THE DEVELOPMENT OF MATHEMATICS MODULE WITH COOPERATIVE LEARNING TYPE OF GROUP INVESTIGATION IN ALGEBRAIC FORM MATERIAL FOR SMP

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ABSTRACT

Learning and teaching material is a set of information that is very much needed to implement learning. Teachers and students need additional teaching materials in modules and learning models to facilitate algebraic material delivery. This study aims to develop teaching materials in mathematical modules covering material about algebra for class VII of junior high school with learning type Group Investigation (GI). This study's subjects were students of SMP Negeri 2 Prambanan and Junior High School (SMP) Muhammadiyah Ngemplak. The technique of collecting data uses observations, interviews, and questionnaires conducted before developing the product. The research instrument used was a need response and questionnaire to assess the module being developed using a Likert scale. Based on the research assessment results from material experts, the average score was 72, which was included in very good criteria. Simultaneously, the assessment of media experts is 82, which belongs to very good criteria. Students' response to the module at the trial stage is 93.09, and the response at the stage of the trial use is 105.61; both are in the good and very good category. Based on the students' expert assessment and response, the cooperative learning module type of investigation group is suitable for the learning process.

Keywords: Module, Algebraic Forms, Group Investigation

INTRODUCTION

Education is a learning process carried out by humans throughout life. Learning is the primary key to education. Education will form quality human resources to get the provision to survive in an increasingly developing era. A curriculum governs the education system in Indonesia, and at this time, the education system that regulates education in Indonesia is the 2013 curriculum. One of the mathematical material by Core Competencies (CC) and Basic Competencies (BC) in Permendikbud Number 24 of 2016 is material algebraic form. For the material of algebraic form to be mastered well by students, adequate learning resources are needed. Learning resources are components of the learning system that play an essential role in achieving basic competency standards or predetermined learning goals. Learning resources that are considered capable of increasing students' learning independence are modules. Sudjana and Rivai (2009: 132) states that a module is a unit of teaching programs arranged in a certain form for learning purposes. The module is a book written to learn independently or with teachers' guidance (Ministry of Education, 2008: 13). The Government and the Ministry of National Education began planning the developing problem-solving skills in schools' education system in learning mathematics. This is in line with Sumarmo's statement in Hendriana, et al. (2017: 43), namely: Mathematical problem solving includes methods, procedures, and strategies which are the core and central processes in the mathematics curriculum or are general goals of mathematics learning, even as the heart of mathematics.

Therefore, the material of algebraic form in mathematics requires good problem-solving skills in solving multi-aspect problems, so the learning model is needed to support one of the mathematics learning objectives. The strategy or learning model that can be used varies, but developing good problem-solving skills in solving multi-aspect problems is to use the cooperative learning model as a learning method. After the researchers observed the junior high school / MTs level, the research was conducted in two schools, each of which lacked modules' availability. This was seen based on the percentage of questionnaires needed by the respondents who were distributed by researchers in two

schools, SMP Negeri 2 Prambanan and SMP Muhammadiyah Ngemplak, with each respondent from the school, namely ten students, on October 2-3, 2018, the results obtained are: 60% of students use the Electronic School Book (BSE) as a learning resource, 30% use Student Worksheets (LKS) and 10% use modules, and 65% all consider learning resources to be interesting. 80% Availability of modules in the school is not adequate.

Then 80% of students choose to agree if a module for mathematics lessons will be developed specifically for algebraic forms based on cooperative learning type Group Investigation (GI) models. Whereas the results of the percentage questionnaire obtained by the needs of teacher respondents in SMP Negeri 2 Prambanan and SMP Muhammadiyah Ngemplak with each one of the respondents from the school were obtained, namely: obtained, 100% choosing no unique learning resources for algebraic material, learning resources used 67% Electronic School Books (BSE) and 33% Student Worksheets (LKS). If a module is developed for mathematics lessons specifically for algebraic forms based on the Group Investigation (GI) type's cooperative learning models, 100% choose to agree. Then based on the results of interviews of researchers with several students when distributing the questionnaire needs in two schools, namely SMP Negeri 2 Prambanan and SMP Muhammadiyah Ngemplak on October 2-3, 2018, students said that in the process of learning and solving a math problem in school students are still lack of mastery in solving a mathematical problem, especially in identifying mathematical problems that are multi-aspect, after that student also say that strongly agree if teaching materials will be developed in the form of modules because there are no modules in the school. Therefore cooperative learning type investigation group is considered to be one of the learning models that can help students in problems improve mathematical problem-solving abilities.

