IMPLEMENTATION OF LEARNING ENVIRONMENTAL POLLUTION MATTER WITH THE SSI-BASED EMODULE TO IMPROVE STUDENTS' ENVIRONMENTAL LITERACY.

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Abstract: This study aims to analyze the level of environmental literacy of students after using e-modules based on Socio Scientific Issues (SSI) on students' environmental pollution material through a survey method. The sample of this study was 26 students of MTs Yasti 1 Sukabumi. Data collection techniques were carried out using environmental literacy instruments adapted from Middle Schools Environmental Literacy Survey/Instrument (MSELS/I) questions made by NELA with modifications according to the context of environmental pollution. Data acquisition was transformed and interpreted using the NELA transformation method.The results showed that the SSI-based environmental literacy e-module was feasible to use in terms of feasibility (content, presentation and language), in terms of suitability for SSI and in terms of media with a percentage of 88%, 84% and 89% respectively. The CVI results related to the feasibility of the e-module are 0.995 (Valid). Learning using the SSI-based environmental pollution e-module can improve students' environmental literacy in the moderate category with an average N-Gain score of environmental literacy of 0.58. Student response to the SSI-based environmental pollution e-module is very good with an average percentage score of 91%. This research concludes that there is an increase in students' environmental literacy after using Socio Scientific Issues (SSI) based e-modules.

Keywords: Socio Scientific Issues (SSI), environmental literacy

INTRODUCTION

In the world of education, the use of advances in technology, information and communication can be adapted to learning needs. Utilizing advances in information and communication technology aims to create innovative, influential work to increase the efficiency and effectiveness of learning. In accordance with graduate competency standards and content in Minister of Education and Culture Regulation number 22 of 2016, the principle of learning to increase the efficiency and effectiveness of learning is to utilize sophisticated information and communication. Teachers are expected to be able to carry out innovations that can change the learning process, acquisition and processing of information through advances in

ICT, one of which is through teaching materials. The use of technology and information can create teaching materials that are able to facilitate students' understanding of biological material, using communicative language, images or videos that can make it easier for students to understand the material they understand, can be developed using information and communication technology, namely electronic modules (E -modules). One scientific approach that can be taken is Socio Scientific Issues (SSI) in learning. SSI-based learning can improve scientific literacy, critical thinking skills, and provide an interesting context for science learning (Borgerding & Dagistan, 2018). The use of SSI in learning will increase students' understanding of scientific concepts related to values and other sciences (Santika et al., 2018)

Socio Scientific Issues can function as a good learning context, enabling students to understand the importance of knowledge in everyday life and forming students' awareness to become consumers of scientific information. This is in line with science material which emphasizes the process of forming scientific natural knowledge related to everyday life. Therefore, the material contained in IPA must contain content that can be connected to everyday life or real life. The material content can be in the form of real problems that are currently developing in society, such as environmental pollution, global warming and other environmental problems which have been the subject of discussion and debate as a social scientific issue (Karisan & Zeidler, 2016).

The current education system must produce students who have environmental literacy so that they have sufficient knowledge about environmental issues and a caring attitude to behave responsibly. Students as the younger generation are assets that act as actors in future development, so they need to be a top priority in order to create complete national individuals with the personality to protect and preserve the environment. Students with good environmental literacy are the goal of environmental education.

In solving problems related to the environment, high literacy is required. With environmental literacy, it is hoped that students can solve problems related to the environment. Environmental literacy is a person's understanding of everything related to the environment, including knowing existing problems and being able to find solutions to overcome problems in the surrounding environment. Therefore, in order to develop environmental literacy, environmental education must develop an understanding of life in the environment, the cause and effect relationship between human attitudes and behavior towards the environment and foster responsible behavior towards the environment.

Improving students' environmental literacy can be done in various ways, one of which is through the learning process. The research results show that several studies state that environmental literacy can increase awareness of the environment. (Nasution, 2021) has conducted research on environmental education which is a means of describing environmental conditions. With environmental education, students can find out more about problems that occur in the environment. So that it

can create awareness in students about the environment.

