DEVELOPMENT OF MATHEMATICS MODULE BASED ON LEARNING MODEL OF GUIDED INQUIRY IN SUB-MATERIAL ALGEBRA FOR JUNIOR HIGH SCHOOL CLASS VIII

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ABSTRACT

The use of materials that are insufficient to cause the learning process centered on the teacher. It causes low student independence and liveliness in building his own, becomes a factor it needs alternative materials that can facilitate the student's independent study. Math algebra material on module into alternative materials that can be used by students. This research aims to develop a mathematical module and test the feasibility of the mathematics modules. The research design used, namely with the stages of Research and Development potential and problems, data collection, product design, design validation, revision of the design, product testing, product testing, revisions, and revision of the product. The subject of research is the study of the expert product, i.e., lecture of mathematics, mathematics teacher, and students. Types of data used, i.e., qualitative and quantitative data. Engineering data collection using a non-test with instruments in the form of sheets of interview and question form. With test instruments through the validation and analysis of data using lecturer analysis question form and analysis of the feasibility of a mathematical module. Based on the results of the study, the feasibility of mathematical module by material obtained an average score of 151 with the criteria of very good, the eligibility module by media expert gained an average of 167.33 criteria very good, and the now the response of students with an average of 130.7 and 127 with the criteria of very good. So, the mathematical content module algebra worth for use in learning.

Keywords: Module Development, mathematics, Guided Inquiry, algebra.

INTRODUCTION

Education is an important aspect of a nation because, through such education, a nation can be judged whether its human resources (HR) are of high quality. In the current era of globalization, free and open competition requires every individual to have the competence to compete in the global world. Each individual must develop the potential that exists within him actively and independently. This is what makes education in Indonesia play a big part in shaping quality human resources (HR) through the existing education system in Indonesia. According to the National Education System Law No. 20 of 2003 Chapter, I article 1, paragraph 1. Education is a conscious and planned effort to create an atmosphere of learning and learning process so that students actively develop their potential to have religious-spiritual strength, self-control, and the skills needed by themselves, society, nation, and country.

Efforts to develop students who are active and able to explore their potential require supporting facilities. One of them is a learning resource that can be utilized as much as possible by students. According to Sanjaya, Wina (2013: 174), Learning resources are all things that students can use to learn materials and learning experiences by the objectives to be achieved. Learning resources itself consists of six types, namely messages, humans, materials, equipment, techniques, and the environment (Prastowo, Andi, 2012: 35-36). From this learning resource, a teaching material will be prepared for use in the teaching and learning process. According to Prastowo, Andi (2012: 32), Teaching materials are materials that have been designed consciously and systematically to achieve the competence of learners as a whole in learning activities. According to their form, teaching materials consist of printed teaching materials (printed), hearing teaching materials, audiovisual teaching materials, and interactive teaching

materials (Prastowo, Andi, 2012: 40). Printed teaching materials are one of the teaching materials that are widely used in the learning process, for example, books, modules, handouts, Student Worksheets (LKS), brochures, leaflets, wall charts, photos, or drawings, and models or models.

Modules are one teaching material that helps students learn actively and independently. According to Prastowo, Andi (2012: 106), a module is a teaching material that is arranged systematically in a language that is easily understood by students according to their level of knowledge and age so that they can learn independently (independently) with minimal assistance or guidance from the educator. Through modules, students gain knowledge independently, without or with the help of the teacher. Therefore, the use of modules can also help students to learn according to their abilities and speed. Based on the results of interviews on 11 and 19 October 2016 with Mr. Tugiman, a mathematics teacher in class VIII of TahfidzQu Yogyakarta Junior High School, information was obtained that the teaching materials used by the school were in the form of a mathematics textbook given to each student. The use of teaching materials has not been able to facilitate students to learn independently because according to the results of interviews with students on October 19, 2016, students are still confused when faced with the formula written in the book without knowing where and how the translation and use of the formula. According to Mr. Tugiman, not all students can learn independently; students still need coherent explanations for things that are considered important by the teacher and explanations for examples of questions in the material.

Before using the textbook as it is now, TahfidzQu Middle School used LKS. However, the use of the worksheet was deemed ineffective according to Mr. Tugiman, because the worksheet only contained questions with very concise material, in which were also found few examples of problems relating to daily life, besides that many of the questions were in the LKS come from questions of the same type as in the previous LKS. According to Mr. Tugiman, a teaching material must be realistic, namely having examples of questions and practice questions that present everyday problems. Therefore, they need examples of real problems in everyday life related to the material being taught as an example of applying mathematics in everyday life.

