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SE-001

IMPACT OF PHET SIMULATION MEDIA TO MINIMIZE QUANTITY MISCONCEPTIONS STUDENTS IN LEARNING DYNAMIC ELECTRICAL MATERIAL

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ABSTRACT

The purpose of this study was to determine the impact of PhET simulations media to improve critical thinking skills and reduce the quantity of student's misconceptions SMA 5 Banda Aceh on the dynamic electrical material. This study using *pre-experimental design* with *one group pretest-posttest design*. The sample used is a class XII-1A4 and XII-IA5 class with totaling 46 students. Before and after the implementation of the media PhET simulations, students were given 16 questions pretest and posttest are equipped with a column Certainty of Response Index (CRI) to distinguish students who know the concept (TK), do not know the concept (TTK), and misconceptions (MK). The amount of student misconceptions in pretest and posttest were analyzed using Microsoft Excel. The results of analysis showed that by using PhET simulations media were able to significantly reduction of student misconceptions on material the dynamic electric.

Keywords: *misconception, dynamic electric, CRI, PhET simulation*.

INTRODUCTION

Learning physics for students has been started from a basic education, but a mistake in understanding a concept still carried by students to higher education kejenjang. One important factor that can affect student learning is what is already known by students (Novak&Gowin, 1985). Misunderstanding between the material that has been owned by a previous knowledge of student with the concepts being taught by a teacher can lead to misconceptions.

Miskonsepsi or wrong concept refers to a concept that is not in accordance with the scientific sense or understanding received experts in the field can be a misconception. Forms of initial concept, errors, improper relationships between concepts, ideas intuitive or naïve view. Various studies have been conducted previously showed that the widespread misconceptions in physics topics (Novak & Gowin, 1985).

Efforts to minimize misconceptions students have been carried out by researchers in various ways. But in research to develop critical thinking skills and minimize misconceptions students will be done by using computer simulations media approach. Media computer simulations will be used here is the PhET simulations (Physics Education Technology). PhET is

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a simulation developed by the University of Colorado.PhET simulations in this study was also based on the consideration that, PhET simulations can mimic the behavior of real systems, a learning strategy that can facilitate understanding the concept is based on information contained in the electrical circuit, attractive, raise awareness about concepts or principles, requires the active participation and learning a lot of things (Joyce, et al ; 2009).

A preliminary test to discover misconceptions in concepts of dynamic electricconducted to the students of SMAN 5 Banda Aceh class XII who have received lessons on this matter at the high school junior class X and class IX. The result of testfindedthe students' understanding as follows; (1) current or consumed in the lamp into the lamp current is greater than the exit, (2) light in the same series circuit does not light, the light that is close to the positive pole of the battery is lit more brightly because most of the current used by the lamp so that the flow that through the next light into a small, (3) lights in a parallel circuit dimmer than light in a series circuit and no lights are on when the switch is opened, and (4) the battery is a constant power supply. Based on the above and on the sources of misconceptions experienced by students, this study was conducted in order to know the influence of media computer simulations to reduction of misconceptions in learning Dynamic Electrical.

METHODOLOGY

This study uses a pre-experimental research design and shape of a one-group pretest-posttest design. The samples used were 46 students of class XII and XII IA-4 HE-5 SMAN 5 Banda Aceh amounted to 46 students. Implementation of the pretest and posttest using diagnostic tests as many as 16 items with the same subconcepts, as shown in Table 1 (Sugiyono, 2011).

Table 1. Subconcepts of dynamic electric for pretestand posttest

No	Subconcept	No. Item test
1	Measurement Tools	6, 8
2	Ohm Law	1, 2, 4, 5, 15
3	Kirchoff Law	7, 10
4	Seri and Parallel circuits	3, 12, 14
5	Energyandelectric power	9, 11, 13, 16

Subconcepts-subconcepts misunderstanding by the student or misconceptions found in the pretest and also posttest. This was done to determine the level of consistency of students' answers. In accordance with the format of the diagnostic test, the pretest and posttest answers sheet supplied answers column, Certainty of Response Index (CRI), and the writing of the

reason. In the column that needs to be filled CRI scale is 1 to 5 according to the criteria of each index as shown in Table 2.