Based on the results of the preliminary study, it shows that the highest environmental literacy score for students in the medium category is knowledge 21%, attitude towards the environment 26% in the low category, cognitive skills 13% in the lowest category and behavior towards the environment 18% in the low category, with the results of achieving all domains environmental literacy is 78% in the low category so it is necessary to use teaching materials in science learning as an effort to increase students' environmental literacy. Environmental literacy is still stated to be low due to several factors, namely students' lack of interest in knowing and studying environmental problems and a lack of caring attitude towards the environment. Teachers as educators can be examples and provide stimuli that understanding the environment must be the basis of attitudes to be able to solve environmental problems. The importance of instilling environment-based attitudes and skills in learning is apparently still lacking, in the learning process there are still many teachers who only convey knowledge and do not include environment-based attitudes and skills. One of the reasons is that many teachers do not have a background in environmental science, which is why students' literacy levels are still low. Based on the results of preliminary research, students' environmental literacy levels are low in all aspects, especially in aspects of students' attitudes and behavior towards the environment, because the learning process does not train students' environmental literacy. In this case, a certain method is needed to increase students' environmental literacy for each indicator. Based on the problems that have been described, it is necessary to develop an e-module based on Socio-scientific Issues to increase the environmental literacy of class VII SMP students.

METHOD

The method used in this study is the survey method. This aims to increase students' environmental literacy. The research sample used was 36 students of class VII junior high school. The instruments used were interviews and environmental literacy instruments adapted from the Middle Schools Environmental Literacy Survey/ Instrument (MSELS/I) used by NELA with modifications to the content of environmental pollution. The types of instruments used include multiple-choice questions for the knowledge domain, essays for the skill domain and questionnaires with the Likert Scale for the attitude and behavior domains. The instrument is deployed online using the help of Google form. The data obtained are then analyzed and interpreted using the National Environmental Literacy Assessment (NELA) transformation technique so it can be describing the conditions that occur in the research subjects (Hollweg et al., 2011). The environmental literacy instrument is adapted from the Middle Schools Environmental Literacy Survey/Instrument (MSELS/I) used by NELA with modifications to the content of environmental pollution. The grid of environmental literacy tests can be seen in table 1.

Table 1. Indicators of environmental literacy

Literacy Domain Environment	Domain	Number of Items
Knowledge	Environmental knowledge	10
Cognitive skills	Issue Identification Issue Analysis Issue Inqury Plan	7
Attitude	Thinking about the environment. Environmental sensitivity. Feelings for the environment	6
Behavior	Environmental responsibility	7

Source: (Hollweg et al., 2011)

The raw scores of the test results are then interpreted into certain criteria using the NELA transformation method which can be fully seen in the following table 2.

Table 2. Methods of transforming the raw scores of NELA environmental literacy test results.

Domain	Range	Criteria
Knowledge	0-60	(0 –20) Low (21 -40) Medium (41 –60) High
Cognitive skills	0-60	0 –20) Low (21 -40) Medium (41 –60) High
Attitude	15-60	(15 –30) Low (31 -45) Medium (46 –60) High
Behavior	12-60	(12 –27) Low (28 -44) Medium (45 –60) High

To measure the achievement of the entire literacy domain used qualification scores as follows Nella:

Table 3. Level of Environmental Literacy Achievement

Level of achievement	Qualification
27-98	Low
99-169	Medium
170-240	Low

To find out the interrelations and contribution values in each environmental literacy indicator, a correlational analysis was carried out including prerequisite tests consisting of normality and linearity tests. After the data were said to be normal and linear, a simple linear regression test and pearson product moment test were carried out using SPSS 26. The results of the analysis will later show the presence or absence of relations and the closeness of the relation between knowledge, cognitive skills, attitudes and environmental behavior (Arikunto, 2010).

RESULTS AND DISCUSSION

Environmental literacy is a person's ability to understand and interpret environmental conditions so that they can decide on appropriate actions in maintaining, improving and increase environmental conditions (Liang et al., 2018). Environmental literacy aims to be able to prepare environmenttally conscious humans to overcome environmental problems that occur (Kusumaningrum, 2018) and (Sari et al., 2020). Analysis of the improvement of students' environmental literacy is one of the evaluation steps taken to ensure that the developed e-module has met the objectives. Environmental literacy is measured using a test instrument, carried out with a pre- test and post-test design before and after learning using the e-module using the same measuring instrument.

