



Development of science learning module for global warming materials for class VII students at public junior high school 3 Tondano

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Abstract

This research is motivated by the textbook used by the teacher in the learning process that has not been able to help students learn independently, so students still have difficulty understanding the material. The purpose of this study was to determine the effectiveness and practicality of the science learning module on global warming material for seventh grade students of SMP Negeri 3 Tondano. This research is a development research with five stages, namely: Analysis, Design, Development, Implementation, evaluation. The results of this study indicate that based on the test based on the assessment of the current material I assessment 81%, material II experts obtained 85% including the category quite valid or suitable for use, while the media experts obtained 88% including the very valid category to use, the effectiveness test based on student learning outcomes with completeness of 0.8 including the criteria of high/very effective and the practicality test of the module obtained from the teacher's response with an average assessment of 4.7 is in the very good category. Based on the results of the study, it can be said that the science learning module on global warming material is feasible, effective and practical to use.

Keywords: development, science learning module, global warming

Introduction

Education is something that every individual needs. Education can be interpreted as a conscious effort to make oneself better. Education is the process of changing attitudes and behavior of a person or group of people in an effort to mature humans through teaching and training efforts (Indonesian Dictionary). Law No. 20 of 2003 concerning the National Education System states that education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have spiritual strength, self-control, intelligence, noble character and skills needed by themselves, society, nation, and the State (Maulana, 2017:12).

Science on students has a major influence on changes in mindset and behavior. Knowledge, able to know the quality of themselves and know what their potential is. The main problem faced by the world of education in developing the potential of students is the problem of the learning process. The learning process that occurs in the classroom increases in skill learning, students learn more to memorize lessons without being asked to understand and relate the lessons they have learned to be applied in everyday life, so that students graduate from smart schools, but are unable to apply them.

The problems above, learning can now be used by teachers to help deliver the material to be delivered to students. One of them is to use learning materials whose delivery can be collaborated with learning models. Learning materials that can be used by teachers to facilitate the delivery of material to students can be in the form of worksheets, modules, and several other learning materials. Some of the existing learning materials, the researcher chose the module to be used as a tool to be used to deliver learning materials.

The module is one of the teaching materials that can help

students understand the learning material. Learning with modules allows students to have a higher speed in completing basic competencies. The modules are presented in good, interesting language, and are equipped with illustrations, this can motivate students to understand learning. The learning module is a program package that is arranged in the form of certain units and designed in such a way for the benefit of student learning. One module package usually has components of teacher instructions, student activity sheets, student worksheets, student worksheet keys, test sheets and test sheet keys (Paktur, 2013:1) ^[13].

The results of observations made by researchers in class VII at SMPN 3 Tondano on October 17, 2020, it was found that the condition of facilities and infrastructure at SMP Negeri 3 Tondano can be categorized as quite complete. For example, student textbooks to help smooth the learning process and charta are available in the school library. The books in the school are books that are in accordance with the current educational curriculum and the number is quite proportional to the number of students. However, for the material on global warming, there are still no available learning resources in the form of modules and teachers still use textbooks and worksheets in the learning process so that teachers and students experience difficulties when learning to teach. So far, the learning process of educators uses the lecture method without using a learning model as a support in the science learning process. This is what causes this material to be considered difficult for most students and causes student learning outcomes on global warming material that are still not as expected and by seeing this reality, it is very necessary to use learning models in the science learning process in order to facilitate the student learning process in the material global warming so that student learning outcomes will increase. So based on these

conditions, alternative learning models are needed that can increase student learning motivation and learning outcomes. Based on the description above and supported by the current situation when the COVID-19 outbreak hit the world, including Indonesia, it has an impact on education where all education in Indonesia is at home so that the learning process is carried out online (online) so that students are required to carry out the learning process independently at home. Researchers conducted research on the development of science learning modules for global warming material for seventh grade students of SMP Negeri 3 Tondano”

Materials and Methods

The module is one form of teaching material that is packaged in a complete and systematic way, in which the module contains a set of learning experiences that are planned and designed to help Students master specific learning objectives. The minimum module contains learning objectives, learning material or substance, and evaluation (Daryanto, 2013) ^[6].

