JURNAL PENDIDIKAN MATEMATIKA DAN IPA

Vol 10, No 2 (2019) h. 314-322

http://jurnal.untan.ac.id/index.php/PMP

THE DEVELOPMENT OF BASIC CONCEPT SCIENCE MODULE WITH SETS VISION BASED ON SCIENCE LITERACY

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DOI: 10.26418/jpmipa.v10i2.29845

Abstract

This study aims to determine the validity and level of readability of the Basic Concepts Science module with SETS vision (Science, Environment, Technology, Society) based on Science Literacy. Testing the validity of the module in this R & D (Research and Development) uses content validity and construct validity tests, while testing the readability level of the module using the crossing test technique. The results of the study show the level of validity of the modules developed is included in the category of very high validity so that the module can be used. Meanwhile, the results of the module readability level test show that the Basic Concepts Science Module Based on Science Literacy SETS developed in the category is quite easy to understand and ideal for use in learning.

Keywords: *Module, basic concepts , science literacy*.

Received **: 28/01/2019**
Revised **: 02/07/2019**
Accepted **: 10/07/2019**

Science Environment Technology and Society (SETS) is one of the approaches that combine science, environment, technology, and issues that exist in society (Khasanah, 2015). The purpose of SETS learning is to improve students' solving skills in community and environmental problems. Once this goal is achieved, the critical thinking skills of students will be developed favorably (Purwandari, 2014).

Meanwhile, scientific literacy is the ability to utilize and apply scientific concepts in dealing with daily situations (Bybee et al., 2009). The National Science Teachers Association (NSTA) and the Regulation of National Education Minister (Permendiknas) No. 16 of 2007 state that science teachers need to master the concept of integrated science (Wilujeng, 2012). This indicates that students as candidates for science teachers in secondary schools must be able to advance scientific literacy in every learning process. One way to improve scientific literacy is through the SETS approach. In Khasanah (2015), it is affirmed that SETS has 5 syntaxes, namely Invitations, Exploration, Solutions, Applications, and Conceptualization. These five syntaxes can nurture students to improve their scientific literacy (Trihastuti, 2017).

The success of the learning process is influenced by several factors, one of which is the availability of teaching materials. Wenno (2010) states that one of the problems in science learning (including physics, chemistry, and biology) is related to teaching materials/study material. In line with this, Tamimiya (2017) asserts that good teaching materials must be able to improve the cognitive, affective, and psychomotor abilities of pupils. Excellent teaching materials can provide broad understanding to students about the concept of material to be delivered as well as its application. If it is associated with scientific literacy, then excellent teaching materials certainly must be able to improve learners' science literacy.

Teaching materials that only pertain to one topic are called modules. Modules should be employed autonomously by students. Therefore, the modules as teaching materials must be arranged systematically and interestingly, and include the contents, methods, as well as evaluations (Setyowati et al, 2013).

The Basic Concept of Science is a discipline that examines and analyzes the basic concepts in natural science. These concepts include an introduction to the science's history and nature (its characteristics, assumptions, scopes, boundaries and types of science), natural phenomena, scientific work, living things and their characteristics, organization of life, diversity of living things and their interactions in the nature of science as well as scientific method. In addition, science concepts also incorporate theories about the nature of matter and its changes (including physical and chemical changes), the use of scientific methods in the creation of scientific products and efforts in overcoming environmental problems.

Learning Basic Concepts of Science can be successful if it is sup-

ported by the availability of excellent teaching materials in order to improve scientific literacy and provide students' understanding of SETS. This knowledge can be acquired as a provision for students to deal with increasingly rapid technological developments.

Based on this description, it is essential to have teaching materials in the form of a Basic Science Concept module that aims to provide SETS understanding and its application, as well as to continue employing Science Literacy as the basis. This module is expected to hold a high level of readability to be used in the learning process.

METHOD

This study is classified as development research. The products which were developed and examined for their readability in this study were modules on the Basic Concepts of SETS vision and Science Literacy basis. This research was conducted at Tegal Pancasakti University. The subjects in this research were students majoring in Science Education Study Program at Pancasakti Tegal University in the odd semester of 2017/2018 Academic Year.

