

Development of Inquiry-Based Natural Science Learning Modules on Classification Materials and Their Changes for Class VII Junior High School/MTs

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Abstract

The problems in this study are educators who have not used the science learning module in the teaching and learning process and the low learning outcomes of students because of the lack of students' ability to construct the knowledge they get. The aims of this study were: to know feasibility, to know practicality, to know the effectiveness of inquiry-based learning modules in material classification materials and their changes for class VII SMP/MTs in the learning process. This research is a development research using the 4D development model which consists of define, design, develop, disseminate. The instrument used is a validation questionnaire which includes aspects of content feasibility, language feasibility, and design feasibility, student response questionnaires and learning achievement tests. The feasibility of inquiry-based modules by lecturers as content and material expert validators obtained a score of 85 with a 100% achievement level in the "very feasible" category, while from subject teachers obtained a score of 88 with a 100% achievement level in the "very feasible" category, the linguist validator obtained a score 59 with an achievement level of 100% in the "very feasible" category and the design expert validator obtained a score of 88 with a 100% achievement level in the "Very feasible" category, practicality of the inquiry module on material classification material and its changes, small group test obtained a maximum score of 77 with the achievement level 67% in the "practical" category, field trials obtained a maximum score of 494 with an achievement level of 90 in the "very practical" category, the effectiveness of inquiry-based modules on material classification and its modifications with a success rate of 84% in the "very effective" category.

Keywords: Module, Inquiry, 4D



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INTRODUCTION

Education is one of the most important sectors in national development, made the mainstay so that it functions as optimally as possible to improve the quality of human life based on faith and piety to the one and only God. Education is expected to increase the ability and dignity of human beings who are educated and have faith, are responsible, creative and innovative, in order to respond to the challenges of the development of progress that is currently taking place. This is in accordance with what is stated in the Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System, article 3 namely: National Education functions to develop capabilities and form dignified national character and civilization in the context of educating the nation's life, aiming to develop the potential of students so that they become human beings who believe in and fear God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent, and become citizens of a democratic and responsible state.

Based on the very important functions and objectives of education, education is carried out as well as possible so that it can achieve the expected educational goals. One of the government's efforts to improve the quality of education in Indonesia is to continue to make efforts to update the curriculum development. In line with the implementation of the

independent curriculum, the teacher should no longer act as the main actor/actress in the learning process, because learning can be done by utilizing a variety of learning resources. In utilizing learning resources, the teacher has the responsibility to help students learn easier, smoother, and more focused.

Learning is an activity that will continue to happen to everyone. Learning means change efforts made by individuals both related to the addition of knowledge, as well as changes in skills and behavior. People who did not know after learning come to know this happens because of the learning experience. For the learning process to occur, of course there are subjects who are given lessons, namely students and there are subjects who teach, namely teachers. In the teaching and learning process of teachers as instructors and students as learning subjects, certain qualification profiles are required in terms of knowledge, abilities, attitudes and values as well as personal characteristics so that the process can take place effectively and efficiently.

Natural Sciences (IPA) is a science that studies nature and natural phenomena that occur, which are related to living and non-living things to be used as objects of natural science studies. Science learning plays a very important role in the educational process, so that science has an effort to generate interest and ability in developing knowledge and understanding of nature. The science learning process emphasizes providing direct experience to develop competencies in order to be able to explore and understand the natural surroundings scientifically. Science is not just mastering a collection of knowledge in the form of facts, concepts or principles, but also a process of discovery. By learning science, students are expected to be able to learn about themselves and the environment, and apply their knowledge in real life (Kemendikbud, 2017: 2). The essence of natural science according to Widodo, et al in the journal Dewi Umroh (2017) includes four main elements, namely attitude, process, product and application. Attitude includes curiosity about objects, natural phenomena, living things, and causal relationships that give rise to new problems that can be solved through the right procedures. The process is a problem-solving procedure through the scientific method (consisting of preparing hypotheses, designing experiments or experiments, evaluating, measuring, and drawing conclusions). Products in the form of facts, principles, theories, and laws. Applications include the application of the scientific method and science concepts in everyday life. The four elements are characteristics of a complete IPA and don't separated from one another.

The main problem in learning science is the dependence of students on teachers, which results in students being monotonous in thinking, or a lack of critical thinking in solving a problem. However, if the teaching and learning process cannot make students think critically in solving their own problems, then the learning becomes meaningless and also affects the learning outcomes of students who are less than optimal. In learning a teacher needs learning resources to support teaching and learning activities. One of the learning resources that can be used by teachers in the learning process in class is modules. The learning process will be more effective and efficient with the availability of modules or tools that support learning. Teachers need a set of well-organized subject matter, containing an action plan that will guide the teacher in designing learning activities. The module is a very important and strategic educational tool to determine success in the teaching and learning process of students at school or at home. With the module, the implementation of education will run more smoothly, and teachers can manage learning activities effectively and efficiently. The module is a form of teaching material that is packaged as a whole and systematically, in which it contains a set of planned and designed learning experiences to help students master specific learning objectives (Daryanto, 2013:9).