According to Mr. Tugiman, that is what needed more effective teaching material to be studied, namely modules. In TahfidzQu Middle School, there is no mathematical module available. According to him, the module is needed by students, especially modules that use learning models that can guide students to find concepts from material and can facilitate students to learn independently. Researchers also conducted observations and interviews with teachers at the SMP Negeri 3 Depok school. Based on the results of interviews with the teacher of Depok 3 Public Middle School, Mrs. Endang, on October 21, 2016, it was discovered that students still needed the help of teachers and peers. Therefore, students' interaction with teaching materials such as books and worksheets is only limited to questionable practice. They actively use teaching materials only for practice questions, not reading material that they can learn independently. Even classroom learning is still based on the teacher because, according to the teacher, students cannot read/understand the material first by learning independently. Even at this school, teaching materials in the form of modules do not yet exist, because SMP Negeri 3 Depok uses textbooks and student worksheet.

For these conditions, researchers are interested in developing modules as one of the teaching materials. The developed module is a mathematics module based on the Guided Inquiry learning model on the subject of algebra for eighth-grade junior high school students. The module compiled contains instructions for use, learning objectives, and presentation of material in a coherent, concise manner. The clear manner by the steps of the guided inquiry learning model according to Kuhlthau, Maniotes, & Caspari (2007: 18) namely Kuhlthau, Maniotes, & Caspari (2007: 18) states there are seven steps in the guided inquiry learning model which includes:

1. Initiation, the task of the first stage is to prepare for the decision to select a topic.
2. Selection, students choose their general topic, aspect of, or question about the class project that they will be working on.
3. Exploration, the students' task is to explore information with the intent of finding a focus.

4. Formulation, a time to form a focus for the research from the information on the general topic found in the variety of sources students are consulting.
5. Collection, the task in this stage is supporting and extending the focus to prepare to present new understandings.
6. Presentation, this stage is the culmination of the inquiry process, when the learning is prepared to share with others.

Modules are also developed oriented towards authentic problems, using language that is simple and easy to understand, and there are examples of questions and discussions, as well as practice questions.

The problem in this study can be formulated as follows: 1) How to compile and develop a mathematics module based on the Guided Inquiry learning model on the subject of algebra for VIII grade junior high school students? 2) How is a mathematics module's feasibility based on the Guided Inquiry learning model on the subject of Algebra for VIII Middle School students? 3) How do students respond to mathematics modules based on the Guided Inquiry learning model on the subject of Algebra for VIII grade junior high school students?

The purpose of developing teaching materials in the form of modules is as follows: 1) Develop and develop a mathematics module based on the Guided Inquiry learning model on the subject of algebra for VIII grade junior high school students. 2) Describe the feasibility of a mathematics module based on the Guided Inquiry learning model on the subject of algebra for eighth-grade junior high school students. 3) Knowing students' responses to mathematics modules based on the Guided Inquiry learning model on the subject of Algebra for VIII grade junior high school students.

METHODS

This research is a research and development R&D (Research and Development) with development steps, namely potential and problems, data collection, product design, design validation, design revision, product testing, product revision, trial use, product revision, and production mass. R&D methods are research methods used to produce specific products and test the effectiveness of these products (Sugiyono: 2011). This research is product-oriented, a mathematics module based on a guided inquiry learning model on the subject of algebra for eighth-grade junior high school students.

The material expert in this study was a mathematics lecturer in algebra and two mathematics teachers in class VIII. The material expert will validate the module from the point of the material, which is categorized from three aspects: the feasibility of the content, the feasibility of the presentation, and the suitability of the guided inquiry learning model. Material experts will also provide positive inputs for the creation of quality modules—media Experts. Media experts consist of one lecturer who is an expert in instructional media and two subject teachers. Media experts will validate the module from the point of the media, which are categorized into three aspects: the feasibility of the language, the feasibility of presentation, and the feasibility of graphics. Material experts are expected to provide suggestions to make the module more interesting, so students are motivated to learn it.

The subjects in the guided inquiry-based mathematics module trial on the subject of algebra were VIII grade junior high school students. Testing is done in small classes and large classes. In testing this product, students are asked to use the algebra module. After using the product, students are given a questionnaire to provide assessments and positive inputs to the module. In small class trials, a sample of 5 students was taken. While in large class trials, it was conducted on 31 students.

Data collection techniques using non-test instruments in the form of interviews and questionnaires. The questionnaire assessment technique was carried out by giving a product validation sheet containing a set of statements to the material expert lecturers and media experts, teachers, and students. Score calculation is done by looking for averages that refer to the guidelines for the ideal assessment criteria, according to Widoyoko (2012: 238). Eligibility in terms of scores obtained is said to be feasible if included in the category of good, good, or sufficient.