According to Slavin in Taniredja et al. (2015: 60), the purpose of cooperative learning is creating a situation where individual success is determined or influenced by the success of the group. One form of cooperative learning is the Group Investigation model. This model is a complex cooperative learning model because it combines cooperative learning principles with constructivism-based learning and democratic learning principles (Isjoni, 2012: 87). Based on the description above, the researcher took the initiative to compile a learning module with algebraic material using cooperative learning model type Group Investigation (GI) through a study entitled Development of Mathematical Modules with Cooperative Learning Type Group Investigation (GI) in Algebraic Forms for Class Students VII Middle School.

Modules have specific characteristics, for example, the form of the smallest and most complete teaching unit, containing a series of learning activities that are systematically designed, containing learning objectives that are clearly and precisely formulated, allowing students to learn independently, and realization of individual differences and the realization of individual teaching (Sudjana and Rivai, 2009: 133). The steps to compile a module, according to Daryanto (2013: 16-24) are as follows:

1) Module Needs Analysis
2) Module Design
3) Implementation
4) Assessment
5) Module Evaluation and Validation
6) Quality assurance

The module quality assessment uses a questionnaire instrument. The modules are developed based on the National Education Standards Agency (2008) regarding the assessed aspects: content feasibility, language feasibility, presentation feasibility, and graphic feasibility. To facilitate the instrument's preparation, it is necessary to use the instrument development matrix or instrument grid (Sugiyono 2016: 149).

The objectives of this study are: 1) Cooperative learning type group Developing mathematical modules on algebraic material uses investigation (GI) for grade VII students of junior high school. 2) It

was knowing the feasibility of a good module on algebraic forms using cooperative learning type investigation (GI) for VII grade students of junior high school.

METHODS

This research is a research that uses research and development (R & D) methods. The product developed and produced in this study is a junior high school mathematics learning module with one material: algebraic form based on cooperative learning model group investigation type. The development steps taken are as follows:

1. Potential and Problems. This problem can be overcome through R & D by examining the potential of SMP Negeri 2 Prambanan and SMP Muhammadiyah Ngemplak, so that a useful integrated handling model, pattern, or system can be found to overcome the problem.
2. Gathering Information. After the potential and problems can be shown factually and up to date, then further information needs to be collected that can be used as material for planning certain products that are expected to overcome problems in SMP Negeri 2 Prambanan and SMP Muhammadiyah Ngemplak.
3. Product Design. The final results at this stage are a new module. This new module is still hypothetical. It is hypothetical because its effectiveness has not been proven, and will be known after going through tests.
4. Design validation. Validation will be conducted by two experts, consisting of two expert lecturers, namely one media expert and one material expert, to determine the module's advantages and disadvantages before being tested.
5. Design Improvement. After product design, validated through discussions with experts, the weaknesses will be known. These weaknesses are then tried to be reduced by improving the design. The task of improving the design is the researcher who will produce the module.
6. Product Testing. At this stage, researchers conducted a trial of products in a small class of 10 people.
7. Product Revision. Researchers conduct product revisions to improve the quality of products developed, not or adequately, if students are used in learning. Media and material experts provide input on product trials results so that researchers can improve product weaknesses developed to produce effective and quality modules.
8. Usage Tests. After the testing of the product is booming, and there may be a revision. The product in the form of a module will be applied directly to students in large classes at SMP Negeri 2 Prambanan and SMP Muhammadiyah Ngemplak as research subjects.
9. Product Revision. This product revision is done. If in the use of real conditions, there are shortcomings and weaknesses. In the use test, researchers should always evaluate how students use the product performance developed in this case.
10. Making Mass Products. Researchers did not carry out this mass production because it was only limited to developing teaching materials for mathematics subjects in algebraic materials.