Basically, the function of the module is as an independent learning medium. Students can study anytime and anywhere independently. Therefore, the module is not limited to the problem of place, meaning that the module does not have to be studied only in the classroom.

The module has characteristics that distinguish it from other teaching materials. To increase students' learning motivation, module development must pay attention to the characteristics needed as a good module as follows (Daryanto, 2013) ^[6]. 1) Self Instruction (Independent) This characteristic is an important characteristic in the module that allows a person to learn independently and not depend on others. To fulfill the self-instruction character, the module must: a) Contains clear learning objectives, and can describe the achievement of Core Competencies and Basic Competencies. b) Contains learning material that is packaged in small/specific parts, making it easier to study thoroughly. c) There are examples and illustrations that support the clarity of the presentation of learning materials d) There are practice questions, assignments and the like that make it possible to measure student mastery. e) Contextual, namely the material presented is related to the atmosphere, task or context of activities and the environment of students. f) Use simple and communicative language. g) There is a summary of learning materials.

The module contains all the required learning materials. The purpose of this concept is to provide opportunities for students to study the learning materials thoroughly, because the learning materials are packaged into a unified whole. a) Stand alone, the module must not depend on other teaching materials/media. Thus, students do not need other teaching materials to study or do assignments on the module. b) Adaptive, the module can adapt to the development of science and technology that develops at any time and is flexible. c) Friendly / Familiar (User Friendly) Familiar in this characteristic means that every instruction and information exposure in the module is helpful and friendly to its users. This includes the ease of users in responding and accessing as desired (Daryanto, 2013) ^[6].

Module Quality, teaching materials can be said to be of high quality if they have several aspects, namely validity and practicality. The explanation of each aspect is as follows: 1) Validity to find out the validity of a module or teaching material, it can be done by validating the module to experts.

There are several characteristics that must be met so that the module can be said to be good and attractive, there are 4 aspects that must be considered, namely the feasibility of content, language, presentation, and graphics. In this case, the mathematics module developed is adapted and developed with the BSNP indicators (BSNP, 2007). 2) Practicality, teaching materials or modules can be said to be practical if they are easy to use by teachers and students in studying a material. Practical teaching materials are teaching materials that are easy to use and not confusing. The module is said to be practical if it is easy to use by students in studying the material presented and is not confusing when used.

Setting Indicators and Learning Content, there are three criteria in formulating learning indicators, namely (1) consistently and systematically described from the subordinates contained in the learning analysis section, (2) using one or more sentences, and (3) the statements used are very helpful and applicable in the preparation of items. -test items. A good learning indicator has four criteria, namely (1) a subject, which is a person who learns, (2) a verb, which is an active verb that can show changes in behavior, (3) a condition, which is a condition that is needed when students learning, and (4) standards, namely the criteria for learning success to be achieved. Learning indicators are intended to build expectations in learners about the rights that must be mastered after learning. Define learning content organizing strategy, the choice of learning organizing strategy is strongly influenced by the type of content of the field of study being studied and how the structure of the content of the field of study is. The results of this step will be in the form of establishing a model to organize the contents of the field of study, both at the micro and macro levels. Determine the strategy for delivering learning content, in the step of determining the strategy for delivering learning content, the list that has been made is used as the basis for selecting and determining the strategy for delivering learning. This rare result is in the form of establishing a model for delivering learning materials.

Submission of learning content refers to the method used to convey learning content to students while receiving and responding to input from students. Therefore, the delivery of learning is called a method for carrying out the learning process. The components that need to be considered in describing the strategy for delivering learning content are (1) learning media, (2) interaction of learning content with media, and (3) the form or structure of teaching and learning.

There are five components of the learning delivery strategy, namely (1) pre-learning activities, (2) information presentation, (3) student roles, (4) testing, and (5) follow-up. The first activity carried out in the delivery of pre-learning is to motivate students about the importance of the subject in question. The second activity is to explain the specific learning objectives with the intention that students are aware of what abilities they have achieved after carrying out learning activities. The third activity is to explain what abilities are needed as a prerequisite for learning.