Table 2. Criteria of CRI index

CRI	Criteria
0	Guess totally
1	Little guessing
2	Not sure
3	Sure
4	Less certain
5	Certain

Source: Hassan.et.al 1999.

The results of the study have three forms of data, namely the answer choices A, B, C, and D, CRI index, and written reasons students. Based on the three types of data and decision matrix model of the three-tier test can be distinguished students who do not know the concept (LK), know the concept (KCC), a guess (LG), misconceptions (Mis) and confidence (NC) for each item matter (Judge et al, 2012).

Table 3. Decision Matrix of CRO for Three-TierDisgnostic Test

Answers	Alasan	Average CRI indexs	Description
Incorrect	Incorrect	< 2.5	Lack of Knowledge (LK)
Incorrect	Correct	< 2.5	Lack of Knowledge (LK)
Incorrect	Incorrect	> 2.5	Misconception (Mis)
Incorrect	Correct	> 2.5	Misconception (Mis)
Correct	Incorrect	< 2.5	Lucky Guess (LG)
Correct	Correct	< 2.5	Understanding of concepts, but Not Confidence (NC)with the answer choiced
Correct	Incorrect	> 2.5	Misconception (Mis)
Correct	Correct	> 2.5	Knowledge of Correct Concepts (KCC)

Source: Hakim, et.al, 2012.

RESULT AND DISCUSSION

The results of the analysis of the pretest (before learning through the medium of computer simulation) with about three-tier diagnostic test models can be seen students who do not know the concept (LK), understand the concept (KCC), a guess (LG), misconceptions (Mis) and confidence (NC). The results are shown in Figure 1 below.

Basedon the above graph it can be seen there are some misconceptions about the items very high, including items about numbers 3, 7 and 15.Item number 3 discusses the concept of series and parallel circuit. The purpose of this question is to expose students to the knowledge of their misconceptions about the concept of the series circuit and parallel. Through these items is expected that students are able to analyze the magnitude of strong currents and voltages are

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arranged in series and parallel. Answer obtained 63.04 % students had misconceptions on this matter.

