

Implementation of Schoology-Based E-Module Learning Media to Improve Student's Concept Understanding on Temperature and Heat Material

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Abstract: This study aims to analyze the increase in understanding of the learning concepts of students in class XI, Senior High School 9 Banda Aceh after the application of schoology-based e-module media on temperature and heat material. This study uses a quasi-experimental design method with a pre-test and post-test control group design. The research sample was taken by purposive sampling which was then divided into experimental class and control class. Concept understanding data was collected from multiple choice objective test scores of pretest and post-test. The concept understanding data was then tested based on the t-test value. The results of the assessment of understanding the statistical concept can be seen that the test results using the t_{test} with a t-count of 6.302 which is greater than the t-table value of 1.671, so it can be concluded that there is a significant difference. Data analysis and hypothesis testing were carried out with the help of SPSS for Windows Version 20. The conclusion of this study showed that the application of schoology-based e-module media increased students' conceptual understanding compared to conventional models.

Keywords: E-Module Media; Schoology; Concept Understanding

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Introduction

The development of information and communication technology in the Industry 4.0 era has had a great influence on the teaching and learning process. (Khisniyah & Hakim, 2019). Technological developments have penetrated into various fields, including the field of education. One of the positive effects of technological developments is that teachers are required to be creative and innovative in utilizing technology in the learning process so that students have good quality (Yulietri, 2015).

Andini's research, et al., (2018) says that the development of information and communication technology also affects the progress of teaching material innovation. Innovations from the development of teaching materials include electronic modules (e-modules). Increasingly sophisticated technological advances in education can be used by teachers to apply learning media in the form of teaching materials in the form of electronic modules (E-modules).

E-module is a set of digital or non-print teaching media that is systematically arranged in a language that can be understood by students, according to the level of

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ability and knowledge, so that students can learn independently (Wijayanti, et al., 2016). The use of e-modules in learning is as one of the reference teaching materials for students and as a tool for evaluating teacher learning outcomes to students on the mastery of the material available in the e-module. In previous research on the research of Fitriani, et al., (2019), Sari, et al., (2018), and Huda, et al., (2019), the researchers concluded that from the three studies above, the use of e-modules for students can improve students' understanding of concepts in the learning process, This is because e-modules can display text, images, animations and videos through an electronic platform that can provide interesting learning so that it can improve students' understanding of concepts in the learning process.

Concept understanding is the ability to understand a material and be able to express the material in a form that is simpler and easier to understand (Yulianah, et al, 2020). According to Murnaka and Dewi, (2018), one of the efforts that teachers can make to improve the ability to understand concepts is to guide students to find and find the concept of a material for themselves. According to research by Agung, et al., (2020) the implementation of e-modules based on a contextual approach can improve students' understanding of concepts.

According to Nurfaida, et al., (2015) the use of Physics Education Technology (PHET)-based modules can significantly improve students' conceptual understanding. Further research by Zulhaini, et al (2016) found that the development of contextual physics modules can improve students' understanding of concepts. Through the development of the module, students will better understand the concept of the material provided, not only as memorization but more emphasis on the importance of understanding concepts in the learning process so that an effective, precise, and varied learning model is needed (Azizah, et al., 2018).

Based on the results of preliminary observations conducted at Senior High School 9 Banda Aceh, information was obtained that the average achievement of semester exam scores in the realm of understanding was low, only 43% of the Minimum Completeness Criteria, which was 75. Physics learning still tends to be teacher-centered and does not involve participants. learn to build concepts. The teacher explains the material on the blackboard, students pay attention and are required to record the material being studied, the teacher does not provide problems related to everyday life so that students have difficulty understanding and mastering the physics material that has been studied. Most students are less actively involved in learning so that students' understanding of concepts becomes weak. As a result, students are only able to memorize

concepts compared to understanding the concepts of the material taught by the teacher. Based on interviews with physics teachers at the school, information was obtained that the minimum completeness criteria score was 75. Meanwhile, the average daily test score was 47.80%. The daily test completeness level based on the minimum completeness criteria value is around 48% and is still relatively low, one of the factors that makes the test score low is that students find it difficult to understand abstract physics material.

Efforts to overcome the problem of the ineffectiveness of the current learning process is to choose applications and learning media. These applications and media must be able to assist students in understanding concepts when the teaching and learning process takes place. One of the innovative learning media to improve students' conceptual understanding is the Schoology-based e-module media. This e-module media has been used by Ismarijati, et al., (2019) in their research, based on the results of research that has been carried out showing that the implementation of e-modules using schoology is effective in increasing interest in learning physics at DeBritto High School with a success rate of 84%.