The procedures for developing the Basic Science Concept Module SETS vision and based on Science Literacy included preliminary studies, planning, module making process, expert validation, product testing, and analysis of trial results. The Validation consisted of Content Validation and Construct Validation which was done by the expert judgment method. The researcher applied the Content Validation to assess the material appropriateness with the syllabus and RPS, the language used, the correctness of the concept, and the suitability of the literature sources with the material. While the Construct Validity is used to assess the suitability of module components with predetermined indicators. The aspects of construct validation in the module assessment included the completeness of the module components, the language used, and graphics.

The score provided by the validator included several points, such as 1 (poor), 2 (adequate), 3 (good), and 4 (very good). Next, the results of the validator's evaluation were later analyzed and calculated as the average for each type of validation. The categories of module content validity assessment are: (1) average score> 34 then categorized as very high validity, (2) 23 <average score ≤ 34 then categorized as high validity, (3) 11 <average score ≤ 23 then categorized as the medium validity category, and (4) the average score ≤ 11 categorized as the low validity category. On the other hand, the category of module construct validity assessment is: (1) the average score> 35 which was very high in the validity category, (2) 24 <average score ≤ 34 was included in the category of high validity, (3) 12 <average score ≤ 23 was classified as moderate validity category and (4) average score 12 which was a category of low validity.

After the results of the validation test were obtained, the module

readability test should be conducted. This test was intended to investigate the practicality of using modules as well as testing its feasibility to be used in learning. Tests were carried out by using a contingency test with a variable-fixed ratio technique that removed words in a certain sequence with the conditions in accordance with the requirements set by the test maker.

FINDINGS AND DISCUSSION

The module characteristics developed in this study covered four components of scientific literacy aspects, specifically: (1) Science as a body of knowledge; (2) Science as a way of investigating; (3) Science as a way of thinking; and (4) interaction of science, technology, and society. Moreover, the modules formed in this study also incorporated two things, namely: Module 1 about the Nature of Science, and Module 2 about the Scientific Method.

After the modules were compiled, construct validation and content validation tests were then carried out by involving three validators who were experts in the field of Natural Science Education, Science Education Evaluation, and SETS. The selection of validators was based on the content enclosed in the module developed. The results of the content validation assessment by the validator team on the Basic Concepts of Science with SETS Vision and Based on Science Literacy with the subject matter of the Science's Nature and Method can be seen in Table 1.

Table 1 is the result of a validator's assessment of the content of the modules. According to Rusdi (2018, 180), there are 11 aspects that are employed and are the elaborations of 3 information that must be fulfilled in knowing the quality of the product contents. The three information are the accuracy of the contents, the present contents, and the completeness of the contents.

The accuracy of the contents in Table 1 includes: (1) the suitability of the material in the module with the RPS (Semester Learning Plan) in the Basic Concept Course of Science; (2) the conformity of material with the theme of the Nature of Science; and (3) the suitability of the material with the Theme of the Scientific Method, Clarity of information, Concept Accuracy , and the suitability of library resources. On the other hand, The Present Content can be elaborated in the aspect of conformity of the material with aspects of Science Literacy and SETS. Finally, the completeness of the contents can be explained in the aspects, the effectiveness and the efficiency of the language used.

The results of the validator's assessment of the contents of the module concerning The Basic Concept of Science with The SETS Vision and the Science-Based Literacy are remarkably valid that these modules can be used without revision. Nevertheless, there are several suggestions given by the validator relating to the contents of the module, namely the need to establish a concept of knowledge, science, and technology along with examples. In addition, a description of the characteristics of science should be presented in

Table 1. The results of module content validation assessment.

