

DEVELOPMENT OF MATHEMATICS MODULE BASED ON THE SCIENTIFIC APPROACH ON SET MATERIAL FOR CLASS VII

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ABSTRACT

Limitations of learning materials is a problem that affects the achievement of learning objectives. Materials that are difficult to understand. Materials that can help students learn actively and independently is a module. This research aims to develop, test the module's feasibility, and know the student response to the development of a mathematics module based on a scientific approach to the set material. The type of research conducted is development research. The subject of research of development mathematics module is material expert, media expert, and some student of SMP Negeri 1 Banguntapan and SMP Muhammadiyah 1 Godean. The object of this research is learning module of mathematics based scientific approach in the material of set for the student of SMP/MTs class VII. The data collection techniques are based on the questionnaire and interviews. The analysis used is quantitative descriptive. The research result shows material expert gives that score of ratings had an average score of 116,67 in perfect criteria score by media expert had an average score of 129 in perfect criteria, and the result of the student response against the module shows that quality module is very good with an average score of 130,80. Based on the calculation, the mathematics module is developed can be used in learning mathematics.

Keywords: Mathematics module, Scientific approach, R&D, Set

INTRODUCTION

In the learning process to facilitate students in achieving the purpose of learning the needs of learning resources. All materials used to support the learning process are called teaching materials. According to Depdiknas (2008), Teaching materials are all forms of systematic materials that can help teachers/instructors conduct learning activities. Teaching materials can be either written or unwritten. One of the teaching materials that help students to learn actively and independently is the module. Through modules, students gain knowledge independently, without or with the guidance of the teacher. Self-study does not necessarily mean self-study, but when students can learn in their way, they develop the ability to focus. By independent study, students are allowed to solve problems, learn by using different techniques based on their background knowledge and learning speed.

The variety of teaching materials used is still limited, i.e., student worksheets and book packages. The teaching materials used are difficult to understand, such as student books and the unavailability of teaching materials able to help students study independently. In the process of learning, the ability of scientific approaches (observing, asking, collecting information, you are, and communicating) is still relatively low. Also, it is known that mathematics is difficult to understand as the set material on the set operations' properties; students prefer to be explained by the teacher because the book of students used is difficult to understand. As well as the unavailability of mathematical modules during the learning process.

From the above exposure, alternative teaching materials are required to make students study independently and actively. The teaching material is a module. The module can be used as alternative teaching material because the language in the module is easy to understand. Using the module, students can independently measure the ability of material mastery because, within the module, there are examples of questions and exercises equipped with the answer key. Based on this, the problem in this research is how to develop and expand the teaching materials in the form of mathematical modules, how to do materials feasibility by the material expert and media experts in the form of mathematical modules and

how the response results in Students of teaching materials in the form of mathematical modules based on scientific approaches to the set material for SMP/MTs class VII.

The purpose of this research is to develop and improve mathematical modules, describing the feasibility of mathematical modules based on scientific approaches to the set material for class VII SMP/MTs by material experts and media experts and knowing Student response to the mathematical module based on the scientific approach to the set material for SMP/MTs students in class VII. Mathematics is a science one that needs to be mastered by humans in living life. Mathematics is very beneficial to live because it has a broad scope in the development of science.

In Suherman, Erman (2003:16-17) There are some mathematical definitions, according to:

1. James dan James: Mathematics is a science of logic about shapes, arrays, magnitudes, and concepts related to each other, divided into three areas: algebra, analysis, and geometry.
2. Reys, dkk: Mathematics is a study of patterns and relationships of a path or pattern of piker, an art, a language, and a tool.
3. Kline: Mathematics is not self-knowledge that can be perfect because of itself, but mathematics is mainly to help people understand and master the problems of social, economic, and nature.
4. Russefendi: Mathematics is formed as a result of human thought relating to ideas, processes, and reasoning.

So, based on the description can be concluded that mathematics is a science that is formed from the results of human thought by being presented in symbols, images, and magnitudes used to help people in understanding and solving problems Applied in other fields.

Mathematics is a fundamental science that develops rapidly. Mathematics is very important to be taught to students informal education in the school. According to Suherman, Erman, DKK. (2003:55-56) School mathematics is taught in schools, namely mathematics taught in elementary education (SD and SLTP) and secondary education (SLTA and SMK). School mathematics consists of selected mathematical parts to develop abilities, form personal, and blend in the development of science and technology. This shows that school mathematics still has features with mathematical features, namely having abstract study objects and a consistent deductive mindset. Based on the explanation above, it can be concluded that school mathematics is very important for students to improve their understanding skills to be used in daily life.

