



Environmental Pollution Module Based on SETS with Islamic Value to Improve Student' Science Literacy

Khaerun Nisa[✉], Dyah Rini Indriyanti, Parmin Parmin

Pascasarjana, Universitas Negeri Semarang, Indonesia

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Abstract

This study aims to test the feasibility and effectiveness of the SETS (Science, Environment, Technology, Society) vision of environmental pollution module containing Islamic values in improving students' scientific literacy. This type of research is research and development (R&D) that uses the ADDIE model (Analysis, Design, Development, Implementation, Evaluation) by applying a one-group pretest-posttest design. The research subjects to test the module developed were three expert lecturers consisting of science material experts, Islamic religious material experts, media experts, and 39 students of class VII MTsN 2 Kendari. The research instruments are expert validation questionnaires, readability questionnaires, gap test questions, and scientific literacy test questions. The analysis of the expert validation questionnaire data showed the average score on the feasibility aspects that were considered very valid. The readability questionnaire analysis describes the module as having very good readability. This result is in line with the results of the gap test analysis that the module is easy for students to understand. The results of the t-test of the students' scientific literacy ability resulted in a significance level of $0.0 < 0.05$, which means that there is a significant difference between the students' pretest and posttest scientific literacy. The N-gain value of scientific literacy for the scientific to investigate aspect is 0.38 in the medium category. The science aspect as a way of thinking is 0.45 in the moderate category, and the scientific aspect as the body of knowledge is 0.46 in the medium type. While another part of scientific literacy, namely the interaction between science, technology and society, the N-gain value of 0.26 is categorized as low. Based on the analysis results, the SETS-based environmental pollution module containing Islamic values is very suitable for learning and effectively improves three aspects of scientific literacy.

[✉] correspondence :
Jalan Kelud Utara III No.37, Kota Semarang, Jawa Tengah,
Indonesia 50237
E-mail: khaerunnisa764@students.unnes.ac.id

INTRODUCTION

Scientific literacy is an essential ability for students to be able to face 21st-century life. Scientific literacy is vital because it can make students learn better and adapt during modern society influenced by science and technology that continues to develop (Yulyanti, 2017). The importance of scientific literacy for students contrasts with the PISA science literacy test from 2009-2018. The results of the science literacy scores of Indonesian students are always in the bottom ten ranks. In 2018, the scientific literacy score of Indonesian students was 396 (OECD, 2019). This score is still far below the average of other countries taking the scientific literacy test. These results are following several studies that analyzed the scientific literacy skills of students in Surakarta and Pematang, which showed that students' scientific literacy was in a low category (Nur'Aini et al., 2018; Hasasiyah et al., 2019).

Students' scientific literacy's low ability shows the need for efforts to improve students' scientific literacy. One action that can do is to utilize modules or teaching materials in learning that empower scientific literacy. One of the studies shows that using ethnoscience-based environmental pollution modules in science learning can improve students' scientific literacy (Mardianti et al., 2020). To support the learning module, especially in the aspect of scientific literacy, it is necessary to add several supporting patterns or forms, including using SETS. Several studies suggest that SETS-based modules are proven to be effective in improving students' scientific literacy. One of the uses of e-modules based on the SETS approach can improve students' scientific literacy in content and process aspects (Syafutri et al., 2020). Other research shows the same thing that the SETS-based physics module is proven to be effective in improving students' scientific literacy (Handayani & Istiyono, 2018).

Another solution to improve students' scientific literacy is to apply SETS-based learning (Atmojo & Kurniawati, 2018; Ristina et al., 2019). SETS (Science, Environment, Technology and Society) learning can instil the relationship of four elements, namely science, environment, technology, and society (Usmeldi et al., 2017). The SETS approach is able to integrate scientific concepts in the form of applications that relate to people's lives (Sulistiyo et al., 2021). It means that SETS-based

learning makes learning contextual because the material raised in learning is learning from students' daily lives.

Students who have a learning environment close to Islamic values should connect the knowledge studied with Islam because science and Islamic values have a close relationship. One evidence of the connection between science and Islamic values is teaching instruments based on scientific literacy, Islamic values, and culture, which are very useful in learning to improve scientific literacy (Asyhari, 2019). Based on this relationship, learning scientific literacy can also be done with Islamic values-based learning. Scientific literacy with Islamic values is an ability that involves science in problems and issues related to science as a reflection of a religion (Suratun, 2018; Asyhari, 2017).

