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THE APPLICATION OF EXCRETION SYSTEM E-MODULE TO IMPROVE SCIENCE LITERACY SKILLS

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ABSTRACT

The research aims to analyze the application of e-modules in improving scientific literacy skills. This research employed the quasi-experimental with pretest-posttest control design group. The population of this study was eleventh-grade students of SMA Negeri 1 Anjatan which consisted of 15 classes, specifically seven science classes and eight social studies classes. The research sample was taken using random sampling. The researchers collected the research data using observations and tests. Furthermore, the data was analyzed using ANES software and SPSS v.25. The analyzed data were the prerequisite tests data and the t-test data. The results obtained from students' learning activities show the highest learning activities occurred at the data collection stage. There science literacy skills improvement between the control class and the experimental class was different. The experimental class' N-gain value was 0.30 and the control class' N-gain value was 0.2. Furthermore, the result of the sig statistical tests was 0.000, which was lower than 0.655. Therefore, Ho was rejected and Ha was accepted. It can be concluded that there was an improvement difference between the experimental class and the control class regarding scientific literacy skills.

Penerapan *E-Modul* Materi Sistem Ekskresi Untuk Meningkatkan Keterampilan Literasi Sains

ABSTRACT: *Tujuan penelitian adalah menganalisis penerapan e-modul dalam meningkatkan keterampilan literasi sains. Metode pengambilan data yang digunakan adalah kuantitatif eksperimen dengan jenis penelitian Quasi Experimen dengan desain penelitian Pretest-Posttest control design group. Populasi penelitian ini adalah seluruh siswa kelas XI SMA Negeri 1 Anjatan sebanyak 15 kelas yang terdiri dari 7 kelas IPA dan 8 Kelas IPS. Teknik pengumpulan data dalam penelitian ini adalah observasi, dan tes. Analisis data menggunakan software anates dan SPSS v.25. Analisis data meliputi Uji Prasyarat dan Uji Beda. Hasil diperoleh aktifitas belajar siswa menunjukkan aktifitas belajar tertinggi pada tahap pemgumpulan data; terdapat perbedaan peningkatan keterampilan literasi sains siswa kelas eksperimen dan control meningkat dengan rata-rata N-gain kelas ekperimen 0,30 dan control 0,2 dengan hasil uji statistic 0,000 < 0,655, artinya* H_o *ditolak dan* H_a *diterima. Sehingga terdapat peningkatan keterampilan literasi sains kelas eksperimen.*

INTRODUCTION

The COVID-19 pandemic has attacked many countries in the world (Amalia & Hiola, 2020; Ichsan et al., 2020; Imron & Syafa'at, 2020; Supriatna, 2020). It limits the movement of people in the world (Yazid & Lie, 2020). One of the methods to overcome this problem is by implementing physical distancing to minimize the spread of the virus (Dewa & Safitri, 2020; Jahrir et al., 2021; Karyono et al., 2020; Silitonga & Purba, 2020). To prevent the spread of COVID-19, the WHO issued a policy to stop all events that cause mass gatherings (Azis, 2020; Suherman et al., 2020). Social distancing also affects the learning system in schools (Argaheni, 2020; Handarini & Wulandari, 2020; Windhiyana, 2020). All educational institutions have changed their learning method by implementing online learning (Cahyani et al., 2020).

Online learning is not new for Indonesia. it has been developed since 2013 as an alternative to classroom learning. Indonesia has applied the method before the outbreak of the virus. however, not all institutions apply online learning, especially schools in rural areas. With this virus outbreak, it is imperative that all schools, colleges, and other educational institutions use online learning methods without exception (Aji, 2020). The learning process must continue even though it must be done at home (Handarini & Wulandari, 2020; Nugraheni, 2020; Putro et al., 2020). Online learning requires learning tools such as e-modules(Atsani, 2020; Maryani, 2020; Nugraheni, 2020). Fausih (Fausih, 2014) states that an e-module is a set of digital learning media that is systematically arranged for the purposes of student self-study (Hakim et al., 2020; Wijayanti et al., 2016).