The use of modules is often associated with self-instruction activities. Then another consequence that must be met by this module is the completeness of content, meaning that the content or material presented in a module must be completely limited through presentations so that readers feel it is sufficient to understand certain fields of study from the

learning outcomes through this module. Modules have many meanings regarding independent learning activities. People can study anytime and anywhere independently. So the learning activities themselves are not limited to the problem of place, and even people who live in places far from the center of the organization can follow learning patterns such as this. In this regard, the module authors have the following objectives: a. Clarify and simplify the presentation of messages so that they are not too variable. b. Overcoming the limitations of time, space, and senses, both learning participants and teachers. c. Can be used appropriately and varied, such as to increase motivation and passion for learning, develop the ability to interact directly with the environment and other learning resources that allow students to learn independently according to their abilities and interests. d. Allows students or students to measure or evaluate their own learning outcomes (Purjianta, 2016).

The ADDIE development module is a learning design model based on an effective and efficient systems approach and an interactive process, namely the results of the evaluation of each phase can bring learning development to the next phase. The final result of a phase is the initial product for the next phase (Ibrahim, 2011). ADDIE development steps, the following are the steps for developing the ADDIE model. a. The steps for developing the ADDIE model according to Chaeruman (2008) ^[5]. 1) Analysis is a process of defining what students will learn. So to find out or determine what to learn, you have to do several activities, including doing a needs assessment (needs analysis), identifying problems (needs) and doing task analysis (task analysis). Therefore, the output that will be produced is in the form of characteristics, identification of gaps, identification of needs and detailed task analysis based on needs. 2) Design is also known as making a design. Like a building, before a blue-print is built on paper, it must exist first. What should be done in this design stage? The first is to formulate learning objectives. Next, compose a test, where the test must be based on the learning objectives that have been formulated. Then determine what the appropriate learning strategy should look like to achieve these goals. There are many choices of combinations of methods and media to choose from and determine what is relevant. In addition, it must be able to consider other supporting sources, such as relevant learning resources, what kind of learning environment is it really? 3) Development is the process of making the blue-print or design a reality. If the design requires a software in the form of multimedia to be developed or a print module is required, then the module needs to be developed. Likewise, the learning environment that will support the learning process must all be prepared at this stage. One important step in the development stage is a trial before it is implemented.

This trial stage is indeed part of one of the ADDIE steps, namely evaluation. More precisely, formative evaluation, because the results are used to improve the learning system developed. 4) Implementation stage is a real step to implement the learning system that is being created. That is, at this stage everything that has been developed in such a way according to its role or function can be implemented. For example, if certain software is needed, the software must have been installed. Must be certain, then the environment is made certain and must also be arranged, then implemented according to the initial scenario or design. 5) The evaluation stage is a process to see whether the learning

system that is being built is successful, in accordance with initial expectations or not. Actually, the evaluation stage can occur at any of the four stages above, called formative evaluation, for example, an expert review to provide input on the design that is being made. At the development stage, it may be necessary to test the product being developed or it may be necessary to evaluate a small group

The subjects of this study were class VII students, 3 experts consisting of 2 science lecturers at Manado State University, 1 science teacher at SMP Negeri 3 Tondano. The object of this research is the science learning module in the seventh grade Global Warming Material. This research was conducted at SMP Negeri 3 Tondano. This research was carried out from April to May 2021 in the 2020/2021 academic year

Implementation, this stage was tested on students to determine the effectiveness of learning outcomes by giving a test on global warming material in the early stages (posttest) and the final stage (pretest). Evaluation, in the last stage of the ADDIE model, the activities carried out are evaluation of learning programs and evaluation of learning outcomes. Thus, the evaluation stage is a stage to measure the practicality of the developed module. For the validity of the module, judging from the assessment of the expert validator at the data development stage, it uses a questionnaire technique to take the results of the practicality test of the teacher's responses.