Learning with the principle of contextual material is believed to improve students' scientific literacy (Sukmawati, 2017) because scientific literacy requires students to solve problems that students have in everyday life. Environmental pollution material is one of the contextual materials if it relates to the environment around students. Several areas in Southeast Sulawesi are declared polluted. One of the studies that show the impact of nickel mining in the Southeast Sulawesi region on the environment is water pollution, air pollution, forest destruction, erosion and growing critical land (Sari, 2019). Another study showed that the water quality analysis in one of the rivers in Southeast Sulawesi in the polluted category (Hasani, 2016). Environmental pollution in Southeast Sulawesi can be an exciting and contextual topic in the learning module.

Based on the study of the environmental pollution module by researchers recorded in Google Scholar 2016-2020, the ecological pollution module with the theme of pollution in Southeast Sulawesi and a SETS-based module with Islamic values has not been developed. The modules that went through this initial review process included the SETS-based environmental pollution module, guided inquiry, ethnoscience, Islam-science, and others (Lekman, 2020; Habsari, 2016; Mardianti et al., 2020; Dewi et al., 2017). The results of the analysis of the seventh-grade junior high school science book, environmental pollution material commonly used by many junior high schools, show that books are

not SETS-based and contain Islamic values. This book presents aspects of scientific literacy but includes more aspects of science as the body of knowledge. Other aspects of scientific literacy in science as a way of investigating, science as a way of thinking, and the interaction of science, technology, and society are very few in books. This book does not even include evaluation questions for environmental pollution material, which means that there are no questions that can train students' scientific literacy. These results indicate the need to develop an ecological pollution module that discusses several pollution problems in Southeast Sulawesi, which has a SETS vision and Islamic values. This module can be used as innovative environmental teaching material to equip students with scientific literacy.

The results of a preliminary study conducted through interviews with one of the science teachers at MTsN 2 Kendari provide additional information that supports the development of an environmental pollution module in Southeast Sulawesi that has a SETS vision and contains Islamic values. The teacher stated that there had been no effort to improve students' scientific literacy so far, and the teacher has never used SETS-based learning in science learning. Books used in teaching and learning are books provided by the school, while reading sources such as modules that support the improvement of students' scientific literacy are challenging to obtain. The teacher stated that he had never independently developed a module for environmental or other materials.

MTsN 2 Kendari is a school with Islamic nuances, where all students are Muslim. However, a preliminary study conducted through interviews with one of the science teachers showed that science learning has never linked science material with Islamic values in the Quran. Islamic values in education are only in the form of prayers and appeals at the beginning and end of learning.

This information shows the importance of researching developing a SETS-based environmental pollution module containing Islamic values to improve students' scientific literacy. The objectives of this study are: 1) to test the feasibility of the SETS-based environmental pollution module containing Islamic values, and 2) to examine the effectiveness of the SETS-based environmental

pollution module containing Islamic values in improving students' scientific literacy.

METHODS

This research is a type of research and development (R&D) that utilizes the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model (Sugiyono, 2019). The research subjects for the feasibility and effectiveness of the module consisted of one science material expert lecturer, one Islamic religious material expert lecturer, one media expert lecturer, and 39 grade VII students of MTsN 2 Kendari. The instruments used to obtain research data were expert validation questionnaires, legibility questionnaires, gap tests, and scientific literacy tests.

The module validation questionnaire by experts uses a modified Likert scale with four categories of answer choices: types 1) Very Good, 2) Good, 3) Less Good, and 4) Not Good. The readability questionnaire also uses a modified Likert scale with four answer options, namely 1) Strongly Agree, 2) Agree, 3) Less Agree, and 4) Disagree. The gaps test is a question that asks students to fill in the word gaps from a sentence or paragraph on environmental pollution material. Aspects of scientific literacy measured in this study are science as a way of investigating, science as a way of thinking, science as a body of knowledge, and the interaction of science, technology, and society (Rusilowati et al., 2016).