E-modules require students to be independent and solve problems (IMANINGTYAS et al., 2016; Laili, 2019; Priatna et al., 2017; Rohmaini et al., 2020). E-module is expected to help students understand concepts and increase their problem-solving abilities to improve their scientific literacy(Latip & Faisal, 2021; Permana et al., 2021; Sari et al., 2017). This matter has been proven by some previous research (Lestari, 2020; Yusnia, 2019) that learning media can improve students' scientific literacy. E-module also allows students to independently construct old knowledge into new and more appropriate knowledge (Lidia et al., 2018). Furthermore, The Kvisoft Flipbook Maker is an application that can support the learning process (Divayana et al., 2018; Handayani et al., 2020; Wibowo & Pratiwi, 2018). According to Sugianto (Sugianto et al., 2013), E-module has several advantages. It can present material with a combination of media, such as audio, video, text, images, and animation. E-module contains images, video, audio, and animation that are interactive and attractive (Puspitasari, 2019; Sriwahyuni et al., 2019).

Scientific literacy is a skill to understand scientific processes (Irawan et al., 2020; Wakhidah, 2015). Scientific literacy skills equip students with knowledge and skills to solve problems in everyday life, both individual and global problems (Hasasiyah et al., 2020; Mustakim et al., 2020; Rifqi, 2021; Safrizal, 2021). Besides, scientific literacy skills emphasize individual scientific knowledge to solve real-world problems (Fakhriyah, 2014; Purnama & Pribadi, 2014). The poor science learning outcomes show that the science learning process in Indonesia ignores the acquisition of scientific literacy skills (Amahoroe et al., 2020; KARTINI et al., 2014; Soepudin, 2018). The weakness needs to be improved and renewed to improve students' scientific literacy skills. The learning process that leads to scientific literacy is a benchmark for the quality of students' science learning outcomes (Marlina, 2016; Winanto & Makahube, 2016).

Research on the application of E-module in improving scientific literacy skills have been done, including the analysis of E-modules on students' learning outcomes and motivation (Rusnawati et al., 2017),

improving scientific literacy skills and reducing misconceptions (IMANINGTYAS et al., 2016), the common errors in solving geometry problems [28], increasing scientific literacy skills through critical thinking skills (Rahayuni, 2016), implementing the Self-Regulated Learning (SRL) Model (Boys & Girls, 2020), and integrating traditional game-based E-learning (Shofiyah et al., 2020). The previous research was limited to media analysis, but not in terms of scientific literacy skills. therefore, this research analyzed the mistakes of pre-service teachers in solving media problems in terms of literacy communication. This research is important to do to analyze the application of E-modules in improving scientific literacy skills.

METHOD

This research is quantitative research. It applied the experimental pretest-posttest control group design. The research was conducted at SMA Negeri 1 Anjatan from March to April 2020. The population of this study was all 15 classes of the eleventh grade of SMA Negeri 1 Anjatan consisting of seven science classes and eight social studies classes. The research sample was taken using random sampling. The samples of this study were 35 students of XI MIPA 5 as the experimental class and 35 students of XI MIPA 3 as the control class. The data collecting techniques used in this research were observations and tests.

The observations were conducted using observation sheets and learning assessment rubrics that had been developed based on the scientific literacy skills indicators. The researchers used the test to measure students' scientific literacy skills. The test consisted of thirty multiple-choice questions. The data analysis was assisted by ANATES software and SPSS v.25. The analyzed data were taken from the prerequisite test and t-test.