RESULTS AND DISCUSSION

After research by the method of R&D (Research and Development) with development steps, namely:

1. Potential and problems. Researchers explore the potential and problems by conducting interviews with mathematics teachers in the two schools where the study was conducted. From the results of interviews conducted at SMP Negeri 3 Depok and TahfidzQu Yogyakarta Junior High School, it can be seen that the potential of students in both schools is equally high in learning motivation. While the problems that are in the form of:
   a. SMP Negeri 3 Depok uses student-generated worksheets. Whereas in TahfidzQu Middle School, teachers use textbooks. The teacher has not yet developed the module as the primary teaching material.
   b. Students have difficulty understanding algebra.
   c. Students' ability to learn teaching materials independently is known from the low level of interaction between students and teaching materials, so the source of learning is still centered on the teacher.
2. Data collection. After studying and understanding the data obtained from the results of potential and problems, researchers collect references about the material taught to junior high school students. At this stage, what the researchers did was Competency Standards(CS) and Basic Competencies (BC) analysis.
3. Product design. The initial framework of the learning module is:
   a. Front cover and back cover. The front cover contains the title of the mathematics module, a picture that matches the material, and the target user, namely the VIII grade junior high school students. At the same time, the back cover contains a photo and identity of the author and an email address for criticism and suggestions.
   b. The front includes:
      1) Title Page
      2) Module Identity
      3) Preface
      4) Table of Contents
   c. The introduction, containing:
      1) Competency Standards, Basic Competencies, Indicators of Achieving Basic Competencies
      2) Module Completeness
      3) Module Usage Instructions
      4) Concept Map
   d. The contents section, loading:
      1) Did you know? In this section, students are given information or general knowledge related to the chapter being discussed.
      2) Chapter Title
      3) Title of Section. The section headline can give students an overview of the material to be studied.
      4) Material, consisting of Initiation, Selection, Exploration, Formulation, Presentation, and Assessment
      5) Example problems
      6) Exercise questions
      7) Summary
      8) Feedback & follow up
   e. The closing part, loading: Competency test, Glossary, Bibliography, and Answer key
4. Design validation. Design validation is carried out by material experts and media experts by filling in validated instruments.

5. Design revisions. Design revisions were made on the results of input and comments from material experts and media experts.
6. Test the product. The first product trial is a small class trial by taking a sample of 5 students.
7. Product revision. Product revisions are made from the results of small class trials, as a form of follow-up to the input and comments given by students.
8. Trial usage. The second class trial is a large class trial by taking 31 students.
9. Product revision. At this stage, product revision is carried out on the results of input and comments from student response questionnaires in large class trials.
10. Mass production. The mass product at the undergraduate level is implemented by providing the results of module development to schools, which are the place of research to be used and further developed by teachers and schools.

The results of the product evaluation by the validator are based on the ideal evaluation criteria, according to Widoyoko (2012: 238), presented in Table 1.

Table 1. Ideal Assessment Criteria

Score Range	**Qualitative Criteria**
$X > (\bar{X}_i + 1{,}8\ sb_i)$	Very Good
$(\bar{X}_i + 0{,}6\ sb_i) < X \leq (\bar{X}_i + 1{,}8\ sb_i)$	Good
$(\bar{X}_i - 0{,}6\ sb_i) < X \leq (\bar{X}_i + 0{,}6\ sb_i)$	Quite good
$(\bar{X}_i - 1{,}8\ sb_i) < X \leq (\bar{X}_i - 0{,}6\ sb_i)$	Not good
$X \leq (\bar{X}_i - 1{,}8\ sb_i)$	Very bad

Expert assessment of the material is done by filling in the mathematics module assessment sheet based on guided inquiry learning models on the subject of algebra for grade VIII junior high school students. This stage is carried out by submitting the product to validate with the product validation sheet instrument consisting of several assessment components, including content eligibility, presentation eligibility, and Guided Inquiry learning model. The assessment instruments used previously were examined by non-test items by the instrument validation lecturer. Module validation for the material was validated by three material experts, namely one material expert lecturer and two mathematics teachers in the school concerned. The results of the eligibility questionnaire calculations by material experts can be seen in Table 2.

Table 2. Results of the Eligibility Questionnaire Calculation by Material Expert

No.	Assessment	Total score	Criteria
1.	Dra. Sumargiyani, M.Pd	150	Very Good
2.	Endang Wahyuti Ningsih, S.Pd	154	Very Good
3.	Tugiman, S.Pd.Si	149	Very Good
Mean		151	Very Good

From Table 2, it can be seen that the average result of the assessment by material experts is 151 and shows that the modules developed fall into the very good category.

Media expert assessment is done by filling in the mathematics module assessment sheet based on a guided inquiry learning model on the subject of algebra for VIII grade junior high school students. This stage is done by submitting the product to then be validated with the product validation sheet instrument, which consists of several assessment components, including the feasibility of the language, the feasibility of presentation, and the feasibility of graphics arranged based on the grid. The instrument used previously had been examined by non-test items by the instrument validation lecturer. Module validation for media was validated by three media experts, namely one media expert lecturer and two mathematics teachers in the school concerned. The results of the eligibility questionnaire calculations by media experts can be seen in Table 3.