The first analysis step carried out on the results of the pretest and posttest of students' environmental literacy is the normality test using the saphiro wilk normality test. Normality test is conducted to determine whether the data is normally distributed or not. If the significance value or probability value <0.05 then the data is not normally distributed. If the significance value or probability value> 0.05 then the data is normally distributed. The results of the pre and posttest normality test for environmental literacy can be seen in table 4.

Table 4. Enviromental literacy normality test

	Kolomogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig	Statistic	df	Sig
Pre-Test	.137	36	.083	.960	36	.220
Post Test	.105	36	.200*	.965	36	.314

*. This is a lower bound of the true significance

a. Lilliefors Significance Correction

Based on the table above, it can be seen that the significance value for the pre and posttest of environmental literacy is greater than 0.05. This shows that the data is normally distributed. In addition to the normality test, the paired sample t test was also conducted, the results of which can be seen in Table 5, Table 6, and Table 7.

Table 5. Paired sample statistical test results

Pair	Mean	N	Std. Deviation	Std. Error Mean
Pre-Test	74.0278	36	7.81386	1.30231
Post Test	85.6111	36	7.26352	1.21059

Table 4. shows the mean pretest < mean posttest. This shows that descriptively there is an average difference in learning outcomes between students' pre and post test results.

Table 6. Paired samples correlation

		N	Correlation	Sig.
Pair 1	Pre test & Post Test	36	.951	.000

Table 5. shows the correlation coefficient value of 0.951 with a significance value of 0.000. Because the sig value. 0.000 < probability 0.05, then it can be said that there is a relationship between the pretest and posttest environmental literacy.

Table 7. Paired sample test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Pre test - Post test	-11.58333	2.41868	.40311	-12.40170	-10.76490	-28.735	35	.000

Table 6. Significance test of differences in pre-test and post-test results shows the Sig value. (2-tailed) is 0.000 <0.05, it can be concluded that there is a real difference between the learning outcomes before and after implementing learning using e-modules based on Socio Scientific Issues environmental literacy in improving students' environmental literacy. Analysis of environmental literacy was carried out by calculating the N-Gain for each aspect of environmental literacy and the average can be seen in table 8.

Table 8. N-gain environmental literacy

Aspects of Environmental Literacy	N-Gain	Category
Knowledge	0,72	High
Cognitive Skills	0,48	Moderate
Attitude	0,55	Moderate
Behavior	0,60	Moderate
Average N-Gain	0,58	Moderate

Based on the results of the study, it can be seen that the increase in environmental literacy scores with high categories is knowledge. In the aspect of cognitive skills, attitudes towards the environment and behavior towards the environment in the medium category. The e-module developed in it is adapted to the Socio Scientific Issues (SSI) component in order to improve students' environmental literacy, this is in accordance with (Santika et al., 2018) by using SSI in learning, it will increase students' understanding of science concepts related to values and other sciences. The involvement of social aspects in SSI provides opportunities for the emergence of scientific reasoning with a social perspective which in learning has the potential to develop moral reasoning and literacy in the context of problem solving related issues, in other words, learning does not just involve knowledge but also requires attitudes and skills to address and solve existing problems or issues. The issues presented in SSI learning show the role of contextualizing social-based science issues learned in classroom learning.

Table 8. also shows the average N-gain value of 0.58 with a moderate category. This shows that overall, there is an increase in students' environmental literacy before and after learning using e-modules based on Socio Scientific Issues (SSI). This can be because learning using SSI-based e-modules makes students understand everything related to the environment including knowing the problems that exist and can find solutions to overcome a problem in the surrounding environment (Andani & Lisa Utami, 2019) with environmental education, students can find out more about the problems that occur in the environment. So that it can create awareness in students towards the environment. Environmental education can increase students' environmental literacy. In line with that, stated that environmental literacy can motivate students to care about their environment. This will help students in preserving the environment around them. This is corroborated by (Schmidt et al., 2013) and (Rose & Flowers, 2008) who also state that knowledge and attitudes are the basis of environmental literacy. Environmental literacy can make a person have awareness and concern for their environment.