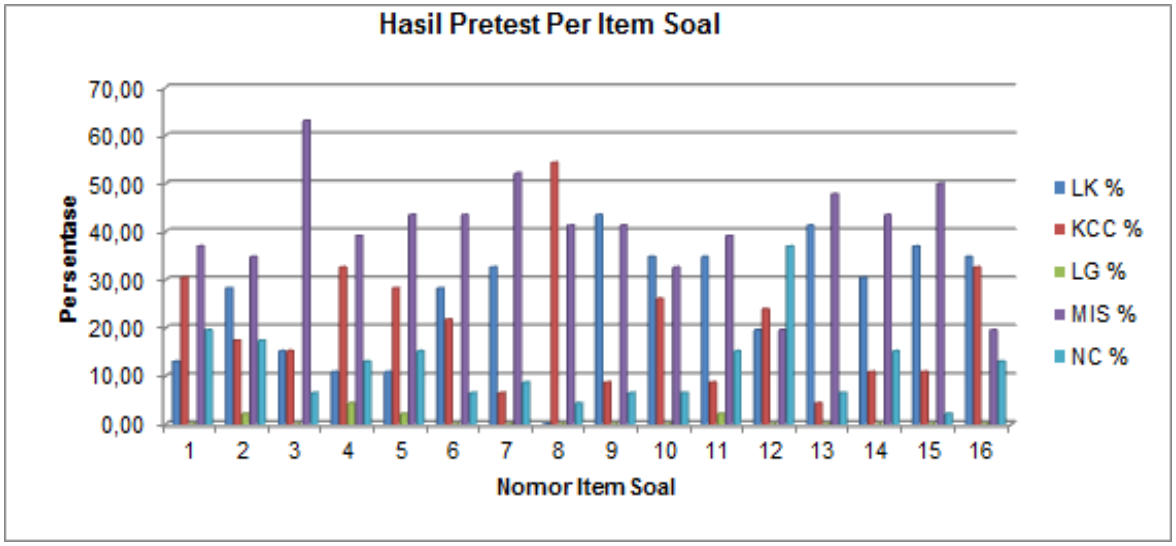

Figure 1.Result of pre-test

Students who lack the knowledge to be stuck with an answer B, i.e if the lamp is broken then light B C will light up brighter. They imagine that the lamp B is closer to the voltage source. Students like this tend to use intusinya in solving physics problems that often lead to misconceptions about him. These findings are supported by studies previously conducted by McDemott (1992), Kocakulah (2007), Darjito& Van den Berg (1991), Duit&Rhoneck (2000), and Depari (2008). Student misconceptions on this matter due to the students assume the current flowing from the negative pole to the positive pole, so close to the negative current greater than the current close to the positive pole.

Item number 7 discusses the legal concept of Kirchoff. The aim is to uncover misconceptions about students of the factors that affect the value of resistance. With this matter is expected that students are able to explain the variables that affect a large drag on a conductor. Answer obtained 52.17 % students had misconceptions on this matter.

Students who lack the knowledge to be stuck with an answer B, if the factors that affect the value of the resistance of a conductor except the cross-sectional area of the wire. Most students are also many who answered A and C. However, the correct answer is D: factors that influence the value of the resistance of a conductor, but a strong current flowing through the conductor. They tend to answer this question based on their intuition in understanding physics concepts so as not infrequently is likely to cause misconceptions on students.

Item number 15 deals with the legal concept ohms . The purpose of this question is to reveal miskonsespsi ohms law students to the application of the series and parallel circuits. With

this matter is expected that students are able to analyze the differences lights if lamput arranged in series . Answer obtained 50.00 % of students who have misconceptions .

Students who lack understanding of the concept will be stuck with the answer C, the students answered because the circuit in Figure 1 consists of two bulbs in series with a voltage source so that they choose the light C in Figure 2 that the circuit will light brighter . These findings are supported by studies previously conducted by Engelhardt and Beichner (2004). Misconceptions on this matter because students construct a concept of what they sense intuitively of their own live.

The results of the analysis of the postest (after learning through the medium of computer simulation) with about three-tier diagnostic test models can be seen students who do not know the concept (LK), understand the concept (KCC), a guess (LG), misconceptions (Mis) and confidence (NC). The results are shown in Figure 2.

