Indonesian Journal of Technical and Vocational Education Training

Indonesian Journal of Technical and Vocational Education Training
Volume 1 (1) 10 – 17 June 2024
The article is published with Open Access at: https://journal.mgedukasia.or.id/index.php/ijtvet

The Influence of SETS (Science, Environment, Technology, and Society) based E-Modules on Scientific Literacy Using the Discovery Learning Model

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Abstract: This research aims to identify the influence of SETS (Science, Environment, Technology, and Society) based e-modules in increasing scientific literacy using the discovery learning learning model. This research uses a quantitative approach with a quasi-experimental design in the form of a Nonequivalent Control Group Design. How to apply the sample using the Purposive Sampling technique where a total of 32 students were obtained consisting of 16 students in classes X1 and X2 as the control and experimental classes. The results showed that the average pretest score obtained by students in the experimental class was 29.68 and the average posttest score was 84.06, while in the control class the average pretest score obtained by students was 30.62 and the average score the posttest average was 69.68. Based on statistical test data using the independent sample test in SPSS Version 25, the results obtained were sig (2-tailed) 0.002 < significance 0.05, meaning that H0 was rejected and Ha was accepted. Where H0 is that there is no influence of SETS-based e-modules on students' scientific literacy and Ha is that there is an influence of SETS-based e-modules on students' scientific literacy.

Keywords: E-module, scientific literacy, discovery learning.

Received May 28, 2024; **Accepted** June 20, 2024; **Published** June 27, 2024

Citation: Elistiana, V., Novita, N., Ginting, F. W., Muliani., & Fadieny, N. (2024). The Influence of SETS (Science, Environment, Technology, and Society) based E-Modules on Scientific Literacy Using the Discovery Learning Model. *Indonesian Journal of Technical and Vocational Education Training*, *1*(1), 10 – 17.

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INTRODUCTION

Physics, as a result of scientific research, is formed from natural laws which are often expressed in mathematical form. The use of mathematical models to explain physical phenomena often challenges students in understanding the true meaning of natural events that occur (Hidayani & Rusilowati, 2016). Physics is a part of natural science that studies natural phenomena and their interactions. Effective science learning is not only about understanding scientific events, but also connecting scientific knowledge with everyday life. The aim is to form students who think and behave scientifically, and are ready to face modern-day challenges with strong scientific literacy (Juniati et al., 2020).

Scientific literacy is the ability to understand scientific concepts and processes and utilize science to solve problems in everyday life (Rahmawati & Istiningsih, 2022). OECD, (2023) says that scientific literacy is the use of scientific concepts to identify questions, obtain new knowledge, explain scientific phenomena and draw conclusions on scientific issues. Based on the several quotes above, it can be concluded that students' scientific literacy is students' ability to understand, identify, communicate and make conclusions based on facts about various issues related to science.

As a result of the importance of scientific literacy, researchers created the Program for International Student Assessment (PISA). PISA is designed to help governments understand and improve the effectiveness of education systems. PISA collects reliable information every three years. PISA findings are used to: (a) compare the reading, mathematics and science literacy of students in one country with other participating countries; (b) understand the strengths and weaknesses of each country's education system (Fazilla, 2016). OECD, (2022) stated that the PISA results show that the percentage of students who have reached level 2 in the subject of science skills is 34.16%. However, this percentage is still far below the OECD country average of 75.51%. Therefore, a new learning model is needed that is able to overcome the problem of students' low scientific literacy abilities. The learning model that is believed to be able to solve this problem is the Discovery Learning learning model (Hi Rahman et al., 2022).

The Discovery Learning Model is a learning model that conditions students to get used to finding, searching and discussing things related to teaching (Suwiti, 2022). according to Maharani & Hardini, (2017) Discovery Learning is a model for developing active ways of learning for students by discovering themselves, investigating themselves, so that the results obtained will be long-lasting in students' memories and will not be easily forgotten. In the Discovery Learning model, there is a syntax that is carried out. According to Muliyati et al., (2018) the Discovery Learning syntax consists of stimulation, problem identification, data collection, data processing, proof, and generalization. By following the syntax or stages it will direct students to carry out learning better in order to achieve the desired learning goals. The advantages of learning with the Discovery Learning model were also conveyed by Rudyanto, (2016) who stated that Discovery learning requires students to discover new things, the process of finding new things requires creativity, so that the Discovery Learning model and the syntax contained in it can improve thinking. creative students. With excellence in implementing the Discovery Learning model, it is hoped that it can develop students' scientific literacy skills in physics learning.