Product testing was carried out based on the following steps:

1. Trial Design. This module is divided into three stages in the trial design:
   a. Expert Evaluation. It is done by taking questionnaire data from material experts and media experts from Ahmad Dahlan University mathematics education lecturers and mathematics teachers from SMP Negeri 2 Prambanan and SMP Muhammadiyah Ngemplak. Then the results are analyzed to become the basis for making the first module revision.
   b. Trial Small Class. Small class trials were conducted on class VII students of SMP Negeri 2 Prambanan and SMP Muhammadiyah Ngemplak as many as ten students.
   c. Trial Large Class. A broad class trial was conducted on class VII students of SMP Negeri 2 Prambanan and SMP Muhammadiyah Ngemplak, with many respondents as many as one class.
2. Try Subject. In this study, the trial subject was the lecturer in mathematics education at Ahmad Dahlan University, a mathematics teacher at SMP Negeri 2 Prambanan and SMP Muhammadiyah

Ngemplak, who acted as material experts and media experts, VII grade students of SMP Negeri 2 Prambanan and SMP Muhammadiyah Ngemplak.

3. Data Types. There are two data obtained from this research development, namely:
   a. Qualitative Data. Qualitative data were obtained from the responses and suggestions of media experts, material experts, and responses of the seventh-grade students of SMP Negeri 2 Prambanan and SMP Muhammadiyah Ngemplak to develop modules by researchers. The purpose of processing quantitative data is to test the feasibility of the module.
   b. Quantitative Data. Quantitative data was obtained from the validation results by media experts and material experts and class VII students of SMP Negeri 2 Prambanan and SMP Muhammadiyah Ngemplak to develop modules by researchers.
4. Data Collection Instrument
   a. Questionnaire. The questionnaires distributed in this study were of two types: questionnaire responses and the second questionnaire. Questionnaire responses to needs in this study were divided into two questionnaire responses to students' needs and teacher needs. The function of the questionnaire response needs in this study as the material used by researchers to obtain what needs are needed in order to be developed, indeed useful for researchers and targets to be studied wherein processing questionnaires, the needs of both grilles and instruments are based on input and suggestions from lecturers counselor and development of instruments to capture nominal data and measurement scale using Likert.
   b. Observation and Interview. The researchers make observations while conducting interviews, not structure.
5. Data Analysis Techniques. Data analysis techniques used responses and suggestions from media experts. Material experts summarized and concluded that they were subsequently used as module repair material before being tested. Meanwhile, evaluation data in the form of responses and suggestions from teachers and students are considered for improving the module after being tested. The data obtained is still in the form of qualitative data. This qualitative research focused more on analysis during the field with the Miles and Huberman models. Following are the Likert scale rules:

Table 1. Rules for Granting Scale using a Likert Scale

Description	Score
Strongly Agree	5
Agree	4
Doubtful	3
Disagree	2
Strongly Disagree	1

According to Sudjana (2016: 109)

Calculate the average, namely:

$$\bar{X} = \frac{\sum X}{N}$$

Information:

$\bar{X}$ = average (mean)

$\sum X$= total score

N = number of subjects

Ideal Assessment Criteria Guidelines

Furthermore, data from material experts, media experts, and students' responses are transformed into qualitative values using the guideline tables of ideal assessment criteria. The provisions of these criteria are shown in the following table:

Table 2. Criteria for Ideal Assessment Categories

Classification	Formula
$X > \bar{X}_i + 1,80 \times sb_i$	Very Good
$\bar{X}_i + 0,60 \times sb_i < X \leq \bar{X}_i + 1,80 \times sb_i$	Good
$\bar{X}_i - 0,60 \times sb_i < X \leq \bar{X}_i + 0,60 \times sb_i$	Good enough
$\bar{X}_i - 1,80 \times sb_i < X \leq \bar{X}_i + 0,60 \times sb_i$	Poor
$X \leq \bar{X}_i - 1,80 \times sb_i$	Very Poor