Learning is a processing activity, which is a process that gives birth to or alters an activity experienced by students in school or outside the environment. According to Hamalik, Oemar (2015:36-37), learning is to modify or reinforce behavior through experience, or a process of individual behavioral change through interaction with the environment. While according to the Slameto (2010:2), learning is a process of business that one takes to acquire a new change of behavior as a whole, resulting from his experience in interacting with his environment. Based on the definition of opinions above, it can be concluded that learning is a business or process to acquire new knowledge, behavioral changes, skills, or values of individuals acquired from their experience in interactions with the environment and not from one's natural progress.

Some definitions, according to experts on learning mathematics in Uno, B Hamzah (2012:130), among others:

1. Schoenfeld: Learn math with regards to what and how to use in making decisions to solve a problem. Mathematics involves observation, supervision, and association with physical and social phenomena.
2. Robert M Gagne: Learning Mathematics is an activity that pertains to the completion of the set of simple mathematical elements and is a new set, which further forms the new, more elaborate sets. So in learning, mathematics should be done hierarchically. In other words, learning math at a higher stage should be based on a low learning stage.

From the above description is given the conclusion math learning is mental activity to understand the meaning, relationships, symbols, and related to how to use it in making decisions to solve the problem of elemental mathematics Simple to elaborate.

A module is a form of printed teaching material used as a learning resource. Depdiknas (2008a: 13) states that a module is a book written to study independently without or with the teacher's guidance. The definition of the module, according to Prastowo, Andi (2015:106) states that the module is essentially a teaching material arranged systematically in a language that is easily understood by students according to their level of knowledge and age so that they can learn Self-reliant with assistance or minimal guidance from educators. Whereas the understanding of the module, according to Daryanto (2013:9), stated that The module is also one form of teaching material that is packed in a whole and systematic, it contains a set of planned Belajar experiences. It is designed to help Learners possess specific learning objectives.

Phase module writing procedure as a guide for writing modules. In the Depdiknas (2008a; 20-23) to write a teaching material in a particular module, there are several phases:

1. Analysis of Competency Standards (CS) and Basic Competencies (BC)
An analysis is intended to determine which materials require teaching materials. In determining the material is analyzed using seeing the essence of the material to be taught, then the competencies that students must have and the critical learning outcomes that the student should have.
2. Determine the module titles
The module title is determined by the BC or learning material contained in the syllabus.
3. Module writing
The module writing can be done with the following steps:
 - a) BC formulation that must be mastered
 - b) Determine evaluation/writing tools
 - c) Preparation of material
 - d) Learning sequence
 - e) The structure of teaching materials/modules

According to the Ministry of National Education (2008a: 21-23), in the structure of writing module teaching materials, there is an opening section, a core/content section, and a closing section.

Understanding the scientific approach according to Hosnan, M (2014: 34) is A learning approach that is designed so that students construct concepts, laws or principles through stages of observing, formulating problems, proposing or formulating hypotheses, collecting data, analyzing data, drawing conclusions and communicating found concepts or principles. While the steps of learning with a scientific approach in Hosnan, M (2014: 39-75) include:

1. Observing: Observing is a method that prioritizes the meaning of the learning process (meaningful learning). Observing is very beneficial for the fulfillment of students' curiosity, so the learning process has high meaningfulness.
2. Questioning: Asking questions is a learning activity carried out by asking questions about the information that is not understood from what is observed (starting from factual questions to hypothetical). The competencies developed are developing creativity, curiosity, and the ability to form questions to form critical thoughts.
3. Experimenting: Gathering information is a learning activity in the form of experiments, reading from sources other than textbooks, observing objects, activities, and interviews with sources. Competence developed in the procedure of gathering information is to develop a disciplined attitude, conscientious, honest, polite, respecting other people's opinions, and the ability to communicate.
4. Associating: The reasoning is a logical and systematic thought process of empirical facts that can be observed to obtain conclusions in the form of knowledge.
5. Communicating: Communicating is a learning activity that delivers the results of observations, conclusions in the form of analysis results verbally, in writing, or other media. The competencies developed are developing honest, conscientious attitude, tolerance, thinking systematically, expressing opinions briefly and clearly, and developing good and correct language skills.