Table 3. Results of the Eligibility Questionnaire Calculation by Media Experts

No.	Assessment	Total score	Criteria
1.	Dra. Sumargiyani, M.Pd	166	Very Good
2.	Endang Wahyuti Ningsih, S.Pd	170	Very Good
3.	Tugiman, S.Pd.Si	166	Very Good
Mean		167,33	Very Good

From Table 3, it can be seen that the average result of the assessment by media experts is 167.33 and shows that the modules developed fall into the very good category.

To determine the students' responses, a small class trial was conducted by taking a sample of 5 students for SMP Negeri 3 Depok and TahfidzQu Junior High School. Whereas in the large class trial, the module was tested on 31 students for each school. Testing small classes and large classes are done by giving modules to students and questionnaires to determine student responses to the module. The results of calculating student response questionnaires can be seen in Table 4.

Table 4. Results of Calculation of Student Response Questionnaire

No	Activity	School	Total Score	Criteria
1.	Small Class Trial	SMP Negeri 3 Depok	130,2	Very Good
		SMP TahfidzQu Yogyakarta	131,2	Very Good
Mean			130,7	Very Good
2.	Large Class Trial	SMP Negeri 3 Depok	124,3	Good
		SMP TahfidzQu Yogyakarta	129,7	Very Good
Mean			127	Very Good

Based on Table 4, it can be seen that the results of students' responses to the modules in the small class trials in two schools, namely SMP Negeri 3 Depok and TahfidzQu Yogyakarta Junior High are very good with an average total score of 130.7. Then in the large class trials conducted at the same school, the students' responses to the module with very good criteria with an average number of scores 127. These results indicate that the modules developed are suitable for use in the learning process.

CONCLUSION

Based on the research results on the development of mathematical modules on algebraic material that has been done, the following conclusions are obtained:

1. Development of mathematical modules on algebraic material is carried out through the following stages:
   a. Observation. At this stage, interviews were conducted with mathematics teachers at SMP Negeri 3 Depok and TahfidzQu SMP about the potential and problems in mathematics. An outline of the results of the interview is as follows:
      1) Student interaction with teaching materials is low.
      2) There is a dependence of students on the teacher, where students still consider the teacher as the main source of learning.
      3) Student independence in learning is low.
   b. Data Collection. At this stage, the data was collected related to the analysis of Competency Standards and Basic Competencies at the Junior High School / MTs Curriculum Level, the selection of material to be presented in the module, and the collection of reference books for the module preparation.
   c. Preparation of Mathematics Modules. At this stage, competency standards are determined, basic competencies, and indicators of achievement of competencies in the mathematics module with algebraic material developed. Then, they will proceed with making module designs and instruments for research in the module trials.

d. Product Validation. Product validation was carried out by material experts and media experts. The material experts consisted of one UAD lecturer and two mathematics teachers from the research school, namely from State Junior High School 3 Depok and TahfidzQu Middle School. At this stage, researchers submit the developed products and assessment instruments to material experts and media experts. Based on validation by material experts and media experts, input and suggestions are obtained, which are then corrected at the product revision stage. After the revision, material experts and media experts evaluate the module using the assessment instruments that have been made previously. The calculation results of the material expert assessment instruments obtained an average score of 151, and the media experts obtained an average score of 167.33.

e. Product Trial. Product trials were conducted twice, namely small class trials, by taking a sample of 5 students and a large class trial by taking a sample of 30 people for each school. Based on the results of small class trials obtained an average score of 130.7. The results of small class trials also obtained input and suggestions from students who later became the material for improvement in the module. Large class trials are conducted using modules that have been improved from the results of small class trials. In this large class trial, an average score of 127 is obtained. In this large class trial, the researcher also gets input and suggestions from students. After being followed up, the mathematics module has become the final product.

2. Eligibility for Math Modules. Mathematical modules on algebraic material developed are suitable for learning based on the results of the assessment of material experts and media experts and student responses. The results of the assessment of mathematics modules by material experts obtained a score of 151 with very good criteria, and media experts obtained a score of 167.33 with very good criteria. The results of student responses are included in the criteria very well, with an average score of 127 in large classes.
3. Student Responses to Mathematics Modules. Mathematical modules on algebraic material developed get good responses from students known from trials conducted in small classes and large classes. Small class trials conducted at the two schools where the study was conducted, namely SMP Negeri 3 Depok and TahfidzQu SMP, obtained an average score of 130.7, which entered the very good category. Students give positive comments and provide constructive input to the module. While in large class trials, students also gave a positive response from the modules that had been made improvements from the results of small class trials. This is indicated by the average student response assessment score, which is 127 and categorized as very good. Positive responses and the results provided indicate that the module is appropriate for students to use in the learning process.

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