No	Rated Aspects	Validators Score		
		I	II	III
1	The material is in accordance Basic Concepts of Science RPS (Semester Learning Plan)	4	4	4
2	The material fits the Nature of Science theme	3	4	3
3	The material fits the Scientific Method theme	3	4	3
4	Material is in accordance with the indicators of Science Literacy	3	4	3
5	Material is in accordance with SETS elements	3	4	3
6	Legibility	4	3	3
7	Information clarity	4	3	3
8	Effective and efficient	3	3	4
9	Conformity of proper and correct language rules	4	4	4
10	The truth of the concept	4	4	4
11	Suitability of library sources with material	4	4	3
	Total Score	39	41	37
	Average Score		39	
	Category		Very High	

the form of points. Furthermore, the steps of the scientific method should be clarified, evaluations need to be added, and SETS content must be attached in the form of diagrams or drawings.

The results of the construct Validation assessment by the validator team on the module Basic Concepts of Science with SETS Vision and Based on Science Literacy on the subject of the Nature of Science and Scientific Methods can be seen in Table 2. Table 2 shows 12 aspects to assess the module construct. The construct here can be interpreted as a module design or display. Rusdi (2018,199) states that the expert's assessment of a product is focused on aspects of material content and design of the product. The description of the aspects assessed is adjusted to the components contained in the module developed, including covers, objectives, diagrams, images, questions, readability and clarity of language, the suitability of language, shape, size, and type, and layout. Table 2 also displays the average value of the total score of the module construct by 41, so that the module can be categorized as very valid and can be used without revision. Suggestions given by the validator relating to the construct/display module are used as a reference for evaluation and improvement, namely the need to improve the layout between the description of the concept and the image so that it is more interesting, reviewing the grammar used, and evaluation instructions need to be clarified.

The module evaluation process by the validator team above in addition to providing an assessment, the validator team also provided suggestions for improvement. Suggestions for improving the validator include adding and refining the material and improving the layout of the module.

Tabel 2. The results of costruct validation

No	Rated Aspects	Validators Score		
		I	II	III
1	Cover Module	2	4	3
2	Purposes	4	4	4
3	Material descriptions	3	3	3
4	SETS diagram	3	3	3
5	Examples of exercises	3	4	3
6	Evaluation questions	3	3	3
7	Legibility	4	4	4
8	The clarity of information	4	4	4
9	Effective and efficient	3	4	3
10	Suitability of good and correct language rules	4	3	3
11	Shape, size and type of letter	4	4	4
12	Layout	3	4	3
	Total Score	40	44	40
	Average Score		41	
	Category		Very High	

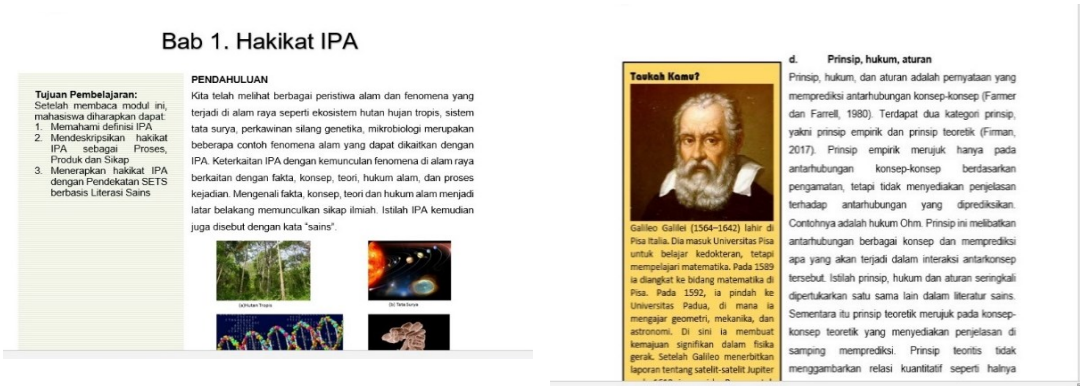

Figure 1. The improvement of image layout in the module.

This suggestion is an evaluation and improvement of the module. Examples of module improvement results can be seen in Figure 1 and Figure 2.

