

DEVELOPMENT MATHEMATIC MODULE OF ALGEBRAIC FORM MATERIAL FOR STUDENTS IN GRADE VII SMP/MTS WITH A SCIENTIFIC APPROACH

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ABSTRACT

The availability of learning materials using a scientific approach that can facilitate students to learn actively and independently is still limited. The mathematic module material form of algebra is one of the alternative materials that can be used to facilitate students in an independent study actively. This research aims to develop a mathematical module of algebraic form material for students in grade VII SMP/MTs with a scientific approach and test the feasibility of the module. This type of research is research development, a mathematical module of algebraic form material for students in grade VII SMP/MTs with a scientific approach. In developing this module refers to researcher development model ADDIE that includes five stages, namely Analysis, Design, Development, Implementation, and Evaluation. The instruments used in the study of this form of assessment sheets for expert assessment sheets for the material, media experts, and student response now. This is a subject matter, media experts, and students of State Junior High School 15 Yogyakarta (SMP Negeri 15 Yogyakarta) and Muhammadiyah Islamic Junior High School Karangkajen (Mts Muhammadiyah Karangkajen). Using qualitative analysis, technical data analysis is converted into a cumulative value scale Likert—data collection techniques in the form of an interview and question form. The results of this research and development show that mathematics developed modules are included in the category of very good based on the assessment by the expert question form the material with a score of 102.33; question form assessment by media expert with score 74.67; and the average student response results in this study was 86,52. The assessment results indicate that the mathematical module of algebraic from material for students in grade VII SMP/MTs with a scientific approach worthy of use in the learning process.

Keywords: Mathematics, scientific approach to Module, ADDIE, a form of algebra.

INTRODUCTION

Education is an important factor in developing a country. Education in Indonesia has an important role in producing quality human resources. As expected, Indonesia will be able to become a superior, productive, and independent nation. According to the Law of the Republic of Indonesia, Number 20 of 2003 concerning the National Education System states that national education functions to develop capabilities and shape the character and civilization of a dignified nation to educate the life of the nation, aiming at developing the potential of students to become human beings who believe in and fear God. The Almighty, having noble, healthy, knowledgeable, capable, creative, independent, and being a democratic and responsible citizen. The problem of education in Indonesia is one of the factors inhibiting the achievement of these goals. The main problem in the world of education is the learning process. The learning process is the core of education. Therefore, the learning process becomes a benchmark for the quality of education. Improving the quality of education can be done by improving facilities or facilities to facilitate the learning process. One of them is the improvement of learning facilities in the form of teaching materials.

Based on observations and interviews with mathematics subject teachers at SMP Negeri 15 Yogyakarta and MTs Muhammadiyah Karangkajen, information is obtained that the availability of mathematics teaching materials that can facilitate students to learn independently and independently is still limited and the unavailability of teaching materials that use scientific approaches. The teacher also

said that there were differences in the ability to absorb the subject matter and the level of learning speed of each student. Mathematics is one of the subjects that is considered difficult for most students. Most students' material in mathematics that is difficult and has not been mastered is algebraic form material. This is because students do not understand the concept of algebraic form material well. Also, students lack practice in working on problems because teaching materials that can help students learn actively and independently are minimal. Based on the problems, it is necessary to develop teaching materials that can help students learn independently. One of the teaching materials that teachers can use to overcome these problems is teaching materials in the form of modules. Through teaching materials in the form of modules, the teacher will be more natural to carry out learning, and students will be more helped and more comfortable to learn.

Modules are an alternative learning material that can be used by students in learning mathematics. Modules are learning packages that are arranged systematically based on a particular curriculum so that students can learn independently to achieve learning objectives without or with the teacher (Purwanto, et al. 2007: 10). The preparation of the mathematics module is designed to facilitate students in understanding the material presented so that the material, examples of questions and exercises contained in the module are interesting to learn, able to increase creativity and motivation to learn mathematics, and involve students in finding the mathematical concept itself. Therefore, we need an approach to produce modules that fit the needs of students. The scientific approach is one approach that can be used in the development of a learning module according to the needs of students. This is because the scientific approach is learning with scientific activities that go through the process of thinking so that understanding about something by asking questions. The steps of learning with a scientific approach include: observing (observing), asking (question), collecting information/trying (experimenting), reasoning (associating), communicating (communicating) (Hosnan, M. 2014: 39-75) Based on the description, researchers feel the need to develop modules to improve learning independence and the quality of learning. Thus, researchers are interested in researching the title Development of Mathematical Modules in the Form of Algebra for Class VII Students of SMP / MTs with Scientific Approaches.

Identification of the problems includes: (1) The availability of mathematics teaching materials that can facilitate students to learn independently and independently on their own is still minimal and the unavailability of teaching materials by using a scientific approach. (2) There are differences in the ability and level of advanced learning of students. (3) There are no mathematics teachers who have developed mathematical modules with a scientific approach. (4) A limited number of textbooks available at school. (5) Students have not well mastered the material in the form of algebra. The formulation of the problem in this study are (1) How to develop a mathematical module of algebraic form material for grade VII students of SMP / MTs with a scientific approach? (2) What is the feasibility of the algebraic form material mathematics modules for grade VII students of SMP / MTs with a scientific approach ?. This study aims to: (1) Develop algebraic form material mathematics modules for grade VII students of SMP / MTs with a scientific approach. (2) Knowing the feasibility of algebraic form material mathematics modules for grade VII students of SMP / MTs with a scientific approach.