Results and Discussion

This research is a type of R&D (Research and Development) research which was developed using the ADDIE model. The purpose of this study is to determine the feasibility, effectiveness, and practicality of the science learning module. This science learning module is equipped with a description of the module, basic competence, learning objectives, the role of teachers and parents, learning activities, practice questions, summaries, research rubrics. 1. Eligibility, 1) Analysis, the first stage in this research is needs analysis. Based on an interview conducted by the author on October 17, 2020 with one of the science subject teachers named Mrs. Djellie Wuwungan, S.Pd: a. The curriculum used at SMP Negeri 3 Tondano is the 2013 revised 2017 curriculum. b. 2 hours of lessons / week x 40 minutes. c. It is not in accordance with. d. One of the science subjects that are considered difficult for students is global warming. e. They still do not understand the material and lack interest in learning. f. The KKM used in science learning is 75.

g. Books and worksheets The conclusion drawn from the needs analysis is that the teaching materials used are still in the form of books and worksheets and the lesson hours are so short, only 2 hours per week which makes students still not understanding the material and lack of interest in learning. To overcome these problems, the researchers compiled a science learning module for global warming material. The results of interviews with teachers can be seen in Appendix 2.

Design, the next stage is designing or designing the module. The steps taken in designing the science learning module for global warming material are adjusting to the Core Competencies and Basic Competencies. The module is designed using white HVS paper, with A4 paper size, 1.5 letter spacing, 12 font size and Times New Roman typeface. The module presentation is arranged in order of cover,

introduction, table of contents, concept map, introduction, learning activities, formative test (evaluation), Bibliography. The steps taken in developing the module design are as follows: a. Early Design of Science Learning Module, the initial design of the module for science learning material on global warming developed by researchers

After completing the design, the next step is development. The development here is the module printing process which is then ready for the validation process. The validation of the science learning module on global warming material was tested by 3 experts consisting of 2 material experts, 1 media expert. The assessment instrument is carried out by Prof. Dr. Rolles Nixon Palilingan, MS as material expert 1 (Lecturer of Physics at Manado State University), Djellie Wuwungan S.Pd as material expert 2 (Science teacher at SMP N 3 Tondano) and Dr. Meike Paat, M.Pd as a media expert (Lecturer of Biology at Manado State University) in order to obtain module validation so that it is suitable for use in research. The criteria for determining expert subjects are experienced in their fields. The validation instrument

uses a 4-scale Likert scale. The results of expert validation are described as follows:

Filling out the validation instrument sheet for material expert I and material expert, valid or feasible to use but need to be revised slightly. Validation by material expert validators II gets a percentage score of 85% which is in the category of quite valid or suitable for use but needs minor revision.

Filling out the validation instrument sheet for media experts can be seen in appendix 5. Based on the validation results as in table 4.5 above, the validation results by the media expert validator get a percentage score of 88%, so it is included in the very valid category or suitable for use without revision.

After validation of the module, the next process is the revision of the module. The module revision activity aims to finalize or complete a comprehensive final refinement of the module. After the module is repaired, the module is ready to be tested. Here are some parts of the module that have been revised:

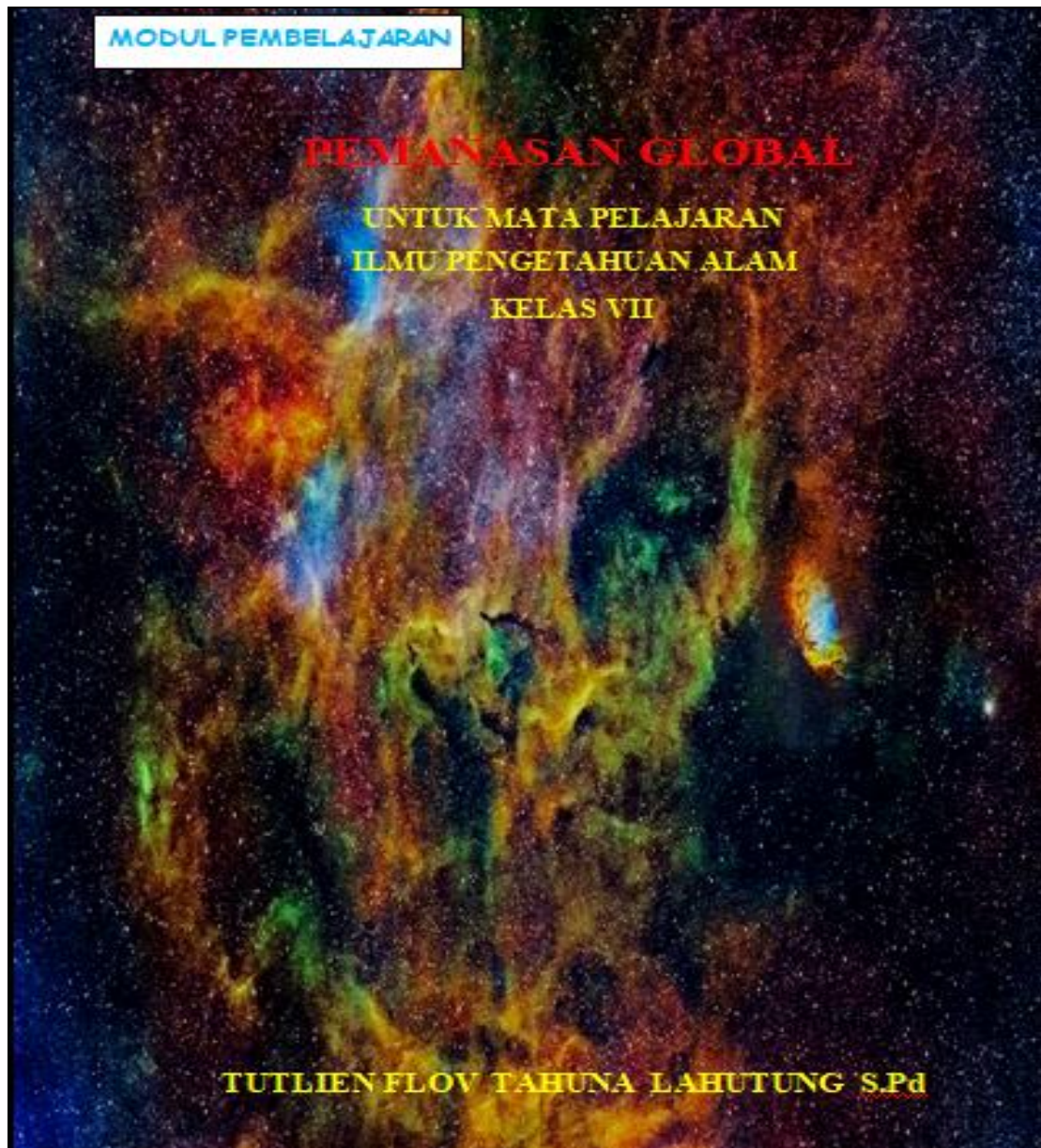


Fig 1: Front Cover Display of the module before revision



Fig 2: The Front Cover Display has been revised

The material expert validator II revealed that it would be better if the language used in the module was adapted to the language of the class VII students. So it is necessary to simplify the language so that the reader really understands and can understand the author's intent in the module. The module revision activity aims to finalize or complete a comprehensive final refinement of the module. After the module is repaired, the module is ready to be tested. The implementation stage is carried out to see the effectiveness of the learning (learning outcomes) stage. The results of the development of science learning modules are

implemented in real classes (field tests) to 20 students. The following are the results of the field test of the implemented teaching material products seen from the effectiveness of learning:

a. Learning Effectiveness (learning outcomes). The learning outcomes test was carried out at the first and third meetings, on April 22 and May 6, 2021 and was attended by 20 grade VII students of SMP Negeri 3 Tondano. The purpose of the learning outcomes test was to determine the effectiveness of the global warming material being tested. Consists of 10 questions. The time allocation is 40 minutes.