Based on the description above, this study aims to identify and observe the application of the schoology-based e-module media to improve the understanding of the concepts of high school students on the material of temperature and heat.

Method

The method used in this study is a quantitative method. The research used is the Quasy-Experimental method with the type of research being Non-Equivalent Control Group Designs. The research design is presented in Table 1.

Table 1. Research Design Non-Equivalent Control Group Design

Subject	Pretest	Treatment	Posttest
Experiment	O ₁	X ₁	O ₃
Control	O ₂	X ₂	O ₄

(Sugiyono, 2018)

Information:

- O₁ : Pretest in the experimental class
- O₂ : Pretest in the control class
- O₃ : Posttest in the experimental class
- O₄ : Posttest in the control class
- X₁ : Application of Schoology-based e-module learning media
- X₂ : Learning by applying the non-media model of e-modules based on schoology

This study took two classes, namely the experimental class which was taught by the application of the schoology-based e-module media and the control

class which was taught by the conventional or lecture model. The population in this study were all students of class XI at Senior High School 9 Banda Aceh which consisted of 3 classes with the total number of students being 81 people. Purposive sampling technique was used to select the sample based on homogeneous end-of-semester test scores from all populations and on the consideration of the physics teacher from the school. The research subjects were the experimental class with 26 students and the control class with 27 students. The data collection technique used for the concept understanding test is in the form of multiple choice consisting of 20 items and the learning interest test consisting of 20 questionnaire statement items. The concept understanding test instrument was compiled based on the indicators proposed by Sakdiah, et al., (2018) and interest in learning was compiled based on the indicators proposed by Slameto, (2010).

The instrument used in this study to measure the understanding of the concept is a question. The data collection procedure was carried out by giving pre-test questions to students before the learning process took place and after the learning process took place, students were given a post-test. The data analysis technique in this study used the N-gain equation, normality test, homogeneity test and t test. The data obtained in this study used statistical software called Statistical Product Service Solutions (SPSS) for version 20.

Result and Discussion

In the learning process understanding the concept is one of the most important things, the goal is to find out the extent to which students understand the material presented by the teacher to him. According to Nugraha, et al., (2019) a strong understanding of concepts in the learning process is very helpful for students in understanding a subject matter. A good understanding of the concept will be able to deliver students to their interest in the material being studied at that time, so that students who do not understand the concept will have difficulty going to a higher learning process.

Understanding the concept can be seen from the acquisition of pre-test and post-test scores that have been given to students. The pre-test is given at the beginning of the lesson to determine the students' initial knowledge before carrying out the teaching and learning process on temperature and heat material, both in the control class and the experimental class. The pre-test scores obtained by students in the control class and experimental class were 34.63 and 35.38. The results of these scores indicate that the average pre-test scores of the control class and the experimental class are still low. This explains that the knowledge and

understanding of students' concepts on the material of temperature and heat are in the low category. While the post-test is carried out at the end of the lesson to see the increase in students' conceptual understanding after the teaching and learning process takes place. The post-test scores obtained by students in the control class and experimental class were 70.74 and 84.80. The results of the scores of the two classes experienced an increase in knowledge and understanding of concepts, but the increase in the experimental class was higher than the control class. This proves that the application of schoology-based e-module media can increase students' conceptual understanding.

Furthermore, to find out the difference in the improvement of students' conceptual understanding between the experimental and control classes, it can be seen by using a t-test so that the difference in results between the two classes can be seen. The results are presented in Table 2.

Table 2. The results of testing the hypothesis of understanding the concept learners

Class	Normality	Homogeneity	Significancy
Control	Normal Sig: 0.702	Homogen Sig: 0.434	$t_{\text{count}} < t_{\text{table}}$ (6.302) < (1.671) (there is a significant difference)
Experiment	Normal Sig: 0.566		

Table 2 shows that the results of the normality test of students with the value of understanding the concepts of the control and experimental classes are 0.702 and 0.566. The homogeneity test of the experimental and control class students was 0.432. The value obtained from the two tests in each class is sig. > 0.05, so it can be concluded that the two data are normally distributed and homogeneous. After testing for normality and homogeneity, the hypothesis test is then carried out. The results obtained based on table 2 show that $t_{\text{count}} > t_{\text{table}}$, this indicates that there is a significant difference between the experimental and control classes. This difference can be in the form of an increase in conceptual understanding that occurs in the experimental class that applies the schoology-based e-module media higher than the control class which only applies the conventional model. After knowing the results of the analysis of the understanding of the concept, then further analyze the assessment of the understanding of the concept based on the 7 existing indicators. The aim is to determine the improvement that occurred in the experimental class and control class. Complete data related to the test of increasing understanding of concepts based on indicators can be seen in Figure 1.