Based on the description above, it can be concluded that the steps of the scientific approach are observing, asking questions, gathering information, reasoning, and communicating.

METHODS

This research is development research of R&D (Research and Development). The Research and Development method is a research method used to produce a specific product and test its effectiveness. The research is product oriented. The product is developed in the form of a mathematical module based scientific approach on the set material for SMP/MTs class VII.

The steps of R&D research method according to Sugiyono (2015:409) are:

1. Potential and problems: The potential is everything if you are going to have value-added. Problems will arise when deviations between what is expected with reality or facts that occur in the field. The problem, as put forward, is the deviation between expected with the happening. SMP Negeri 1 Banguntapan and SMP Muhammadiyah 1 Godean and have the potential of teaching materials with scientific approaches, but the lack of a module teaching materials developed by the teacher. Potential and problems can be known in various ways. In this case, researchers interview and get information that students' teaching materials are challenging to understand, not yet the availability of mathematical modules, the absence of teaching materials that make students active and independent.
2. Data Collection: Once the latest facts demonstrate the potential and problems, the collection of research data is needed to get a variety of data based on the potential and problems it has to solve the problems encountered. The information obtained can be used as materials for the specific product planning expected to resolve the issue. Data collection can be an analysis of Core Competency (CC) and BC to determine the materials and objectives of the learning to be achieved.
3. Product Design: make the product design to be developed. Product design must be tangible or in the form of scratch products. The initial product on the development is tentative (uncertain) as it will still be refined through some trial activities.
4. Design validation: a process that must be passed to assess product design eligibility. Validation activities in this development study involve material experts and media experts. Validation adjusted to the evaluation component, according to Depdiknas (2008a: 28). Material experts and media experts assess product design to know its weaknesses and strengths from the design
5. Material experts and media experts validate design revision: made after product design. Design revisions were made based on the expert input of the module's review to overcome the weaknesses and shortcomings of product design. These weaknesses and shortcomings are further improved to enhance the design. To be more assured, the revisions and design enhancements are consulted with the material experts, media experts, and educational practitioners.
6. Product Trial: a step after a product design has been through the validation of design improvements. The development of module teaching materials can be tested by directly giving to students, but must pass through trials of material and media experts. In-Test product researchers collect information to improve the product, that is, with a limited trial of the product to students. At the test of the product, students are given a questionnaire by the researcher. The questionnaire is given that is a formative evaluation instrument of teaching materials by the rules of Depdiknas (2008a: 28).
7. Product Revision: carried out after the product trial is carried out, then proceed with design revisions to material experts, media experts, and education practitioners. Product revisions are based on product trials, input from material experts, media experts, school practitioners, and students' input to overcome weaknesses and deficiencies in product design.
8. Trial use: conducted by large-scale students over previous trials. The usage test is expected to test the use of defects, and product weaknesses are not found anymore.
9. Product Revision: after testing the product for several students. If student learning results increase, then the resulting product is worth using in learning and requires only a few product revisions. Also, products should be declared effective and feasible. Product revision aims to overcome the deficiencies and improve the product modules that have been tested on the students. It is intended to improve the module to be more effective and worth using.

10. Mass production: The result of mass production is not done. Because of the limited time, the cost of energy, the development of mathematical modules based on scientific approaches to the set material for SMP /MTs class VII is limited to product revision only.

The data obtained through the poll by the expert material, media, and student responses are qualitative and then being expertly quantized. The terms of the scoring on qualitative data, according to Sugiyono (2015:135) are as follows:

Table 1. Scoring rules

Information	Score
SA = (Strongly agree)	5
A = Agree	4
SA = (Simply Agree)	3
DA = (Disagree)	2
SDA = (Strongly disagree)	1

From data collected according to Sukarjo (2015:55) can be calculated on average with the formula:

$$\bar{X} = \frac{\sum_{i=1}^k x_i}{n}$$

Information:

\bar{X} = mean score

x_i = score given by the -i

k = Number of statements on a poll

n = Number of responses

Furthermore, after the whole data becomes qualitative by using the category of ideal assessment criteria table, according to Sukarjo (2006:55) with the conditions:

Table 2. Ideal Scoring Criteria

Score Range	Qualitative criteria
$\bar{X} > (M_i + 1,8 \times SB_i)$	Excellent
$(M_i + 1,8 \times SB_i) < \bar{X} \leq (M_i + 1,8 \times SB_i)$	Good
$(\bar{M}_i - 0,6 \times SB_i) < \bar{X} \leq (\bar{M}_i + 0,6 \times SB_i)$	Good enough
$(M_i - 1,8 \times SB_i) < \bar{X} \leq (\bar{M}_i - 0,6 \times SB_i)$	Less
$\bar{X} \leq (M_i - 1,8 \times SB_i)$	Very less

Information:

\bar{X} : Empirical score (average score)

M_i : Ideal Average

$M_i = \frac{1}{2} \times (\text{Ideal maximum score} + \text{ideal minimum score})$

SB_i : Ideal Raw deviation

$SB_i = \frac{1}{6} \times (\text{Ideal maximum score} - \text{ideal minimum score})$

Where:

The maximum score is ideal: \sum Questionnaire item \times highest score.

The maximum score is ideal: \sum Questionnaire item \times lowest score.

Highest score: 5

Lowest score: 1

After every aspect of the module judged by material experts, media experts, and student responses, subsequently, the calculated data is then changed to qualitative value by using the ideal assessment category criteria.

RESULTS AND DISCUSSION

Material experts assessing the feasibility of mathematical modules based on scientific approaches to the set material are lecturers of mathematics education and mathematics teachers. The results of the calculation of instruments assessment by material experts as follows:

Table 3. The calculation result of the expert eligibility poll

No	Name	Score
1	Dra. Sumargiyani, M.Pd.	120
2	Dina Mardiyati, S.Pd.	114
3	Siti Muslihah, S.Pd.	116
Total		350
Mean		116,67

The table results showed that the average scoring score of faculty experts and mathematics teachers was 116.67 and included in the perfect criteria.

The media experts who assess the feasibility of mathematical modules based on scientific approaches to the set material are a lecturer in mathematics education and mathematics teachers. The result of the calculation of instrument assessment by media experts as follows:

Table 4. The calculation result of Media expert eligibility poll

No	Name	Score
1	Dra. Sumargiyani, M.Pd.	126
2	Dina Mardiyati, S.Pd.	129
3	Siti Muslihah, S.Pd.	132
Total		387
Mean		129

The table above shows that the average scoring score of media experts and mathematics teachers is 129 and is included in the first criterion.

Student's response to mathematical modules based on scientific approaches to this set of materials is based on the poll results shared with students in the I trials and II trials. The results of the student response poll can be seen in the following table:

Table 5. Student Response Poll Results

No	Activity	Score Mean	Categories
1	The trial at SMP Negeri 1 Banguntapan	129,37	Excellent
2	The trial at SMP Muhammadiyah 1 Godean	132,22	Excellent
Mean		130,80	Excellent

From both tests, it was concluded that the mathematical modules developed reached an average of 130.80 with a perfect category and were well worth it to use in the learning process.

CONCLUSION

Based on the research results of the development of mathematical modules based on scientific approaches to the set material for SMP/MTs class VII, the following conclusions are obtained:

1. With regards to developing mathematical modules based on scientific approaches to the set material are:
 - a. This research is done based on the potential and problems that have been collected. From the interviews of both schools, the problem that researchers found in learning the teaching materials in the form of student books is difficult to understand, there are no mathematical modules based on scientific approaches, and scientific approach skills are still And there is some material in the set that is difficult to understand.

- b. Data collection is done by analyzing the CC and BC and collecting references about the set material and specifying the scope of the material presented in the module.
2. Product design IE write and create mathematical modules on the set material in the form of the original product. Related to the feasibility of the mathematics module is a product that has been compiled in the form of an initial product and then validated by material experts (lecturers and teachers) and media experts (lecturers and teachers) by filling out the formative evaluation sheets of material experts and media experts.
3. Revisions were made to improve the product. If there are any improvements and input from the experts of Material Media, it is revised. The results of materials eligibility by material experts are reaching an average of 116.67 with a perfect category, and media experts reach an average of 129 with a perfect category.
4. With regards to the results of student responses from teaching materials in the form of mathematical modules is a mathematical module that has been developed very well to be used in the learning process based on the assessment from students of grade VII from SMP Muhammadiyah 1 Godean and SMP Negeri 1 Banguntapan gained an average score of 130.80 with a category of excellent. So this module can be used in the math learning process.

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