Based on observations and interviews with physics teachers at MAN 3 North Aceh, it was found that students' scientific literacy was low, as seen from the AKM test results which showed less than 50% completeness. Students have not received learning that supports scientific literacy, and the learning process is still teacher-centered. Lack of interest in reading, especially physics textbooks which are considered difficult and abstract, is also a factor in low scientific literacy. The lack of learning media and students' low interest in reading also contribute to this problem. This is in line with the opinion of Levianti et al., (2023) who stated that factors that influence students' low scientific literacy abilities include low interest in reading, evaluation tools that do not yet lead to the development of scientific literacy, and teachers' lack of knowledge about scientific literacy.

Based on these problems, researchers offer a solution to overcome students' difficulties in scientific literacy by providing non-print reading materials in the form of e-modules that encourage independent learning. In schools, non-print teaching materials such as animations and learning videos can increase students' interest in scientific literacy (Chanifah, 2021). In line with the opinion of Kimianti & Prasetyo, (2019) that to improve students' scientific literacy skills in understanding physics material and concepts, it is necessary to develop unique and flexible learning tools, namely in the form of modules in electronic form. Electronic modules are learning media presented in digital format to support the learning process, and contain components such as competencies and learning

outcomes, instructions for use, tools/materials required, material summaries, as well as exercises and assignments (Istiqoma et al., 2023). E-Module presents material systematically and allows students to learn independently without depending on others. E-Modules are attractive to students because they contain practical elements such as images, audio and YouTube links (Ilhami et al., 2023).

Based on research conducted by Handayani & Istiyono, (2018). States that one of the practical and effective learning media for increasing students' scientific literacy is e-modules with the SETS approach. The SETS approach is a learning approach that connects science, technology, society and environmental issues. SETS-based physics learning, the material taught is packaged contextually regarding real problems in life with the aim of opening insight and improving scientific literacy skills (Yulistiana, 2015).

Researchers are interested in conducting research on students at MAN 3 North Aceh by implementing SETS-based e-modules, to find out whether using SETS-based e-modules can increase students' scientific literacy in physics lessons. This SETS-based e-module has never been implemented in MAN 3 North Aceh. From the results of observations that researchers obtained, MAN 3 North Aceh has adequate facilities and infrastructure, and students are permitted to bring smartphones with the aim of supporting the learning process, so that they can support the implementation of this research later.

METHODS

This research is quantitative research using a quasi-experimental method to determine independent and dependent variables (Sugiyono, 2019). The research design used was Nonequivalent Control Group Design. This research was carried out at MAN 3 North Aceh in the 2023/2024 academic year. The sample population consists of all class XI students, totaling 62 students and divided into 4 classes. The samples were taken based on certain considerations such as average grades and class conditions (Purposive Sampling), so that two classes were selected, namely classes X1 and X2, each consisting of 16 students, so that the total sample was 32 students.

The data collection technique and instrument is a test consisting of 20 multiple choice questions which have been validated by the validator. Instrument testing was carried out to ensure its suitability as a research instrument, through validity tests, reliability tests, difficulty level tests, and differentiating power tests with the help of SPSS Statistics Version 25. After the data from the test results were collected, data analysis prerequisite tests were carried out, namely normality and homogeneity tests. Next, an analysis was carried out to see the effect of implementing the e-module and tested the hypothesis with a t-test or independent sample T-Test with a significance level of 0.05 to find out whether there was an influence of the SETS (Science, Environment, Technology, and Society) based e-module. on students' scientific literacy abilities using the discovery learning method which was analyzed using the SPSS Statistics Program Version 25. In the methods section, explained about subject/participant, procedure of studies, the material/instrument, and data analysis. It can be written by using subheading with 3 levels maximum.