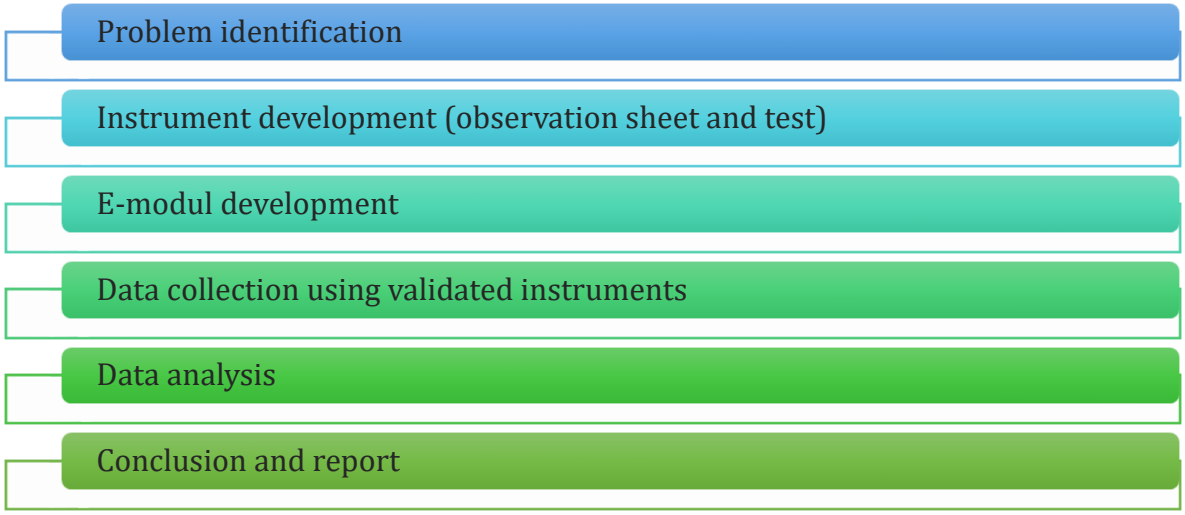

Figure 1. Research Procedure

The research subjects were first given a pretest to determine their scientific literacy skills before the treatments. Next, the two classes were given two different treatments. The experimental class was treated with an E-module, while the control class was treated without E-modules. After the treatments, the two classes were given a posttest to determine the scientific literacy skills improvement to see the influence of E-modules in the learning process. The researchers utilized WhatsApp, Google Classroom, and Google Forms to collect the data. Those platforms support various learning activities during the pandemic.

RESULTS AND DISCUSSION

The results of this research are the general student activities during the learning process using e-modules and the improvement of scientific literacy skills between the experimental class and the control class. The researchers observed students' learning activities that applied the E- module to the human excretory system. This research aims to determine the learning activities and scientific literacy skills differences between the experimental class and the control class. The researchers observed students' learning activities in the experimental class and the control class which applied the discussion method and Q&A in the WA group and Google Classroom.

The observed activities were students' discussions oriented towards scientific literacy skills indicators through WhatsApp groups. Four indicators became references of students' activeness, namely explaining phenomena scientifically, interpreting data and showing scientific data, analyzing data and problems based on available information, and evaluating and making scientific investigations. The researchers observed the indicators during discussions in Google Classroom. The discussions were carried out among students and the researchers.

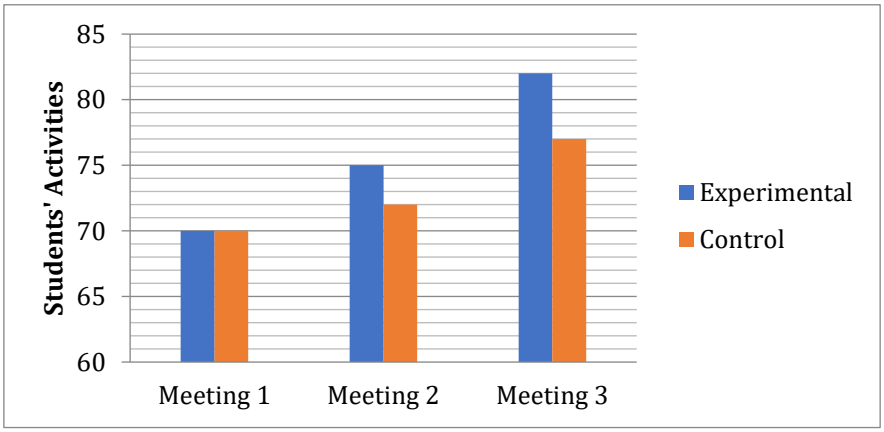

Figure 2. The Activities Differences between the Experimental Class and the Control Class at Each Meeting

Figure 2 shows students' learning activities in the experimental class and the control class. The first meeting used WhatsApp where both classes had the same percentage of 70%. However, at the second and the third meetings, there was a significant difference between the activities of the experimental class and the control class. There was a 3% increase in learning activities at the second meeting between the control class and the experimental class. However, there was a 5% increase in learning activities at the third meeting between the control class and the experimental class. The average value of the experimental class's learning activities was greater than the average value of the control class's learning activities. The average difference between the control class and the experimental class was 2.6%. The posttest and pretest score difference between the experimental and the control class can be seen in Figure 3.