Based on the experience of prospective researchers while observing the learning process at SMP N 1 Gunungsitoli Utara, the lack of activeness of students in science subjects is due to the

fact that the teaching and learning process is still dominated by teachers even though an independent curriculum has been implemented. This lack of learning effectiveness occurs because supporting books to support the learning process in schools are still lacking. Students do not have handbooks to support related knowledge about the material presented by the teacher, this causes students to have difficulties in constructing the knowledge they get and the decline in student learning outcomes at the school.

From the problems above, one of the reasons why students in the learning process in the classroom still tend to be passive is because the teaching materials used do not facilitate students to learn actively in discovering their own concepts. Students need teaching materials, these teaching materials are in the form of science modules that can help students to study independently or in groups in finding the concepts of science learning material to be studied. The form of teaching materials that researchers want to develop is in the form of a science module. The important thing in learning science is interesting teaching materials, one of which is the student module. Various forms of teaching materials according to Warpala (2011: 23) include: Audio teaching materials such as humans, sound recordings, radio, printed teaching materials such as books, newspapers, magazines, posters, modules, visual teaching materials such as posters, photos, pictures, teaching materials audio-visual such as films, videos. Teaching materials based on conformity with one material to another.

To overcome problems in learning so that students are able to construct their own knowledge, the researchers developed a module based on inquiry learning. The inquiry learning-based module emphasizes the activeness of students in having learning experiences in discovering material concepts based on the problems posed. The use of this module is useful for activating students in the learning process, helping students develop concepts, assisting students in finding and developing process skills, as a guide for teachers and students in carrying out the learning process, helping students obtain notes on material learned through learning activities . The use of this module is also expected to help students be actively involved with the material discussed and provide learning experiences for students in practicing their independence in learning. Development Goals: Knowing the feasibility of content, language feasibility and the feasibility of inquiry-based science module designs on material classification materials and their changes by subject matter experts/validators and teachers. Knowing the practicality of inquiry-based science modules on material classification materials and their changes. Knowing the effectiveness of inquiry-based IPA modules on material classification and its changes.

DEVELOPMENT METHOD

Development Style

Selection of a good development model will produce an effective and efficient product. The right selection of the development model will produce the right product. The development model used in this study is the 4-D model development. The model used is the Thiagarajan development flow according to Trianto, this development model consists of four stages, namely the define, design, develop and disseminate stages. This model was chosen because it aims to produce a product in the form of an IPA module. The products developed are then tested for feasibility and practicality with validity and product trials to determine effectiveness after using the Science module in the learning process on global warming material.

Development Procedure

The development design used in this research is the 4-D model development research design (Four D Models) according to Thiagarajan. This includes 4 stages, namely define, design, develop and disseminate which can be explained as follows:

1. Defining Stage (Define). Activities at this stage are carried out to determine and define development requirements. In determining and determining learning requirements, it begins with an analysis of the objectives of the material boundaries developed by the device. This stage includes 5 main steps: Front End Analysis, Student Analysis, Task Analysis, Concept Analysis and Formulating Learning Objectives. At this stage the prospective researcher formulates the results of the task analysis and the above concept analysis becomes the goal of achieving learning outcomes. The details of the learning objectives are as follows: Classifying Substances, Classifying Mixtures, Explaining physical and chemical properties, Applying the utilization of physical and chemical properties of a substance/object, Physical Changes and Chemical Changes, Separation of Mixtures.
2. The Design Stage. After getting the problem from the definition stage, then the design stage is carried out. This design stage aims to design a module that can be used in science learning. This design stage includes: Preparation of Tests, Selection of media, Selection of Formats, Preliminary Design.
3. Development Stage (develop). In this development stage the aim is to produce the final science module product after going through a validation process from material experts, language experts, design experts and field trials. At this development stage there are 2 steps, namely: expert validation and product trials. Expert Validation consists of Content/Material Experts, Language Experts and Design Experts. Simulation and product trials.
4. Stage of Dissemination (disseminate). After the Science module is declared valid and feasible, this module is printed in as many quantities as needed and then the Science module is disseminated in learning activities at schools. At this stage, the module was distributed to students in class VII SMP N 1 Gunungsitoli Utara, which aims to test the effectiveness of using the device in teaching and learning activities. Dissemination of science modules that have been developed in real situations, namely in the classroom. The material is delivered in accordance with the developed IPA module. The activity is then continued by conducting a learning achievement test after completing learning. This aims to obtain some useful data to assess aspects of the effectiveness of teaching materials as a reference for revision so that the Science module becomes better.