METHODS

This type of research used in this study is the method of research and development (Research and Development) using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The steps of the ADDIE model development research are quoted from Pribadi, Benny A. (2014: 30), namely (1) Analysis; (2) Design; (3) Development; (4) Implementation; (5) Evaluation. The following explains the steps for the ADDIE model by the explanation above:

1. Analysis. In this stage, an analysis of several things is carried out to obtain a picture of the teaching material to be developed. This analysis phase was carried out in two schools, namely, SMP Negeri

- 15 Yogyakarta and MTs Muhammadiyah Karangajen. Analysis of instructional materials design includes analysis of teaching material requirements, material analysis, and curriculum analysis.
2. Design. The design or planning step is carried out after the researcher has interviewed, observed, and collected information. This stage consists of three steps, namely outlining the module contents, module content design, and compiling module assessment instruments.
 3. Development. This stage includes (1) information gathering, (2) module writing, (3) validation and assessment, (4) small class trials.
 4. Implementation. At this stage, the learning module's application is applied to the actual classroom conditions in the mathematics learning process. The product is tested to determine the feasibility of the module being developed.
 5. Evaluation (evaluation). The evaluation step is a process carried out to provide value to the modules that are developed. The aim is to find out how the module is developed. The module is evaluated based on an assessment questionnaire from material experts, media experts, and student responses.

The subjects in this research and development consisted of material experts, media experts, and students of class VIII of SMP Negeri 15 Yogyakarta and students of class VII of MTs Muhammadiyah Karangajen. This research development uses data collection techniques, namely: interviews and questionnaires. The research data were obtained using the following data collection instruments: the material expert eligibility questionnaire, the media expert eligibility questionnaire, and the student questionnaire for student responses. After the data is collected, in Sukarjo (2006: 55) the average is calculated, using the formula:

$$\bar{X}_i = \frac{\sum_{i=1}^n X_i}{n}$$

Info:

\bar{X}_i : average score

$\sum_{i=1}^n X_i$: total score

n : many assessors

Furthermore, after all the data has been converted into qualitative data using the ideal assessment criteria guideline table with the following conditions:

Table 4. Criteria for Ideal Rating Categories

| No | Score | Criteria |
|----|--|-----------|
| 1. | $X_i > \bar{X}_i + 1,8 \times SB_i$ | Very good |
| 2. | $\bar{X}_i + 0,6 \times SB_i < X_i \leq \bar{X}_i + 1,8 \times SB_i$ | Good |
| 3. | $\bar{X}_i - 0,6 \times SB_i < X_i \leq \bar{X}_i + 0,6 \times SB_i$ | Enough |
| 4. | $\bar{X}_i - 1,8 \times SB_i < X_i \leq \bar{X}_i - 0,6 \times SB_i$ | Less |
| 5. | $X_i \leq \bar{X}_i - 1,8 \times SB_i$ | Very less |

(Sukarjo, 2006:53)

RESULTS AND DISCUSSION

The trial data in this research development was obtained by the research process of developing the ADDIE module with the following steps:

- a. Analysis (analysis). In this stage, the analysis process obtained is a reference in the development of learning modules. So researchers do some analysis to provide an overview of the learning modules that will be developed. The analysis carried out is as follows:
 - 1) Analysis of Teaching Material Requirements. Analysis of the need for teaching materials aims to determine the availability of teaching materials by the applicable curriculum, find out the teaching materials used by teachers in the learning process, and determine the teaching materials needed at the school.
 - 2) Material Analysis. After analyzing the need for teaching materials, the next step is to choose the developed material. The material selection is made by consulting with mathematics teachers at SMP Negeri 15 Yogyakarta and MTs Muhammadiyah Karangajen.

- 3) Curriculum Analysis. Curriculum analysis is done by studying learning material, core competencies, basic competencies, and learning objectives that must be achieved by students in learning.
- b. Design. This stage consists of 3 steps: outline the contents of the module, design the contents of the module, and compile the module assessment instrument.
 - 1) Outline the Module Content. This process begins by arranging the order in which the material is presented in the module.
 - 2) Module Content Design. The contents of the module design that the researchers developed consisted of the initial part, the core part, and the final part.
 - 3) Develop a Module Assessment Instrument. This study's module assessment instrument was a questionnaire consisting of a material expert assessment questionnaire, a media expert evaluation questionnaire, and a student response assessment questionnaire. Before the questionnaire is used, validation is done first by the validator.
- c. Development. The development of teaching materials is the stage where the initial design is translated into actual appearance. The stages are as follows.
 - 1) Collection of References. At this stage, a reference review is carried out, which will be used to prepare the material in the learning module to be developed. In this stage, the researcher used six mathematics books that were used as references.
 - 2) Writing Module. At this stage, the initial design of the product that has been made is developed into a learning module.
 - 3) Validation and Assessment. Validation is intended to request assessment and input from experts, namely material experts and media experts, on the learning modules developed.
 - 4) Small Class Trial. The small class trial was conducted in two schools, namely Yogyakarta 15 Public Middle School and Muhammadiyah Karangajen MTs, which involved five students.
- d. Implementation. The implementation is carried out by testing the modules to students in large class trials to determine the module's suitability if used in learning. Students who take part in the implementation fill in the questionnaire responses to the module.
- e. Evaluation. Assessment is given to several parts, namely the aspects of the material to be assessed by material experts, aspects of the media that will be assessed by media experts and assessment by students (student responses). The assessment will be used as a reference to determine whether or not the learning module developed.