After the module revision had been conducted with the input from the validators, then the researcher carried out the readability level test of the SETS Basic Science Module with SETS Vision and based on Science Literacy. This test was conducted on 10 science education students. Tests were conducted by using a contingency test with a variable-fixed ratio technique which removed words in a certain sequence with the conditions in accordance with the requirements set by the test maker. The results of the test can be seen in Figure

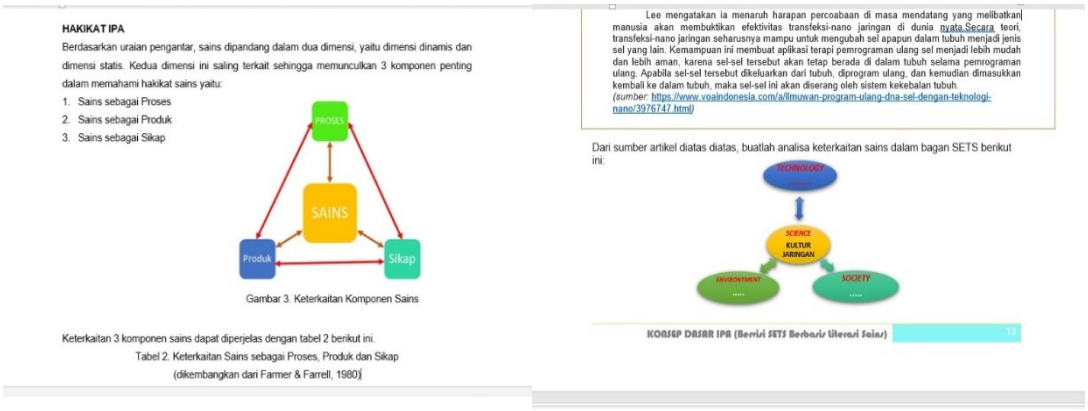

Figure 2. The addition of materials to link the SETS components to the module.

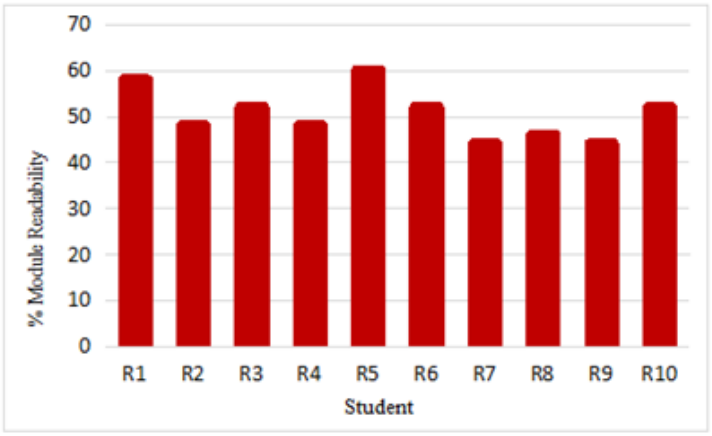

Figure 3. The distribution of module readability level test score.

Table 3. The recapitulation of module readability test results

Description	% Module Readability Level
Minimum score	44
Maximum score	60
Average	50,4

1 and Table 3.

Table 3 presents the acquisition of the average score of the module readability level of 50.4%. This shows that the module SETS Basic Concept of Science-Based on Science Literacy developed into the category of teaching materials that are ideally used in learning. Some input submitted by students during the implementation of the readability test is related to the layout between the material description and the image, and the need to attach SETS diagrams.

CONCLUSION AND SUGGESTION

The conclusions of the SETS-based Basic Science Concept Module development research based on Science Literacy are: (1) Test construct validation and module content validation confirms that the Basic Science Concept Module SETS and the Science-Based Literacy developed are included in the very high validity category so the module can be utilized; (2) The module readability test results in this study indicate that the Basic Science Concept Module with SETS Vision and Science-Based Literacy developed in the category is considerably easy to be understood and ideally used in learning.

Suggestions that can be conveyed in this research is that further research efforts are required to develop SETS-based Basic Science Concept Modules and Based on Science Literacy for other themes. Moreover, the testing also needs to be accomplished on a wider scale with larger sample sizes.

ACKNOWLEDGMENT

The researcher expresses the gratitude to the Ministry of Research, Technology and Higher Education for the Research Grant for Beginner Lecturers in the 2018 Funding Year.

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