The first stage of research is the analysis stage. This stage analyzes the problem or product that wants to develop through literature review and interviews with science teachers. The second stage is the design stage which consists of designing the modules to be developed and the lesson plan. The third stage is the development stage. This stage consists of creating or compiling modules according to the design made, continued with module validation activities by experts, and ending with module readability trials in ten students of class VII6 MTsN 2 Kendari.

The fourth stage is implementing a SETS-based environmental pollution module containing Islamic values to 29 students of class VII5 MTsN 2 Kendari using the One Group Pretest-Posttest design. At this stage, a scientific literacy test is carried out at the beginning and end of the lesson.

The fifth stage in this research is an evaluation that aims to evaluate the effectiveness of the environmental pollution module developed in improving students' scientific literacy.

Analysis of expert validation data and module readability was using presentation and category description techniques. The criteria for the validity and readability of the module are in Table 1.

Analysis of the scientific literacy data of students is first using the t-test and then continued with determining the N-gain value using the SPSS application. The N-gain value functions in assessing the effectiveness of the SETS-based environmental pollution module with Islamic values in increasing students' scientific literacy, which consists of three categories shown in Table 1.

Table 1. Categories of Data Validity, Readability Questionnaire, Gap Test, and N-gain

Data	Percentage score (%)	Category
Validity	81.25 – 100	Very valid
	62.50 – 81.25	Valid
	43.75 – 62.50	Less valid
	25.00 – 43.75	Invalid
Readability questionnaire	81.25 - 100	Very good
	62.50 – 81.25	Good
	43.75 – 62.50	less good
	25.00 – 43.75	Not good
Gap test	$P < 37$	Hard
	$37 \leq P \leq 57$	Moderate
	$P > 57$	Easy
N-gain science literacy	$g > 0.7$	High
	$0.7 \geq g \geq 0.3$	Moderate
	$g < 0.3$	Low

RESULTS AND DISCUSSION

Module Eligibility

The feasibility of the SETS-based environmental pollution module with Islamic values is obtained from the expert validation data and the module's readability test. Three experts, namely

science material experts, Islamic religious materials, and media experts, carry out module validation activities by filling out a validation questionnaire. Table 2 summarizes the results of the validation of the SETS vision environmental pollution module containing Islamic values by experts.

Table 2. Validation Results of the SETS Vision Environmental Pollution Module with Islamic Values

Expert	Rated aspect	Percentage	Criteria
Science material	Contents	100	Very valid
	Presentation	100	Very valid
	Graphics	100	Very valid
	Aspects of scientific literacy	100	Very valid
	SETS Aspect	87.5	Very valid
Islamic religious material	Islamic values	93.75	Very valid
	Contents	87.5	Very valid
Media	Presentation	83.3	Very valid
	Graphics	75	Valid
Average		91.89	Very valid

Based on Table 2, science material experts, Islamic religious material experts, and media experts stated that the SETS vision environmental pollution

module containing Islamic values was very valid for science learning. This kind of research results because the module includes basic competencies,

learning objectives, table of contents, concept maps, assignments, summaries, exercises, answer keys, glossary, bibliography, and range of modules following learning objectives. In addition, the module developed also has an attractive cover that describes environmental pollution material, and the images used in the module are primarily images of environmental pollution in the Southeast Sulawesi area, one of the figures in Figure 1. The use of pollution images around the environment of students is what becomes one of the exciting factors for students in studying environmental pollution material.

The environmental pollution module with SETS vision with Islamic values also has an additional exciting component (shown in Figure 2). This exciting component is like the component "Ayo cari ilmu," which displays the relationship between environmental pollution and SETS elements. The next component is the "Ayo cari tahu" component which contains questions to practice scientific literacy. Then another component is "Sekilas info," which functions to add information on environmental pollution supported by barcode scanner technology so that students can watch videos of environmental pollution information discussed. The components that can attract students to learn in student learning is not monotonous.