Three material experts assessed the feasibility of the learning material with a feasibility questionnaire calculation in the following table:

Table 6. Results of the Calculation Questionnaire for Material Feasibility

| No | Evaluator | Score | Quantitative Category |
|----|--------------------------|--------|-----------------------|
| 1. | Dra. Sumargiyani, M.Pd. | 109 | Very good |
| 2. | Sukrisna, S.Pd. | 107 | Very good |
| 3. | Vika Rosana Aloha, S.Pd. | 91 | Well |
| | Average | 102,33 | Very good |

Based on Table 6, it can be seen that the average score of the results of the material expert assessment is 102.33. These results indicate that the learning modules developed were reviewed in terms of the material included in the excellent category.

Media eligibility was assessed by three media experts, with the results of the eligibility questionnaire calculation can be seen in the following table:

Table 7. Results of the Media Feasibility Questionnaire Calculation

| No | Evaluator | Score | Quantitative Category |
|----|-----------------------|-------|-----------------------|
| 1. | Anggit Prabowo, M.Pd. | 67 | Good |
| 2. | Taufik Ruadi, S.T. | 80 | Very good |
| 3. | Andriyanto, S.T. | 77 | Very good |
| | Average | 74,67 | Very good |

Based on the table above, the average score of the results of the assessment of media experts is 74.67. So it can be concluded that the learning modules developed were reviewed in terms of media included in the category of very good.

Student responses to the learning modules that are developed are known from the results of student assessments through questionnaires given during small class trials and large class trials. The following calculation of student questionnaire responses in small class trials:

Table 8. Results of Calculation of Student Response Questionnaire in Small Class Trials

| No | School | Score | Quantitative Category |
|----|-----------------------------|-------|-----------------------|
| 1. | SMP Negeri 15 Yogyakarta | 89 | Very good |
| 2. | MTs Muhammadiyah Karangajen | 86,8 | Very good |
| | Average | 87,9 | Very good |

Based on the table above, the average score of the results of the assessment of student responses in small class trials is 87.9. Based on the guidelines on the criteria of learning media assessment of aspects of student responses included in the excellent category.

Following are the results of calculation of student response questionnaires in large class trials:

Table 9. Results of Calculation of Student Response Questionnaire in Product Trial

| No | School | Score | Quantitative Category |
|----|-----------------------------|-------|-----------------------|
| 1. | SMP Negeri 15 Yogyakarta | 87,06 | Very good |
| 2. | MTs Muhammadiyah Karangajen | 83,2 | Good |
| | Average | 87,9 | Very good |

Based on the table above, it can be seen that the average score of the results of the assessment of student responses in the use of the trial is 85.13. So based on the guidelines on the criteria of learning media assessment of aspects of student responses included in the excellent category.

Revising the learning modules developed in the design and development process is an important step in designing and developing learning modules. The revision process is carried out before the learning module is tested on students. The revised learning module has the following arrangement:

- 1) The first part contains Cover/cover, title page, module identity, preface, module position map, table of contents, introduction (description, prerequisites, competencies, concept map, learning objectives, and module usage instructions).
- 2) The core part that contains: Learning activities, quizzes, reflections, summaries, evaluations, feedback, and remedial. The learning activities section contains: let us observe, let us ask, let us dig for information, let us the reason, let us share, practice questions, competency tests.

CONCLUSION

The research and development that has been carried out have succeeded in creating a mathematical module of algebraic material for grade VII students of SMP / MTs with a scientific approach. This research and development use the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The result of the development process is creating a mathematical module with a scientific approach that is ready to be used in the learning process. The results of the assessment of material experts are 102.33, and media experts are 74.67. These results indicate that the learning module developed is seen from the material aspects and aspects of the media included in the criteria very well. In the small class trials in SMP Negeri 15 Yogyakarta and MTs Muhammadiyah Karangajen, the students' responses to the learning module scored 87.9 with very good criteria. In the trial of large classes in SMP Negeri 15 Yogyakarta and MTs Muhammadiyah Karangajen, the results of student responses to the learning module scored an average of 85.13 with very good criteria. Based on the data above, it can be concluded that the mathematics module of algebraic material for VII grade students of SMP / MTs with a scientific approach is appropriate for teaching material in the learning process.

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