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Implementation of the Geometry Optical Material Module Based on a Scientific Approach

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Abstract
Many students find it difficult to receive lessons because students do not have a handbook. Meanwhile, for schools that are still implementing the 2013 curriculum, textbooks that are in accordance with the scientific approach are not yet available. This research aims to provide solutions based on the problems faced by students, namely by developing teaching materials, namely modules. The research design is development (Research and Development). Meanwhile, the type of research is qualitative and quantitative research. Meanwhile, the development model is ADDIE. The technique used to collect data is by distributing questionnaires. The data analysis technique is a percentage technique, while the data type is quantitative data in the form of percentage values of student responses and qualitative data in the form of analysis results from the percentage of student responses. In this study, reliability was measured using the Kuder Richardson KR-20 formula. The physics module based on a scientific approach for high school class.

Keywords: Implementation; Geometry Optical Material; Scientific Approach

INTRODUCTION

Education in Indonesia has undergone curriculum changes nine times since post-independence (Sani, 2014). Education is a process in order to influence students to be able to adapt as best as possible to the environment (Djamarah, 1994:3). Education is an integral part of development (Ni Luh Gede Riwan Putri Bintari, I Nyoman Sudiana., 2014). The 2013 curriculum is the latest curriculum which began to be implemented in 2013. In the 2013 curriculum learning process, process skills are trained. The 2013 curriculum develops two learning processes, namely direct learning and indirect learning. Direct learning uses a scientific approach, namely observing, asking questions, collecting data, associating and communicating (Sani, 2014). Teaching materials are prepared to arouse interest in reading and are written and designed for students (Daryanto, 2014). Teaching materials are also tools used to assist teachers/instructors in carrying out learning and teaching activities (Daryanto, 2014). Through this process, it is hoped that students will have abilities in the realm of knowledge, attitudes and skills.

Many students find it difficult to receive lessons because students do not have a handbook. Meanwhile, for schools that are still implementing the 2013 curriculum, textbooks that are in accordance with the scientific approach are not yet available. Learning based on a scientific approach is the most general understanding of curriculum is a set of subjects determined to be taught in school

(Mahfuddin, 2013). This is based on the author's observations while carrying out teaching practice at SMAN 3 Jambi City, for classes X and XI there are no physics textbooks that are in accordance with the scientific approach. In general, the mechanism of scientific thinking is aimed at acquiring knowledge (Aka et al, 2010). Learning objectives with a scientific approach are based on the advantages of this approach (Machin, 2014).

One of the physics lesson materials in the 2013 Curriculum is optical instruments or geometric optics. To study optical instruments, students must have prerequisite knowledge regarding reflection and refraction of light. Reflection and refraction material has been studied at junior high school level in class VIII, but at junior high school level, light reflection and refraction material is only explained in general terms. Therefore, many students have difficulty understanding the concepts of optical instruments or geometric optics.

Based on the description of the problem, the author provides a solution, namely developing teaching materials, namely modules. Modules are printed media teaching materials designed for students to study independently (Asyhar, 2010). A module is a teaching material that is arranged systematically using language that can be easily understood by students and can be studied independently (Praswoto, 2013). Modules can also be used according to the student's learning speed. In this sense, a good module has five characteristics, namely self-instruction, self-contained, stand alone, adaptive, and user friendly (Asyhar, 2010).

RESEARCH METHODS

Contains the type of research, time and place of research, targets/objectives, research subjects, procedures, instruments and data analysis techniques as well as other matters related to the method of research. targets/objectives, research subjects, procedures, data and instruments, and data collection techniques, as well as data analysis techniques and other matters related to the method of research can be written in sub-chapters, with sub-headings.

The research design is development (Research and Development). According to him, the type of research is qualitative and quantitative research. Meanwhile, the development model is ADDIE, which stands for Analysis, Design, Development, Implementation and Evaluations. The place where this research took place was in classes X1 and X2 of Al-Falah Islamic High School and the time of the research was April 6-10 2015. In class Meanwhile, in class X2, data on student perceptions of the module was taken. The development model used in this research is the ADDIE model. That ADDIE is an acronym for Analyze, Design, Develop, Implement, and Evaluate (Branch, 2009).