In the domain knowledge, high achievement was obtained from the domain knowledge before and after learning using e-modules. The high level of student knowledge is influenced by several factors including previous knowledge, experience, sources of information, environment and the role of parents (Silalahi et al., 2016). In the cognitive skills domain, the moderate achievement results in the cognitive skills domain obtained indicate that most students lack good cognitive

skills. This is evidenced by the large number of students who answer questions without reason or with inappropriate reasons and the students' lack of habit in carrying out a problem-solving process that requires high-level thinking skills. Moderate cognitive skills can also be caused by the lack of quality of students' learning experiences. Students have less opportunity to interact directly with environmental problems that occur around them (Rokhmah & Fauziah, 2021).

The next result, the moderate level of achievement in environmental care attitudes shows that some students already have sensitivity and the ability to think about the environment quite well, as evidenced by the acquisition of attitude values in each domain. In addition, several factors that influence attitudes towards the environment include personal experience, culture, people closest to them, information, educational/religious institutions and emotional factors in individuals (Widianingrum, 2021).

The last is the domain of environmental action with moderate achievement results. These achievement results are caused by the lack of environmental behavior score results in the environmental responsibility aspect. The lack of scores in the environmental responsibility aspect illustrates that students have not been able to contribute and interact well with environmental sustainability and do not have the motivation to prevent damage to the environment (Suryanda et al., 2020). Factors that can influence students' environmental behavior include family factors, habits, friendly environment, association and information (Istiana et al., 2020), factors of condition, personality and relationships with nature (Krajhanz., 2010), as well as factors of facilities, the role of parents and the surrounding environment (Suryani, 2018). The last evaluation step in the e-module development stage is to analyze the results of students' responses to the e-module that they have used as a teaching material source. Student responses to the e-module were obtained by giving a questionnaire to 36 students with a score range of 1-5. The recapitulation results of student responses to the e-module can be seen in table 9.

Table 9. Student responses.

Aspect	Total Score	Persentase	Criteria
Material Aspects	817	90%	Very high
Display Aspects	985	91%	Very high
Motivational Aspects	489	90%	Very high
Aspects of Understanding	169	93%	Very high
Average Percentage		91%	

Table 9. shows that students respond very well to the e-module both in terms of material, appearance, motivation and understanding aspects. Students are also active in the learning process using e-modules and this can be because the e-modules developed are tailored to student needs based on observation results such

as the need for teaching materials that can be accessed easily and can be studied independently. Apart from that, the e-module is also equipped with pictures and videos so that it can increase students' motivation to learn. According to (Ari & Ika Pratiwi, 2018) e-modules can be compiled with multimedia applications because they can combine various media in the form of text, images, graphics, music, animation, video and interactions into digital files (computerization), and are used to convey messages to user. Apart from that, the amount of teaching time can be reduced, and the learning process can be carried out anywhere and at any time by students independently with e-modules.

Print and conventional learning media used by teachers in class do not attract students' attention in the era of digitalization. The use of interesting learning media can have a big impact on students' understanding of the material by arousing desire, motivation and stimulation to learn. On the other hand, the ability of teachers and students to operate computers or smartphones is an opportunity in developing e-modules. According to (Kuncahyono, 2018) in his research regarding the development of e-modules in thematic learning in schools, the results were that the e-modules developed were able to develop students' digital literacy potential. Then research conducted by (Fitriana et al., 2018) shows that the environmental pollution module can improve students' environmental literacy skills.

CONCLUSION

The research results show that the environmental pollution e-module was developed in accordance with Socio Scientific Issues (SSI) which can be seen in the material and activities menu on the e-module. The e-module display is made colorful and equipped with pictures and videos so that students are more motivated in learning. The SSI-based environmental literacy e-module is suitable for use in terms of suitability (content, presentation and language), SSI suitability and in terms of media with percentages of 88%, 84% and 89% respectively. The CVI result regarding the feasibility of the e-module is 0.995 (Valid). Learning using the SSI-based environmental pollution e-module can increase students' environmental literacy in the medium category with an average environmental literacy N-Gain score of 0.58. Student responses to the SSI-based environmental pollution e-module were very good with an average percentage score of 91%. This research concludes that there is an increase in students' environmental literacy after using Socio Scientific Issues (SSI) based e-modules.

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