Figure 1. Module Displaying Pictures of Environmental Pollution in Kendari Bay, Southeast Sulawesi



Figure 2. Additional components in the SETS-based environmental pollution module with Islamic values

Another reason that makes science material experts state that the module developed very valid is an "Ayo cari tahu" component, assignments, and exercises to train students' scientific literacy. These three things cover all aspects of scientific literacy

that are assessed, so that students can train and improve their scientific literacy. The three components of this module are always present in every sub-material of environmental pollution, so that in each learning process, students can practice

their scientific literacy. The study process, which held carried out while the COVID-19 pandemic, required that all learning processes be conducted online. Therefore Students work on each task in the SETS-based environmental pollution module containing Islamic values individually. In addition, the exercises in the module help students to practice their scientific literacy independently because at the end of the exercise in the module there is an answer key accompanied by an explanation and how to determine the score obtained by the students. So, these three components can certainly train and help improve students' scientific literacy.

Islamic religious material experts also stated that the module developed was very valid or very feasible for science learning. This result because the module includes Islamic values related to environmental pollution material. Islamic value in the environmental pollution module consists of Quranic verses about environmental pollution material accompanied by its meaning and explanation. Each sub-material of environmental pollution in the module contains Islamic values in the holy verses of the Quran. Islamic religious material experts state that the Quran verses in the module have the right pronunciation and meaning. In addition, the expert stated that the verses of the Koran included in the module were following the topic of environmental pollution. Quran verses also have the right placement and by each sub-topic of environmental pollution.

This Islamic value in the module is exciting for students because it shows the relationship between ecological pollution material and the Quran verses. Figure 3 shows one example of Islamic values contained in the module. Islamic values in the module can support scientific literacy by encouraging students to prevent and overcome environmental pollution using their knowledge. This statement follows studies in previous research that stated that the relationship between Islamic values and scientific literacy is that a religious person will reflect on himself by taking an attitude to solve scientific problems and issues by utilizing scientific knowledge (Suratun, 2018).

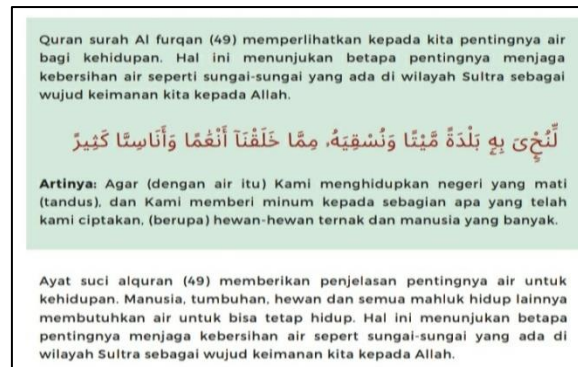


Figure 3. One of the Islamic Values in the Module

The media expert also stated that the module was very valid or fit to apply in the learning process, which was the same as these two previous experts. This statement based on a module can describe environmental pollution material, a consistent and attractive overall module design, proportional and attractive colour composition, and a harmonious layout. This module also uses a font that is not too much, and the cover has a title font size that is more dominant and proportional to the extent of the module and the author's name. Images and photos in a module have an attractive appearance, proper placement, and good colour quality. Figure 1 shows one of the images or photos assessed in the module to meet the criteria and is declared very valid.

The module assessment from three experts showed that the developed module was very feasible to use in the science learning process on environmental pollution. This result follows previous research on the feasibility test of an interactive E-module with SETS vision which is declared very suitable for use in science learning (Syafutri et al., 2020). Other research shows that learning tools that emphasize the integration of Islam-Science are displayed very feasible in science learning (Winarti, 2017).

Experts also provide suggestions as material for improving the module before applied in learning. Science material experts offer advice for correcting writing errors and providing introductory variations on the "Ayo cari ilmu" component. Other suggestions by the Science material expert are improving some examples of the association of the SETS chart, adding to the discussion of types of waste that cause water pollution, and discussing ways to deal with water pollution. Islamic religious material experts provide suggestions for adding the interpretation or explanation of the verse after the

meaning of the holy Quran. Media experts provide input to add information on the SETS element in describing environmental pollution, delete inappropriate images, and improve the quality of the writing of the Quranic verses to be more apparent.