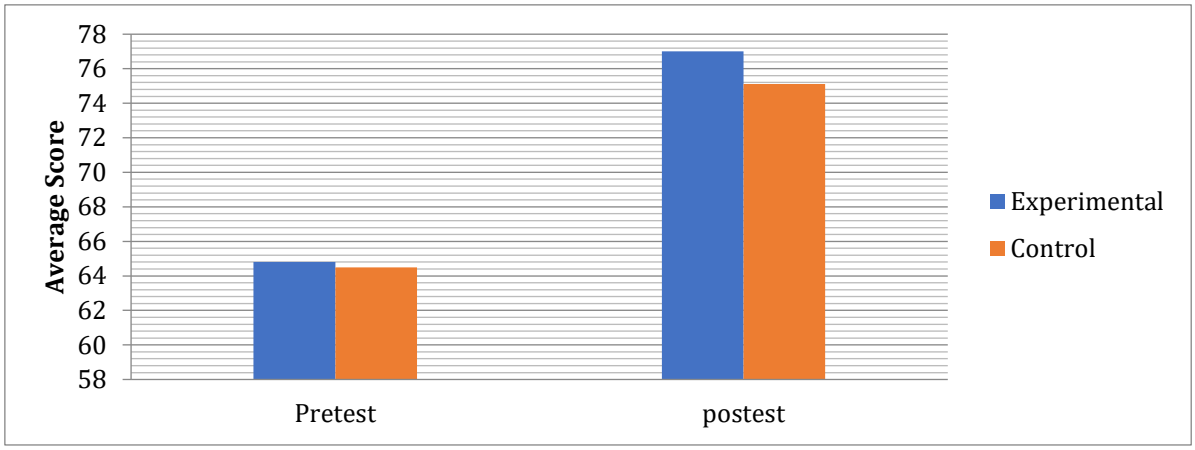

Figure 3. The average Pretest and Posttest Score between the Experimental Class and the Control Class

The average pretest score in the control class was 65 while the average posttest score in the control class was 75 (ten points increase). The average pretest score in the experimental class was 65 while the posttest score in the experimental class was 77 (twelve points increase). From both treatments in the control and experimental classes, the experimental class had a significant increase compared to the control class. Based on the data, the pretest scores for both the experimental class and the control class were still below the criteria of minimum mastery (KKM) for biology subjects (70).

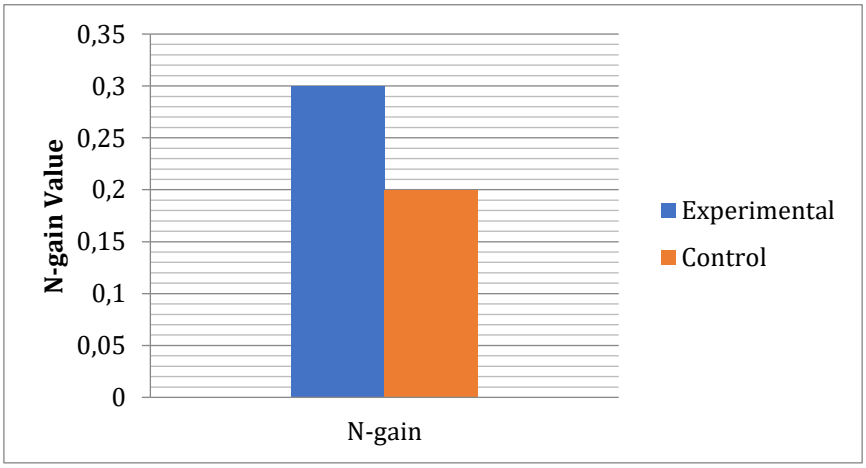

Figure 4. The Average N-Gain value of the Experimental Class and the Control Class

Figure 4 shows the average N-gain value of science literacy skills in the experimental class and the control class. The average N-Gain value of the experimental class (0.3) was greater than that of the control class (0.28). However, the average N-gain value of the experimental class and the control class belonged to the low category. The N-gain value in the experimental class and the control class was not significant due to various factors involved. One of the factors that influenced the value difference was the well-implemented biology learning. The biology teacher conducted usual learning activities so that students were accustomed to the learning activities.

The indicators of this research are Identifying scientific issues (recognizing issues that may be investigated scientifically), identifying keywords for scientific information, recognizing the characteristics of scientific investigations,

explaining scientific phenomena by applying scientific knowledge in a given situation, describing or interpreting phenomena, predicting changes, identifying appropriate descriptions, explaining and predicting, using scientific evidence by interpreting scientific evidence and drawing conclusions, providing reasons to support or reject conclusions, identifying assumptions to reach conclusions, communicating conclusions related to evidence and the reasoning behind conclusions, and reflecting based on the social implications of scientific conclusions. The differences in the scientific literacy skills improvement between the experimental class and the control class can be identified by performing statistical tests. The statistical tests consisted of the prerequisite test and the t-test. The prerequisite test consisted of the normality test using the Kolmogorov-Smirnov formula and the homogeneity test. The N-gain categories of the research results are presented in Figure 5.