(Source: Widoyoko, 2016: 238)

Information:

$\bar{X}_i$ (Ideal average) = $\frac{1}{2}$ × (ideal maximum average score + ideal minimum score)

sb_i (Ideal standard deviation) = $\frac{1}{6}$ × (ideal maximum average score - ideal minimum score)

X = empirical score

RESULTS AND DISCUSSION

Three material experts assess the assessment of mathematical modules. The calculation of the feasibility questionnaire assessment results by material experts can be seen in Table 3.

Table 3. Results of Calculation of Material Assessment

No	Assessment	Average Score	Criteria
1	Dra., Sumargiyani, M.Pd	75	Very Good
2	Diva Arliesa P, S.Si	77	Very Good
3	Widya Wigati, S.Pd	64	Very Good
	Average Score	72	Very Good

Based on Table 3, it can be seen that the average score of the assessment by the material experts is 72 results indicating that the mathematical modules developed with algebraic material included in the criteria are very good.

In terms of the mathematical module's feasibility, media experts assessed product assessment, where three media experts assessed the assessment. The following are the results of the feasibility questionnaire calculation by media experts in Table 4.

Table 4. Results of Calculation of Media Expert Assessments

No	Assessment	Average Score	Criteria
1	Syariful Fahmi, M.Pd	85	Very Good
2	Diva Arliesa P, S.Si	88	Very Good
3	Widya Wigati, S.Pd	73	Good
	Average Score	82	Very Good

Based on Table 4, the average score is 82. These results indicate that the mathematical module developed with algebraic material in terms of media is included in the criteria very well.

The students' responses based on the questionnaires distributed were obtained when product trials or small class trials and large-scale usage or trial trials can be seen in Table 5 and Table 6.

Table 5. Results of Calculation of Students' Response to Product Trials (Small Classes)

No	Scoring	Score Average	Criteria
1	Student SMP N 2 Prambanan	91,2	Good
2	Student SMP Muhammdiyah Ngemplak	96,6	Good
	Average trial	93,9	Good

Table 6. Results of the Calculation of the Response of Students in the Usage Test (Large Class)

No	Scoring	Score Average	Criteria
1	Student SMP N 2 Prambanan	103,62	Very Good
2	Student SMP Muhammdiyah Ngemplak	107,60	Very Good
	Average trial	105,61	Very Good

Based on Table 5, the students' average test results at the product trial stage or small class trials were 93.9. This shows that the module developed was seen from the students' assessment responses included in the good criteria. For calculating the average results of the use of large class trials or trials can be seen from Table 6, the results of 105.61 are obtained, which means that the modules developed are included in the criteria very well.

CONCLUSION

The module's material consists of 2 learning activities, namely two sub-material, including knowing algebraic forms and algebraic form counting operations. Students are asked to be active in learning in each material, and students can find out their abilities through evaluation tests presented in the module. Based on the validation carried out by experts, including material experts and media experts, as well as the response from students, it can be seen the categories or criteria of teaching materials developed, based on material expert validation obtained an average score of 72.00 or it can be said that the module was developed in. in the very good category, then from the acquisition of validation by media experts, the average score is 82.00, or it can be said that the developed module falls into the very good category. In contrast, the average score is obtained from the students' responses to the product trial or trial phase. Small classes conducted in 2 schools obtain an average score of 93.09, or it can be said that the developed module falls into the good category. For large-scale usage or trial trials by students, the average score of students' responses is 105.61, which means the modules fall into a very good category for the learning process. It can also be concluded that mathematical modules with cooperative learning type Group Investigation on algebraic material for class VII SMP students are very suitable for teaching materials in learning both independently and with educator assistance when viewed from the acquisition of average scores amounting to 105.61.

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