Table 1: Effectiveness of Learning Outcomes

Student	Pretest	Posttest	Learning Outcome Test Score $g = \frac{\text{posttest} - \text{pretest}}{\text{skormaks} - \text{pretes}}$	Category
1	20	80	0,7	High/highly effective
2	10	85	0,8	High/highly effective
3	10	85	0,8	High/highly effective

4	15	90	0,8	High/highly effective
5	25	90	0,8	High/highly effective
6	20	90	0,8	High/highly effective
7	15	95	0,9	High/highly effective
8	15	80	0,7	High/highly effective
9	15	80	0,7	High/highly effective
10	10	80	0,7	High/highly effective
11	10	80	0,7	High/highly effective
12	10	95	0,9	High/highly effective
13	15	95	0,9	High/highly effective
14	20	90	0,8	High/highly effective
15	15	90	0,8	High/highly effective
16	15	80	0,7	High/highly effective
17	15	90	0,8	High/highly effective
18	15	80	0,7	High/highly effective
19	15	90	0,8	High/highly effective
20	10	80	0,7	High/highly effective

The results of the learning outcomes test were carried out on 20 students who scored above the KKM, where the KKM determined by the school was 75. The results of the analysis of the learning outcomes test with completeness reached 0.8. This means that the learning device meets the qualifications effectively because it has high/very effective criteria.

The feasibility test of the module is reviewed from the validation assessment. Validation is assessed directly by material experts and media experts. Validation is said to be valid if it can be done correctly and can provide the desired results. Student learning. The module is said to be valid if it has gone through several stages such as validation by experts (Ginanjari, 2010). According to Nuryadi (2019) ^[16], the validation process can be carried out more than 3 times so that the resulting product is truly valid and feasible to use. In this study, validation was carried out 3 times by each validator (expert) so that there were several designs and languages that were neatly arranged and easy to understand. This research is said to be valid because it meets the appropriate criteria for the material, design, and suitability of the material with KI and KD.

The results of the validity of the science learning module by 3 validators consisting of 1 material expert lecturer and 1 media expert lecturer, each from a science lecturer at Manado State University and 1 teacher as a material expert II at SMP Negeri 3 Tondano. Based on the results of the validator material experts I and II obtained an average score of 81% and 85% which are in the category of quite valid or feasible to use but need to be revised slightly. The results of the media expert validator obtained an average score of 88%, so it is included in the very valid category or deserves to be used without revision. According to Windarti (2015) ^[18] states that the learning module is seen from the aspects of the feasibility of content, language, presentation, graphics and character of the expert assessment results with a percentage of 90% which are in the very valid and feasible category to use.

Test the effectiveness of the module based on student learning outcomes using the N-Gainscore test obtained from 20 students with completeness reaching 0.8 with high/very effective criteria. This study is relevant to research conducted by Mustofa (2017) ^[2] the effectiveness of learning outcomes is seen from the N-Gainscore test obtained from 32 students with completeness reaching 0.4 with moderate/effective criteria.

The quality of the module is also determined from the

practicality of a module when used in learning. The data to determine the practicality of this module was obtained from student responses questionnaires and teacher responses. Based on the data obtained an average assessment of 4.7 by the teacher, so this module is included in the good category, which means this module is practical to use in learning. This research is relevant to research conducted by Zana Sartika Silaban (2020) ^[19]. The practicality of this module is obtained from student responses questionnaires and teacher responses. Based on the data obtained an average assessment of 4.7 by the teacher, so this module is included in the good category, which means this module is practical to use in learning.

Conclusions

The results of research on the development of science learning modules on global warming material for seventh grade students of SMP Negeri 3 Tondano, have been carried out in accordance with the ADDIE model research, it can be concluded that the results of this study are as follows:

1. The feasibility of the science learning module on global warming material after being validated was obtained by material experts and media experts with a valid enough level of validity or suitable for use even though it needs to be revised.
2. The effectiveness of learning outcomes obtained high criteria / very effective.
3. The practicality of the science learning module based on the teacher's questionnaire has practicality with very good criteria.

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