RESULTS

Student learning outcomes on sound wave material were obtained from the results of the pretest and posttest in each class, namely class XI MIA 3 as the experimental class and class XI MIA 2 as the control class. In the experimental class the highest pretest score was 50 and the lowest score was 10, while in the control class the highest pretest score was 45 and the lowest score was 15. The pretest scores in the experimental class and control class had different averages, the experimental class had an average value, namely 29.68 while the average value in the control class was 30.62

In the experimental class the highest posttest score was 100 and the lowest score was 60, while in the control class the highest posttest score was 85 and the lowest score was 45. The posttest scores in the experimental class and control class had different averages, the experimental class had an average score namely 84.06 while the average value in the control class is 69.68.

Normality test

The normality test aims to test whether the data obtained is normally distributed or not. The pretest data normality testing procedure uses Shapiro-Wilk. Where the significant value is greater than 0.05 then normally distributed data is acceptable, if the Sig value (p-value) < α (α = 0.05) then Ho is accepted. The results of the normality test using SPSS version 25 are as follows:

TABLE 1. Pretest Normality Test Results for Experimental and Control Classes

Class	*Shapiro-Wilk*		
	Pretest	**Posttest**	**Information**
Experiment	0,650	0,476	Normal
Control	0,284	0,215	Normal

The results of the normality test in table 1. above show that the pretest posttest data for the experimental and control classes are normally distributed with a significant pretest value for the experimental class 0.650 > 0.05 and a significant pretest value for the control class 0.284 > 0.05. And the posttest data for the experimental and control classes were normally distributed with a significant posttest value for the experimental class 0.476 > 0.05 and a significant posttest value for the control class 0.215 > 0.05.

Homogeneity Test

The homogeneity test used SPSS version 25 with the Lavene technique and a significance level of 0.05. The provisions of the homogeneity test are that if the significant value is > α then the data is homogeneous. If data < α then the data is not homogeneous. The following are the results of the homogeneity test based on the pretest and posttest scores for the experimental and control classes:

TABLE 2. Pretest Homogeneity Test Results for Control and Experimental Classes

Homogeneity of Variants Test		
Pretest	**Posttest**	**Information**
0,804	0,768	Homogen

Based on table 2. above, the significant value of the pretest data results is 0.804 > 0.05 and the posttest data results are 0.768 > 0.05. So it can be concluded that the data is homogeneous.

Hypothesis Test

The experimental and control class posttest results were then tested using the t-test in SPSS version 25. This test aims to answer the research hypothesis, namely the hypothesis is accepted or rejected. The hypothesis used is:

Ha : There is an influence on students' scientific literacy by using SETS-based e-modules with the discovery learning model

Ho : There is no influence on students' scientific literacy with the use of SETS-based e-modules with the discovery learning model

TABLE 3. Posttest T-test Results for Experimental and Control Classes

		F	Sig.	t	Df	Sig. (2-tailed)
Students' Scientific Literacy Ability	Aqual Variances	0,088	0,768	3.443	30	0,002
	Equal variances not assumed			3.443	29.777	0,002

Based on table 3. above, it shows that there is a significant influence between students' scientific literacy in the experimental and control classes because the significant value (2-tailed) has a value of 0.002 < 0.05, the hypothesis is accepted. So it can be concluded that the influence on students' scientific literacy is obtained by using SETS-based e-module learning media with the discovery learning model.

N-Gain Score

The results of the N-Gain score test calculation showed that the average N-Gain score for the experimental class was 0.41, while the average N-Gain score for the control class was 0.19. The comparison of the increase in learning outcomes (scientific literacy) between the experimental class and the control class using the N-Gain test can be seen in the following graph:

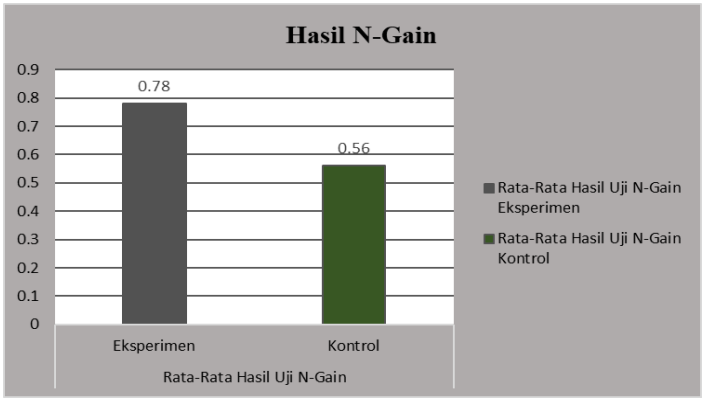

FIGURE 1. N-Gain Average Score Percentage Chart

Based on the graph in Figure 1 above, the experimental class achieved an increase in student learning outcomes using SETS-based e-module learning media which was developed with a score of 0.78 with the "High" criteria, while the control class achieved an increase in learning outcomes. students without using Non-E-Module e-module learning media with a score of 0.56 with "medium" criteria.