1. Analyze

At this stage, the main activity is to analyze the need to develop a new learning model and analyze the feasibility and conditions for developing a new model. Problems can occur because the current learning development model is no longer appropriate to the target needs, learning environment, technology and student characteristics.

2. Design (Design)

At this stage the author needs to design the formulation of learning objectives, formulate learning materials, formulate tools for measuring success, outline media programs, explain learning materials, write media scripts.

3. Development (Development)

The development stage contains activities to realize the product design. In the design stage, a product framework has been prepared.

4. Implementation

After undergoing several improvements and revisions, the module was finally declared suitable for use by media validators and material validators. So the module will be tested in class X2 of AL-Falah Islamic High School, Jambi City.

5. Evaluation (Evaluation)

Evaluation is carried out in two forms, namely formative evaluation and summative evaluation. Formative evaluation occurs at the analysis, design, development and implementation stages. This is of course when the preparation of the module has been revised several times.

The technique used to collect data is by distributing questionnaires. In this research, a small group trial was carried out with 20 students. In this research, reliability is measured using the Kuder Richardson KR-20 formula (Arikunto, 2013). The data analysis technique is a percentage technique, while the data type is quantitative data in the form of percentage values of student responses and qualitative data in the form of analysis results from the percentage of student responses.

RESULTS AND DISCUSSION

The material validator provides input and suggestions in terms of material, presentation and language used.

Tabel 1. Phase I Validation

No	Question	Validator I	Validator II	Validator III	Suggestion
	Suitability Module with Characteristics Module				
	Load objective learning with clear	√	√	√	Without revision
1.					
2.	Provide example And supporting illustrations	X	X	√	Rays special made Alone
3.	Provide question And exercise	√	√	√	Without revision
7.	Module load all over fill material	√	X	X	Add material binoculars
8.	Spaciousness material in accordance with competence base	√	√	√	Without revision
10.	Module Can used without other media	X	X	√	Material on module outlined more in
11.	Module contains examples with development new technology	√	√	√	Without revision
	Module use common term	√	√	√	Without revision
12.					
	Suitability Module with Element Quality Module				
14.	Use the correct paper format	√	√	√	Without revision
18.	Picture And illustration interesting	√	√	√	Without revision
19.	Module cover interesting	X	√	√	Don't too Lots writing
22.	Type letter appropriate	√	√	√	Without revision
24.	The margins are precise	√	√	√	Without revision
27.	Form And letter consistent	√	√	√	Without revision

Table 2. Results of Phase II Media Validation

No	Statement	Validator I	Validator II	Validator III	Suggestion

1.	Material in accordance with 2013 Curriculum	√	√	√	Without revision
2.	Material in accordance with KI, KD, and Indicator 2013 Curriculum	√	√	√	Without revision
3.	Easy language understood	X	X	√	Keep it simple sentence
4.	Organizing material systematic	√	√	√	Without revision
5.	Material possible participant educate Study independent	X	X	√	Material too short , explain Again
6.	Description material in accordance with approach scientific	X	X	√	Activity observe And gather not enough appropriate
7.	Activity process scientific makes it easier participant educate understand material	√	√	√	Without revision
8.	Depth And breadth material appropriate	X	√	X	add material binoculars
9.	demonstrated phenomenon makes it easier understand material	√	√	√	Without revision
10.	Picture in accordance with material	√	√	√	Without revision

Tabel 3. Phase III Validation

No	Question	Validator I	Validator II	Validator III	Suggestion
	Suitability Module with Characteristics Module				
1.	Load objective learning with clear	√	√	√	Without revision
2.	Provide example And supporting illustrations	√	√	√	Without revision
3.	Provide question And exercise	√	√	√	Without revision
7.	Module load all over fill material	√	√	√	Without revision
8.	Spaciousness material in accordance with competence base	√	√	√	Without revision
10.	Module Can used without other media	√	√	√	Without revision
11.	Module load examples with development new technology	√	√	√	Without revision
12.	Module use common term	√	√	√	Without revision
	Suitability Module with Element Quality Module				
14.	Use the correct paper format	√	√	√	Without revision
18.	Picture And illustration interesting	√	√	√	Without revision
19.	Module cover interesting	√	√	√	Without revision
22.	Type letter appropriate	√	√	√	Without

					revision
24.	The margins are precise	√	√	√	Without revision
27.	Form And letter consistent	√	√	√	Without revision

Based on table 3 above, all validators checked "yes" on all questions in the questionnaire. This means that a module based on a scientific approach is suitable for use.