Suggestions or criticisms from experts became materials to improve the module development to obtain a module with good writing. The improved module has an introduction to "Ayo cari ilmu", which is not monotonous and has a complete discussion of the sub-topics of causes and how to overcome water pollution. The improved module also has examples of better SETS elements on the SETS chart, additional explanations or interpretations for each verse of the Quran, SETS explanations on environmental pollution material explanations, more precise environmental pollution pictures, and clearer Quranic writings. The addition of an explanation for each verse of the Quran aims to make students better understand the relationship

between environmental pollution and Islamic values, namely the Quranic verse in the module. It only consisted of Quranic verses and their meanings. Then, adding a description of the SETS element in the description of environmental pollution is included because the module before the repair provided examples of the relationship between the SETS elements on the SETS chart only. Therefore, information on the SETS element aims to make students better understand the relationship between the SETS element on environmental pollution.

Based on experts' suggestions, this revised module then proceeds to the readability trial stage in a small group of 10 students in class VII 6 MTsN 2 Kendari. The readability questionnaire and a gap test became an instrument to show the readability of the based-SETS environmental pollution module with Islamic values. Figure 4 shows the results of the data analysis of the legibility questionnaire and the analysis of the gap test.

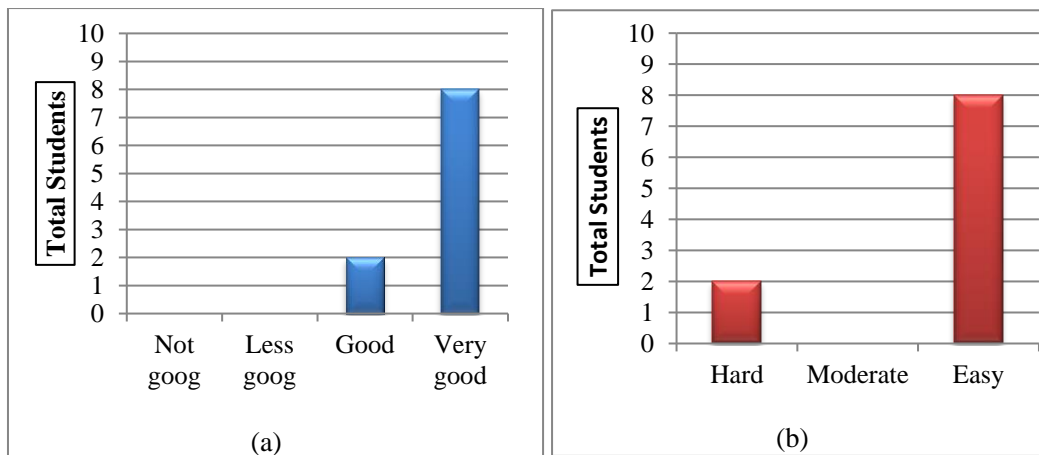


Figure 4. Results of Data Analysis (a) Readability Questionnaire, and (b) Readability Gap Test

The result analysis of the module readability questionnaire in Figure 5 shows that the module with the SETS vision with Islamic values has very good readability. This result followed the students' gap test, which showed that the modules were easy to understand. This result was obtained because through a legibility questionnaire, most of the students stated that the environmental pollution module developed had clear writing, easy-to-understand language and the content of the module that displayed pictures and cases of environmental pollution in the Southeast Sulawesi area. In addition, this module also has instructions for use so that participants can easily use the environmental pollution module developed for independent study.

Everything in this module attracts students' interest and motivates students to read or study using the developed environmental pollution module.

Eight students in the module readability test answered almost all the gap test questions correctly, and only two students were unable to answer the questions properly. This result is because these two students do not understand how to answer the gap test questions. These two students answered the gap test questions not by filling in the blanks in the sentences but by providing explanations. The inability of students to answer this gap test should not occur because the gap test questions given to students are equipped with instructions for working on the questions. However, based on the average

score of all students' answers on the gap test (for the readability of the module), the conclusion is the environmental pollution module with SETS vision contains Islamic values easy for students to understand.

Based on these overall outcomes about the legibility questionnaire and the gap test, the environmental pollution module developed has a very good level of readability and is easy for students to understand. According to previous research, these results showed that SETS-based learning devices have excellent readability (Ariyanti & Wilujeng, 2018). The same results are also found in other studies, which state that science teaching materials integrated with Islamic values have a very good level of readability (Susilowati, 2017). Based on the results of this readability test and the results of the module validation, the SETS vision environmental pollution module containing Islamic values is very feasible to be implemented in the science learning process on environmental pollution material.

