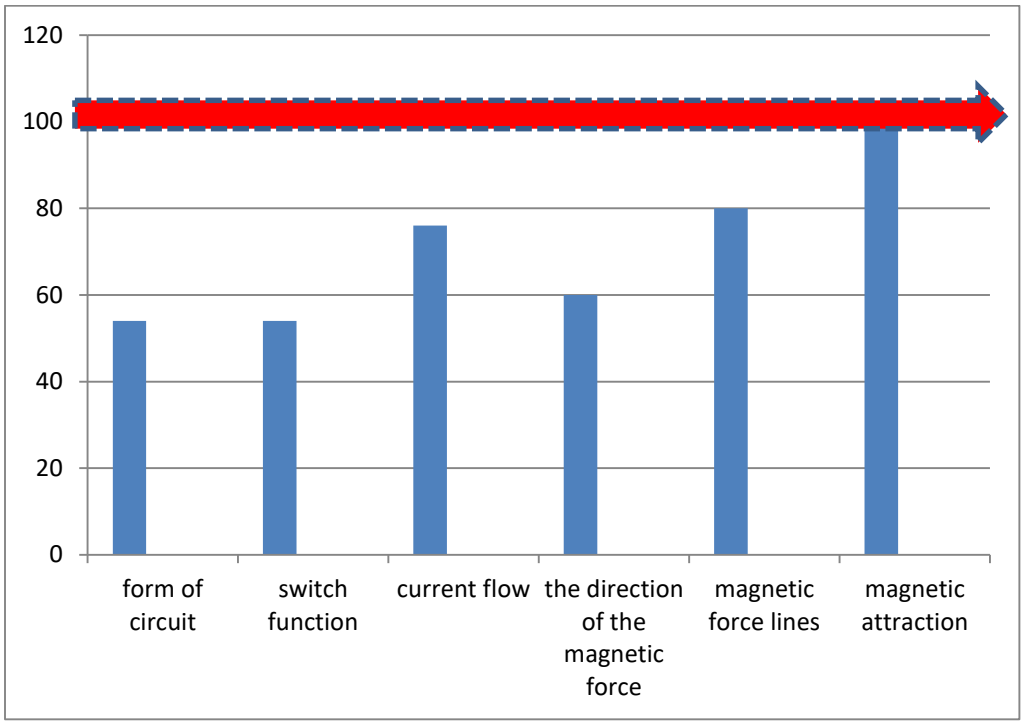
Proportion of Understanding:

The three questions in the question can be divided into several parts of understanding specifically, namely:

1. The proportion of understanding for a simple one-way electrical circuit reaches 172/3 x 100% = 54% including the category of poor achievement
2. The proportion of understanding for a simple unidirectional switch circuit reaches 172/3 x 100% = 54% including the category of poor achievement
3. The proportion of understanding for simple direct current circuits reaches 226/3 x 100% = 76% including the category of achievement quite well
4. The proportion of understanding for magnetic direction magnetism reaches 60% including the category of poor achievement
5. The proportion of understanding for the magnetic line magnetism reaches 80% including the category of achievement quite well
6. The proportion of understanding for magnetism of attraction / magnetism reaches 100% including the category of very good achievement
7. The proportion of understanding for the use of electrical energy in homes relating to the account of the electricity meter or the form of tokens (pulses) all answer the payment of the account is very dependent on the amount of electricity used. The amount of energy that

should be used at the end of each month stated on the bill for the electricity bill, or when the electricity meter gives a sign that the pulse will run out. The proportion of understanding reaching 0% is not very good.

Chart. Proportion of Achievements in Understanding Electrical Circuits and Magnetism



H. Conclusion

From the description of the data analysis above, it can be concluded that:

1. The proportion of the understanding of teachers (students) of the Open University S1 PGSD to the material about simple electric circuits in elementary schools is in the lowest proportion which is not good and the highest reaches quite well, which is <54 to 89%. The expected proportion both quantitatively and qualitatively is 90 to 100% at very good achievement

2. The proportion of the understanding of teachers (students) of the Open PGSD S1 University on the material about the nature of magnetism in elementary schools about magnetism in the lowest proportion is quite good and the highest reaches very good, ie 75 to 100%. The expected proportion both quantitatively and qualitatively is 90 to 100%.

Bibliography

A.Schrommers . 1992. *Elektronika untuk Pemula*: Jakarta. Gramedia

Abruscato Joseph. 1982. *Teaching Childrem Science*. New Jersey: Prentice Hall, Inc

Maman Rumanta.dkk. 2007. *Praktikum IPA di SD*. Jakarta : Universitas Terbuka

Subiyanto. 1988. Pendidikan Ilmu Pengetahuan Alam. Jakarta: Departemen Pendidikan dan Kebudayaan

Saandra E.Cain and Jack M. Evans. *Sciencing*. An Involvement Approach to Elemntery Science Methods. Ohio: Charles E. Merrill Publishing Company

Van Den Berg Euwe.1985. Miskonsepsi Fisika dan remidiasi. Magelang: Universitas Satya Wacana