DEVELOPMENT RESULTS AND DISCUSSION

Presentation of Product Trial Data

1. Product Validation Data

- a. Content and Material Expert By Lecturer. The percentage of the results of module validation by material experts for the aspect of Suitability of Module Material with KI-KD, presentation techniques, support for inquiry-based presentation in the first revision is a decent percentage of 49.41%. And in the second revision, the percentage results reached 67.05% which was quite decent. While the third revision reached 100% and received the criteria of Very Feasible. Based on the analysis of the data obtained from the validation of material experts, the researcher made several revisions. The results of these revisions were corrected in accordance with suggestions for improvement orally or in writing from material experts. After revisions and improvements were made in accordance with the suggestions of the validator, the module was declared "Very Eligible" by the material expert validator.
- b. Content and Material Experts By Subject Teachers. The percentage of module validation results by field of study teachers for aspects of suitability of material with KI and KD, presentation techniques, support for inquiry-based presentation in the first revision is the percentage results reaching 48.86%, the criteria are quite feasible. And in the second

revision, the percentage results reached 57.95. Fairly feasible, while in the third revision, it reached 100% and received the criteria of Very Feasible. Based on the analysis of the data obtained from the validation of the subject teacher, the researcher made several revisions. The revision results were corrected in accordance with the suggestions for improvement orally and in writing from the subject teacher as follows. After revisions and improvements were made in accordance with the suggestions of the validator, the module was declared "Very Eligible" by the subject teacher validator.

- c. Linguist Validation Data. Percentage of module validation results by linguists for technical aspects of module language presentation. presentation techniques and presentation support in the first revision is the result of the percentage reaching 45.76% which is quite feasible. Whereas in the second revision the percentage results reached 57.62% which was quite feasible and in the third revision the percentage results reached 100% very good criteria. Based on the analysis of the data obtained from the validation of the linguists, the researcher made several revisions. The revision results were corrected according to suggestions for improvement orally or in writing from linguists. After revisions and improvements were made in accordance with the suggestions of the validator, the module was declared "Very Eligible" by the linguist validator.
 - d. Design Expert Validation Data. The percentage of module validation results by design experts for the aspect of module format, cover layout and module content, cover typography and module content, and cover illustrations and module images in the first revision was the result of the percentage reaching 73.86% criteria Eligible and in the second revision it reached 77.27% with Eligible criteria. Whereas in the 3rd revision the percentage results reached 100% Very feasible criteria. Based on the analysis of the data obtained from the validation of the design experts, the researchers made several revisions. The results of these revisions were corrected according to suggestions for improvement orally or in writing from design experts. After revisions and improvements were made in accordance with the suggestions of the validator, the module was declared "Very Eligible" by the design expert validator.
2. Product Practicality Data. The practicality test was carried out using an assessment sheet in the form of a student response questionnaire, which was carried out in three stages, namely simulation, small group practicality test and field practicality test. The trial results were obtained by means of an assessment through a student response questionnaire. The student response questionnaire assessment of the module can be seen in the following table:

Table 1. Module Practicality Assessment Questionnaire

No	Product Trials	Gain Score	Maximum Score	Achievement Level	Category
1	Simulation	18	56	32%	Less practical
2	Small group test	77	114	67%	Practical
3	Field test	448	494	90%	Very

Based on the analysis of the practicality of inquiry-based module data in product trials, it was obtained that at the simulation stage the acquisition score was 18 and the maximum score was 56 with an achievement level of 32% in the less practical category, Small Group Trials an acquisition score of 77 and a maximum score of 114 with an achievement level of 67% in the Practical category, Field Trials obtained a score of 448 and a maximum score of 494 with an achievement level of 90% very feasible category.

Product Effectiveness Data. The effectiveness test is carried out using a learning outcome test in the form of essay questions, which is carried out after teaching and learning activities using

modules. The effectiveness test was carried out in the trial class, namely class VII. The success rate of the effectiveness test in the VII trial class was 85% in the very effective category, from the assessment of learning outcomes tests, 24 of the 28 students completed the KKM.