DISCUSSION

The research results were used to obtain data on increasing students' scientific literacy skills. This data was obtained from the pretest and posttest question instruments. The pretest and posttest question instruments used came from valid trial questions sourced from previous researchers, Olympic questions, and questions from high school books which were adjusted to indicators of scientific literacy and then also validated by Mrs. Muliani as a physics lecturer at the University. Malikussaleh.

The average pretest score of the 16 students used as research samples in the experimental class was 29.68, the average posttest score was 84.06. Meanwhile, the average pretest score in the control class was 30.62, the average posttest score was 69.68. Based on the data presented in table 1, the results of the pretest normality test were obtained with a sig value of 0.650 > 0.05 in the experimental class, while the pretest in the control class obtained a sig value of 0.284 > 0.05. Based on the data obtained, the results of

the posttest normality test which was carried out showed sig > 0.05 with a value of 0.476 > 0.05 in the experimental class, while the posttest normality in the control class obtained a sig result of 0.215 > 0.05, it can be concluded that the pretest data and the posttest data has a "normal" distribution. Furthermore, for the homogeneity test presented 2. obtained results of 0.673 > 0.05 on the pretest data and 0.768 > 0.05 on the posttest data after the data met the homogeneity test criteria, this is in accordance with the homogeneity test criteria, so it can be concluded that the pretest and posttest data "homogeneous" distribution. The final test carried out was a hypothesis test using the t-test or independent t-test in the experimental class. The results of the t test shown in table 3. obtained sig. (2-tailed) < 0.05 with a value of 0.002 < 0.05, so Ha is accepted, meaning that there is a significant influence on students' scientific literacy abilities after using the SETS-based e-module using the model. discovery learning.

Increasing students' scientific literacy skills in the experimental class showed better results than in the control class. This is shown based on the results of the N-Gain in the experimental class of 0.78 in the "High" category. This can be proven from the increasing ability of students in presenting problem solutions through discussion activities, students are able to explain social problems related to science and technology. , able to explain the presentation of graphs, pictures and tables and students can explain facts, concepts, principles and laws of physics. Meanwhile, the control class obtained an N-Gain value of 0.56 in the "Medium" category. The N-Gain results of the control class continued to increase in the medium category even though they did not use learning media in the form of e-modules, because the model applied had high effectiveness, this was proven from the results of teacher observations during learning, by implementing discovery learning students were more active and collaborative in follow the learning process. This is in line with research conducted (Handayani & Istiyono, 2018) with the title "Development of a SETS-based Physics Module to Improve High School Students' Science Literacy Abilities", where the results of the research show that the SETS-based physics module is suitable for use in learning momentum and impulse by obtaining very good category and declared effective in improving scientific literacy skills. This increase is supported by the use of SETS-based e-module learning media which can help students learn independently, can train students' scientific literacy skills which are in line with educational demands in the 21st century.

This research has been planned as well as possible and observations of the treatment have been carried out carefully. However, there are still parts of this research that do not overall go according to plan. During the research, there were several obstacles or problems that the researchers encountered in the field. The obstacles that researchers found during the research were that there were some students who did not bring gadgets so they had to look at their friends, so students were less focused on learning and when learning was taking place, maximum supervision was needed to ensure that students actually used gadgets to learn. and not for other activities. Apart from these obstacles, there were no other obstacles that researchers experienced in the field.

CONCLUSION

Based on the research conducted, it can be concluded that SETS-based e-modules have an influence on students' scientific literacy abilities using the discovery learning model. This was proven through statistical tests using the Independent Sample Test, which showed that the average score for the experimental class was higher than the control class. Apart from that, the results of the N-Gain test show that the control class has "medium" criteria, while the experimental class has "high" criteria. This shows an increase in students' scientific literacy skills by using SETS-based e-modules with a discovery learning model.

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