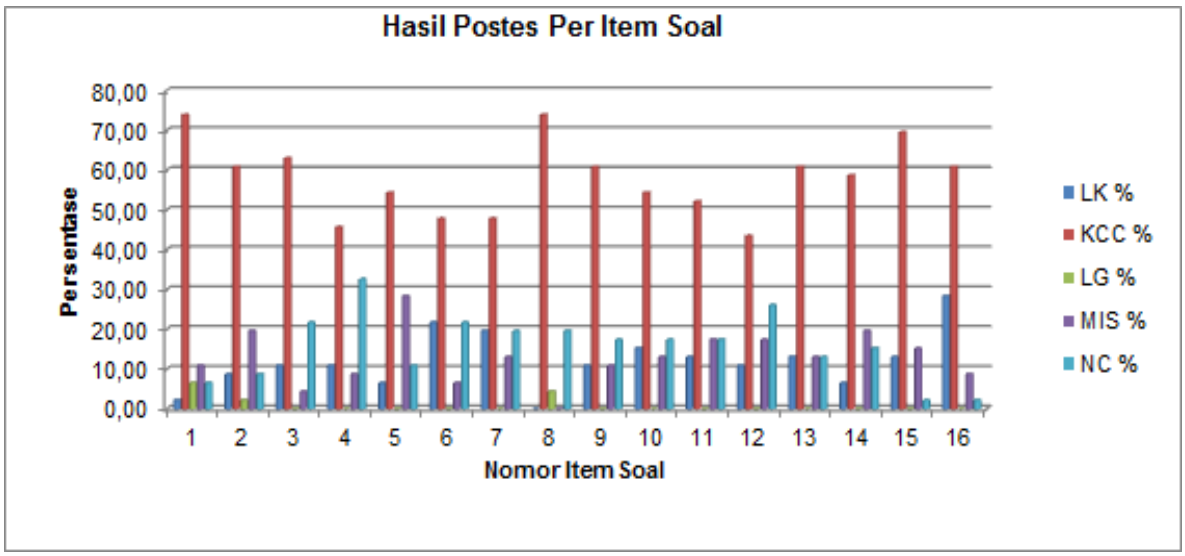

Figure 2.Result of pos-test

Based on the above graph was found that the average item misconceptions about to experience a significant reduction . In question number 8 of electrical measuring instrument concepts students are not experiencing misconceptions (0.00 %). While that is still going on misconceptions about high at number 5 on the legal concept ohms (28.26 %). Numbers 1, 2, 3, 5, 8, 9, 10, 11, 13, 14, 15 and 16, students already understand the concept (KKC) with an average height greater percentage (50.00 %)

Based on the above graph it can be seen that , once given tretment turns misconceptions still occur in any discussion subpokok dynamic power with a very small percentage of 3.26%. So we get that misconception on the concept of dynamic power can be caused by several things, including :

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1). The misconception is stable and resistant to change .

2). Some students ignore new knowledge while supporting their beliefs ,

3). Status of knowledge that is used to change misconceptions lower than the status of student misconceptions ,

4). The ability of teachers to ask and do not optimal interaction in directing students to think ,

5). Some students are still confused when doing experiments . They do not understand about what they need to do because they are unfamiliar with experimental activities ,

6). Some students chatting and did not participate and perform experiments when this phase is very important in changing the misconceptions students ,

7). The use of the method of discussion during the learning process is one of the means which remains to transfer misconceptions students to other students during group discussions took place .

8). The ability of students to operate a computer is very limited so it can hamper the learning process , and

9). The ability of the students in solving physics problems is very low , so that in solving these problems often use intuition students each

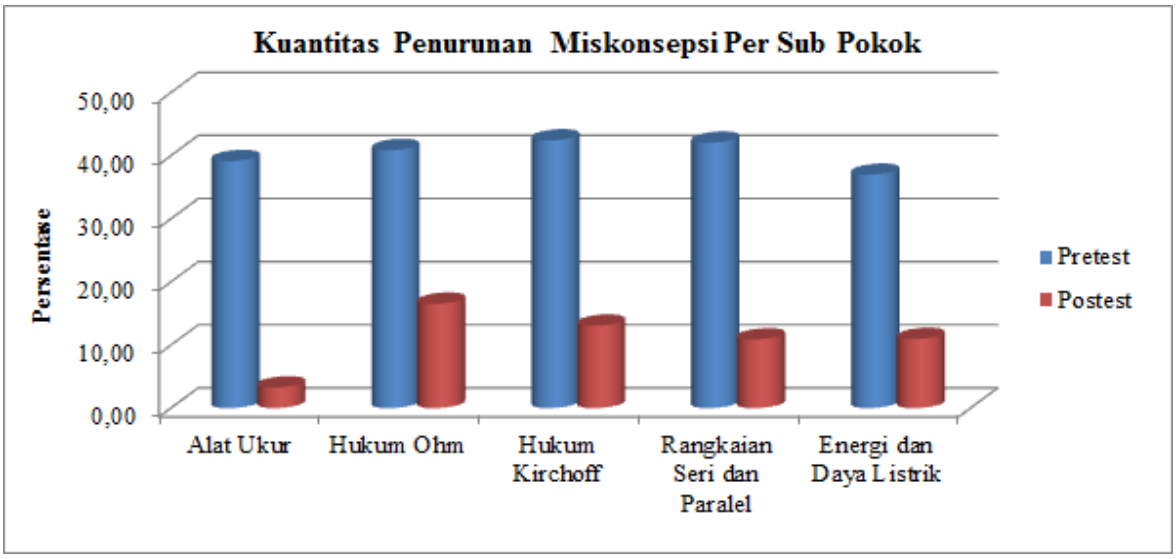

Figure 3. Comparison misconceptions reduction in each sub subject

CONCLUSSION

Based on the analysis of research data, it can be concluded that learning by using computer simulations media is able to reduce misconceptions on the concept of dynamic power. This is evidenced also by increasing students' critical thinking skills on each indicator.

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