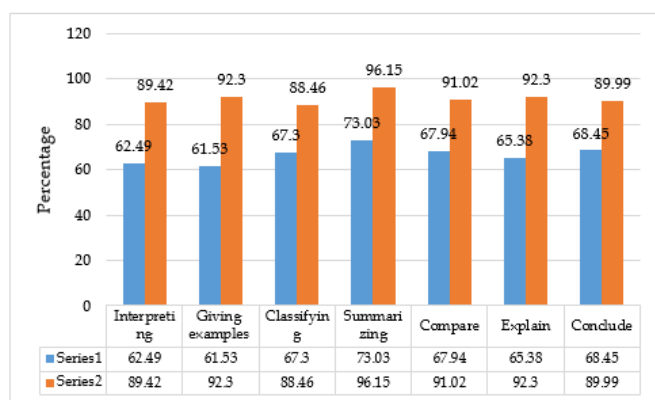


Figure 1. Comparison of the percentage value of understanding the concept of experimental class and control class based on indicators.

Based on Figure 1, it shows that the results of data analysis as a whole have a higher understanding of the concepts of students in the experimental class than in the control class in each of the indicators obtained. Based on seven indicators of conceptual understanding, the experimental class obtained a high category n-gain value, with indicators interpreting (89.42%), giving examples (92.30%), classifying (88.46%), summarizing (96.15%), compare (91.02%), explain (92.30%), and conclude (89.99%). Meanwhile, for the control class, the n-gain value was in the medium category with indicators interpreting (62.49%), giving examples (61.53%), classifying (67.30%), summarizing (73.03%), comparing (67.94%), explained (65.38%), and concluded (68.45%).

Overall, the ability to understand the learning concepts of experimental class students was better than the control class who received conventional learning, this was indicated by the difference in the n-gain value of the two classes. Increased understanding of students' concepts due to the implementation of learning using schoology-based e-module media that can make students learn independently so that they will train their understanding of concepts. According to research by Atep and Dewi, (2019), good media or teaching materials can enhance the learning process with regard to the benefits of media or teaching materials. This is related to the presentation and display of media or e-module teaching materials that can attract the attention of students so that it creates enthusiasm to understand the concept of the material being studied. Furthermore, Arsyad, (2011) said that learning media is an important component in learning, learning media can be a reference source in addition to the material delivered from the teacher. In addition, learning media is an inseparable part of the teaching and learning process in order to achieve educational goals in general and learning objectives in schools in particular.

The increase in post-test scores obtained by students in this study was the same as in the study of Falah, et al., (2017) which stated that there was an increase in posttest scores compared to pretest scores. Research that has been carried out by Agung, et al., (2020) that the implementation of e-modules based on a contextual approach can improve students' understanding of concepts and is very feasible to be used as media or teaching materials. Then Nafaida, et al., (2015) stated that learning using module teaching materials can significantly improve students' conceptual understanding and can create active learning in the classroom. This is also supported by the results of research by Herawati and Muhtadi, (2018) which states that the modules usually used by students are in the form of print modules and tend to be monotonous, this affects students' learning enthusiasm which results in students' mastery of concepts does not increase. One way to make the module more attractive and effective, it is necessary to create an electronic module that can be used as an interactive medium because various images, animations, audio, and video can be inserted.

Several studies have shown that e-module media has a positive effect on increasing students' conceptual understanding. E-modules have the aim of helping to add learning resources, learning media, increasing students' learning independence and are expected to improve understanding of subject matter during the learning process which is carried out without face to face with the teacher (Wirganata et al 2018). The results of the research by Fitriani, et al., (2019) stated that the use of e-modules can provide interesting learning, so that it will generate interest in learning and understanding the concepts of the material provided by the teacher. Research that has been done by Azizah, et al., (2018) through the development of modules, students will better understand the concept of the material provided, not only as memorization but more emphasis on the importance of understanding concepts in the learning process so that effective, precise, and varied learning media are needed.

Conclusion

Based on the results of the study, it can be concluded that the application of the schoology-based e-module media can improve understanding of the concept of temperature and heat at Senior High School 9 Banda Aceh. The results of the analysis of the data on the understanding of the concept prove that the average post-test score for the control class is 70.37 while the experimental class is 84.80 so that the results obtained in the experimental class are > 75 or above the

minimum completeness criteria specified for high school level. Suggestions that can be put forward are that teachers in the field of physics are expected to be able to apply schoology-based e-module media in the physics learning process. It is recommended that the use of schoology-based e-module media is not only limited to the subjects studied in this thesis, but also to other subjects. Further researchers are expected to pay more attention to the learning process of students with e-modules when studying independently through schoology.

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