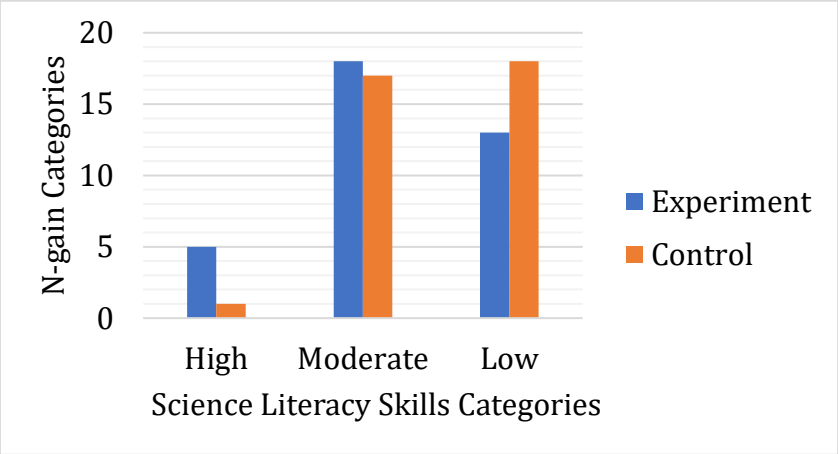

Figure 5. Graph of n-Gain for control and experimental classes in each category

Based on Figure 5, the experimental class had a higher N-gain value compared to the control class. On the other hand, the control class's N-gain values were in the moderate and low categories. Based on the N-gain results, there was a very significant difference between the experimental class and the control class. This difference is enough evidence to assume that the research followed the researchers' expectations. The results of the prerequisite tests are displayed in Table 1.

Table 1. The Results of the Normality Test and the Homogeneity Test

DATA	CLASS	Normality test		Homogeneity Test	
		Sig.	Note:	Sig.	Note
N-gain	Experimental	0.2	Normal	0.9	Homogeneous
	Control	0.2	Normal		

Table 1 presents the results of the normality test and homogeneity test. The normality test result for the experimental class and the control class was 0.2, which indicated that the data was normally distributed. The result of the homogeneity test showed that the data was homogeneous because of the Sig. values of the two data were normally distributed and homogeneous. The t-test was carried out after conducting the prerequisite tests for the N-gain data. Since the data were normally distributed and homogeneous, the independent sample t-test can be performed. The results of the t-test are shown in table 2.

Table 2. The Result of the t-test

Data	Test	Sig. (2 tailed)	Information
N-Gain	t-test	0.4	The difference is not significant

Table 2 shows the t-test results from the N-Gain data in general. The significance value of the t-test was 0.4, which means that H_o was rejected and H_a was accepted. Based on these data, it can be concluded that there was an insignificant difference in the improvement of students' scientific literacy skills between the experimental class and the control class. Although the difference was insignificant, the experimental class's average posttest score was higher than the control class's and the experimental class's N-gain value was higher than the control class.

The students were enthusiastic during the application of the E-module. It can be seen from the personal chat sent by several experimental class students regarding the ease of use of the E-module. They also stated that the E-module was easy to understand (Suastika & Rahmawati, 2019). The research revealed that some of the experimental class students believed that the E-module was very interactive even though the use of the E-module was constrained by the application. Therefore, the E-module needs a lot of improvements. The online learning method also influenced the insignificant difference. There were some students who did not pay attention to the discussion using WhatsApp Group. Boredom caused by online learning made the students careless in answering the pretest and posttest.

Some of the students could not access the E-module. Based on the results of interviews, students' difficulties were generally caused by several factors: lack of scientific literacy, difficulty in accessing the E-module, and confusion. Also, the E-module required a long learning duration and contained too many learning materials.

CONCLUSIONS AND SUGGESTIONS

Based on the results of the research, it can be concluded that learning biology using the E-module can improve the scientific literacy skills of the eleventh-grade students of SMA Negeri 1 Anjatan. However, there were some difficulties faced by the students, namely the lack of supported smartphones and low scientific literacy skills in working on problems, finding information, and analyzing. Therefore, the researchers suggest the teachers provide appropriate E-modules with easy to understand language. Furthermore, students should be given practice questions and supervised in performing good literacy.

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