Tabel 4. Phase IV Validation

No	Statement	Validator I	Validator II	Validator III	Suggestion
1.	Material in accordance with 2013 Curriculum	√	√	√	Without revision
2.	Material in accordance with KI, KD, and Indicator 2013 Curriculum	√	√	√	Without revision
3.	Easy language understood	√	√	√	Without revision
4.	Organizing material systematic	√	√	√	Without revision
5.	Material possible participant educate Study independent	√	√	√	Without revision
6.	Description material in accordance with approach scientific	√	√	√	Without revision
7.	Activity process scientific makes it easier participant educate understand material	√	√	√	Without revision
8.	Depth And breadth material appropriate	√	√	√	Without revision
9.	demonstrated phenomenon makes it easier understand material	√	√	√	Without revision
10.	Picture in accordance with material	√	√	√	Without revision

Based on table 4 above, all validators checked "yes" on all questions in the questionnaire. This means that the material in the scientific approach-based module is suitable for use. Based on the student perception questionnaire, the following results were obtained:

Table 5 Percentage of student questionnaires for each indicator

No.	Indicator	Percentage	Category
1.	Design learning	89.6%	Very Good
2.	Material	84.4%	Very Good
3.	Benefit Module	84.4%	Very Good
	Average	**86.13%**	**Very Good**

Based on the table, it can be concluded that the benefits of the module created are categorized as very good. The following are several views of the scientific approach-based module which has undergone general revision:

Figure 1. Before revision

The creation of a physics module based on a scientific approach has been developed and validated by a team of validators. Media validators provide input, criticism and suggestions related to the scientific approach-based module. states that learning with a scientific approach is learning that uses a scientific and inquiry approach (Nurul, 2013). Meanwhile, the material validator provides input and suggestions in terms of material, presentation and language used.

Based on validation by the validator, it is recommended to improve the module as follows: (1) The example in the discussion of special rays should be written by hand. (2) Adding material to discuss binoculars (3) So that the module can stand alone, the material in the module is explained so that students do not use other media at the same time. (4) The sentences in the module instructions are made simpler so that they are easy to understand. (5) The structure of the sentences in the discussion about the eyes has been tidied up so that students can understand more easily. (6) The writing on the module cover has been reduced so it doesn't look messy. (7) Some paragraphs in the material are not organized, so that it looks more interesting. Based on the validation results, the validator suggests improving the material by simplifying the sentences in several paragraphs so that they are easier to understand. The material in the module is too concise, it is explained further so that students can learn independently. Instructions in observing activities simplified. And activities for collecting data should be made into LKPD and additional material for telescopes.

In class X1 it is used to determine the validity and reliability of the questionnaire and X2 to determine students' perceptions about the scientific approach-based module that has been developed. Learning with a scientific approach can improve learning outcomes (Marjan et al., 2014). Based on the data produced, it was concluded that the research questionnaire could be trusted and was used to collect non-test data regarding the feasibility of the scientific approach-based module that had been developed. The feasibility of the module is taken in class X1 at Al-Falah Islamic High School, and the data taken is student data regarding modules based on a scientific approach. From the trials carried out on Al-Falah Islamic High School students in Jambi City as a whole, it can be concluded that the physics module based on a scientific approach that has been developed is suitable for use as an independent learning medium for students, especially high school students. This can be seen from the percentage of students' perceptions of this scientific approach-based physics module which has a percentage of 83.93% in the good category. Revisions were made based on suggestions given by three validators. The revisions carried out concern the appearance, quality elements of the module, the language or sentences used and the material.

CONCLUSION

Based on the development and results of field trials, it can be concluded that a physics module based on a scientific approach can be produced for high school class X on Geometric Optics material. This module was evaluated directly by three validators, namely two physics education lecturers at Jambi University and one teacher at Al-Falah Islamic High School, Jambi City. The physics module based on a scientific approach for high school class

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