Product Data Analyst

1. Module Eligibility. The results of the initial product development will then be validated by the validator. The product is said to be feasible if theoretically the experts state that the product is in the "good" category according to the characteristics of the expert validators. Validation is carried out to assess the learning media that have been made by researchers, and the suggestions that have been given are used to improve the module on material classification material and its changes.
 - a. Material Expert. Based on the results of the material validation assessment by the lecturer, the developed module is considered capable of meeting the needs of students. The material expert's feasibility assessment shows that the module is in accordance with the existing KI and KD and contains concepts (material) that are suitable for use in schools. The average percentage of module assessment results by material experts for the aspect of Suitability of Module Material with KI-KD, presentation techniques, support for inquiry-based presentation in the first revision, the percentage reached 49.41%, which was quite feasible. And in the second revision, the percentage results reached 67.05%, which was quite feasible. Meanwhile, in the third revision, it reached 100% and received very feasible criteria. that the module is also in accordance with the existing KI and KD and contains concepts (materials) that are appropriate for use in schools. The average percentage results of the module assessment by material experts for the aspect of suitability of the material with KI and KD, presentation techniques, support for inquiry-based presentation in the first revision is the percentage results reaching 48.86%, the criteria are quite feasible. And in the second revision, the percentage results reached 57.95%, the criteria were quite feasible. Meanwhile, in the third revision, it reached 100% and received very decent criteria.
 - b. Linguist. Based on the results of the linguist feasibility assessment, the developed module is considered to have fulfilled the criteria for using good language and can be understood by students at the junior high school level. The average percentage of module assessment results by linguists for technical aspects of module language presentation. presentation technique and presentation support in the first revision is the result of the percentage reaching 45.76%, the criteria are quite feasible. Meanwhile, in the second revision, the percentage results reached 57.62%, the criteria were sufficiently feasible, and in the third revision, the percentage results reached 100%, the criteria were very feasible.
 - c. Design Expert. Based on the results of the expert feasibility assessment, the developed module design is considered to have met the needs of students. The feasibility assessment by design experts shows that the design used in the module is in accordance with the interests of students, and is suitable for use in schools. The average results of module feasibility assessments by design experts for aspects of Module Format, cover layout and module content, cover typography and module content, and cover illustrations and module images in the first revision were the results of a percentage of 45.76% good criteria and in revision to 2 reached 57.62% with good criteria. While in the 3rd revision the percentage results reached 100% very good criteria.
2. Practicality of the Module. The practicality of the module was measured using a student response questionnaire. The practicality test was carried out in three stages, namely simulation, small group test and field test. The simulation was attended by friends, the response questionnaire was filled out by colleagues after the researcher carried out a

simulation using the module. The results of the participant response questionnaire obtained an acquisition score of 18 out of a maximum score of 56 with an achievement level of 32% in the "less practical" category. After the individual test was completed, it was followed by a small group test which was attended by 6 students. The results of the questionnaire obtained a score of 77 out of a maximum score of 114 with an achievement level of 67% in the "practical" category. After the small group test was completed, it continued with the field test, which was carried out at SMP Negeri 1 Gunung Sito Utara, which was attended by 28 class VII students. The results of the questionnaire obtained a score of 448 out of a maximum score of 494 with an achievement level of 90% in the "very practical" category.

3. **Module Effectiveness.** The effectiveness of the module was measured using student learning outcomes tests. Data acquisition in class VII-A, namely KKM mastery of 24 out of 28 students with an acquisition of 84% in the very high category, can be concluded that the module is very effective to use. Based on the validation data analysis by content and materials experts, linguists, and design experts, the researchers made several revisions to the eligibility of the module so that it could be used. The results of the revision can be seen as follows:

Product Revision

1. **Validation by Content and Material Experts.** The contents and materials of the module were revised by two validators, namely UNIAS Gunungsitoli lecturers and subject teachers. By Lecturer: Added material about the classification of material and its changes. By subject teacher: adding material according to indicators.
2. **Validation by linguists.** Criticism and suggestions by linguist validators, as follows: Improve some of the sentences used in the module and improve the spacing between sentences.
3. **Validation by design experts.** Criticism and suggestions by the design expert validator, as follows: Make the delivery of material more effective and make the module cover more attractive.

CONCLUSION

Based on the results of the research and development above, it can be concluded that: Feasibility of inquiry-based modules by lecturers as content and material expert validators obtained a maximum score of 85 with an achievement level of 100% in the "very feasible" category, while subject teachers obtained a maximum score of 88 with an achievement level 100% in the "very feasible" category, the linguist validator obtained a maximum score of 59 with a 100% achievement level in the "very feasible" category and the design expert validator obtained a maximum score of 88 with a 100% achievement level in the "Very feasible" category. Practicality of the inquiry module on material classification material and its changes. Small group testing obtained a maximum score of 77 with an achievement level of 67% in the "practical" category. Field trials obtained a maximum score of 494 with an achievement level of 90% in the "very practical" category. The effectiveness of the inquiry-based module on material classification and its changes with a success rate of 84% in the "Very Effects" category.

Based on the research findings, discussion and conclusions in this study, some suggestions from researchers are as follows: Class VII inquiry-based module on material classification material and its changes need to be refined again, if indeed it is useful and produces a higher quality product. Class VII inquiry-based modules on material classification material and its changes that have been developed can be published more widely so that they can be used as teaching materials in the world of education. Inquiry-based modules for class VII to be used in

the learning process as teaching materials, especially in material classification material and its changes.

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