Module effectiveness

This module, which is very valid and has excellent legibility, is then implemented in the learning process of environmental pollution material in class VII 5 MTsN 2 Kendari consisting of 29 students. The implementation phase aims to test the effectiveness of the module in improving students' scientific literacy. Analysis of the data from the pretest and posttest results of students' scientific literacy is a step to test the effectiveness of the developed module data. This analysis consists of the t-test and the determination of the N-gain value. The t-test activity resulted in a significance level of $0.00 < 0.05$, and the t count was 10.93, which was greater than the t table, which was 2.0. The results of the t-test showed a significant difference between the pretest and posttest results of students' scientific literacy. These results are the basis for stating that using the SETS-based pollution module with Islamic values has a significant effect on students' scientific literacy.

This result can occur because, during the learning process, students learn to use the environmental pollution module developed with a special design to improve students' scientific literacy. Students work on several assignments in a module that functions to train students' scientific literacy. In addition, students also do exercises located at the

end of the discussion on the environmental pollution module, which is designed to train students' scientific literacy skills. This learning activity enables students to improve their scientific literacy skills. This t-test result is in line with previous research, which revealed that the Physics module with the SETS vision impacted increasing students' scientific literacy (Handayani & Istiyono, 2018).

The N-gain test is the next step to determine the level of improvement of each assessed aspect of scientific literacy. Table 3 shows a recapitulation of the data analysis description of the N-gain value for each assessed element of scientific literacy.

Table 3. Description of the N-gain Pretest and Posttest of Science Literacy

Aspects of scientific literacy	N-gain	Criteria
Science as the body of knowledge	0.46	Moderate
Science as a way of thinking	0.45	Moderate
Science as a way of investigating	0.38	Moderate
The interaction between science, technology and society	0.26	Low

The description of N-gain in Table 3 shows that three aspects of scientific literacy have increased in the medium category. This result occurs because students learn to use modules that provide clear and interesting explanations of environmental pollution material. Another reason is that students work on assignments in the module in each learning process and answer questions in the "Ayo Cari Tahu" component in the module environmental pollution based SETS with Islamic values. The task and component of "Ayo Cari Tahu" aim to train students' scientific literacy, including aspects of science as a way of thinking and science as a way of investigating.

The fourth aspect, namely the interaction between science, technology, and society, is the only aspect of scientific literacy that has increased in the low category. Implementing the SETS vision module in learning could not improve students' scientific literacy skills in the interaction of science, technology, and society for the better. This result is because students are not accustomed to using SETS-based learning. Besides that, students experience

difficulties due to online education due to the impact of the Covid-19 pandemic. Online learning makes teachers unable to provide maximum instructional guidance, and some students experience internet network problems. These obstacles make it difficult for students to understand environmental pollution material, especially those that emphasize the relationship between science, environment, technology, and society because this association is new to students. This incident is in line with previous research, which shows that online learning has several shortcomings, namely the difficulty of teachers monitoring education, lack of internet networks, and difficulty concentrating (Handayani, 2020).

In general, the research carried out can be declared effective in increasing students' scientific literacy, because three of the four aspects of scientific literacy that are assessed have increased in the moderate category. so that the research provides a new alternative contribution in science learning, namely the application of a SETS-based environmental pollution module containing Islamic values in increasing students' scientific literacy. However, the low value of increasing N-gain in one aspect of literacy, namely the interaction between science, technology, and society, indicates the need for further research on this aspect.

CONCLUSION

Based on the analysis and discussion of the research results, this study concludes that the SETS-based Environmental Pollution module, which contains Islamic values, is very suitable for science learning. The developed module is also effective in improving three aspects of scientific literacy: science as a body of knowledge, science as a way of thinking, and science as a way of investigating, with N-gain in the medium category. This study provides an alternative contribution to new science learning, namely applying a SETS-based environmental pollution module with Islamic values in increasing students' scientific literacy. Further research is highly recommended related to increasing scientific literacy in the interaction between science, technology, and society.

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