

DEVELOPING MATHEMATICS MODULE BASED ON INDONESIAN REALISTIC MATHEMATICS EDUCATION ON THE PLANE FIGURE SUBJECT FOR THE STUDENTS OF GRADE VII

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ABSTRACT

Fewer students backed the study play an active role in the learning process and still have difficulty completing abstract things. The purpose of this research is to develop a module with the approach of Indonesia realistic mathematics education (red. PMRI), know the eligibility module based on expert assessment material, media experts, and student response against modules that have been created, as well as to find out the results of student learning. Research conducted using methods Research and Development (R&D). The steps undertaken include the following two aspects, namely the development of modules and eligibility. Development modules include: (a) collect information, (b) the design of the module, (c) perform the validation material, namely Dra. Sumargiyani, M. Pd., Kristianta A.B, S.Pd., and Ratnaningsih, S.Pd. And also expert media, namely Dra. Sumargiyani, M.Pd. Kristianta A.B, S.Pd., and Ratnaningsih, S. Pd (d) revision of the product. The next step, namely the In ligibility module that includes (a) conduct a test, (b) analysis of data (c) feasibility of the module. The subject of the research in this study is grade VII. Data analysis using descriptive qualitative analysis to expose the inputs and analyze the expert assessment results, media experts, and student response to determine the module's effectiveness. Research succeeded in developing learning modules for mathematics material Plane Figure to SMP students of Class VII even semester with the approach of PMRI(Pendidikan Matematika Realistik Indonesia). The assessment results by the expert of the material obtained an average score of 161,33 with categories either. The results of the assessment by the expert media obtained an average score of 100 by category. The student response results against the modules included in the excellent category, with an average score of 73,75. Simultaneously, the percentage of the value of a study's results using the module is 67% with categories either. The results showed that the learning modules of mathematical material Plane Figure to SMP students of Class VII were feasible and effective for use in the learning process.

Keywords: Module, The Approach Of PMRI, Plane Figure

INTRODUCTION

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, personality, intelligence, noble character, and the skills needed by themselves, society, and the country (Law No. 20 of 2003). Education will make humans develop their potential to deal with any changes that occur due to advances in science and technology. The rapid development of science and technology has led to various social phenomena and obstacles in society. This encourages people to do things that are more creative and innovative. Progress in each field also makes people motivated to always excel and compete positively, including education. Therefore, education needs to get attention and better handle various issues relating to the quantity, quality, and relevance.

Mathematics is one of the main subjects taught in schools from the elementary level to the secondary level. Mathematics as one of the subjects that play a very important role in education. Because in addition to developing logical, rational, and critical reasoning as well as providing skills to them to be able to use mathematics and reasoning in solving various problems in daily life and in learning other sciences. Given the importance of the mathematics learning process, educators must be able to adjust, choose, and integrate appropriate learning models in every mathematics learning. Therefore, improvements are needed in learning mathematics, such as the learning model used and

learning resources, to be more interested in learning mathematics. The use of learning models and varied learning resources in mathematics learning is expected to be more interested in mathematics.

Freudenthal believes that mathematics should not be given to students as ready-made products but rather as a form of activity in constructing mathematical concepts. In other words, mathematics is a form of human activity. This statement is behind the birth of RME (Realistic Mathematics Education) in Indonesia. RME, which is commonly known as PMRI (Indonesian Realistic Mathematics Education), is an innovation in the world of education explicitly developed for mathematics and according to Indonesia's cultural climate, which can improve students' connections to mathematical concepts by using the principles in RME. (Wijaya: 2012).

The Plane Figure is one of the materials in the mathematics learning curriculum. For plane figure material to be mastered by students, an understanding of the concept is needed first. PMRI is one of the innovations that can help students develop a plane figure concept by applying it in real life. Starting with giving examples of real problems or problems that students can imagine, students are directed to compile the knowledge obtained to obtain the desired conclusions. Based on the results of interviews with researchers of mathematics class VII teacher at SMP Muhammadiyah 2 Depok Sleman, Mrs. Ratnaningsih S.Pd. Instructional media has been used, although not fully used in teaching and learning. The teacher only uses teaching materials in the form of textbooks borrowed from the library and photocopied question sheets as student activity sheets. From the expressions of some VII grade students of SMP Muhammadiyah 2 Depok Sleman, they use textbooks. However, teachers are less interested in teachers' teaching materials because the teaching materials do not provide a real picture of mathematics considered difficult.

The same thing was also found by researchers at SMP Negeri 4 Patuk Gunung Kidul Yogyakarta. The learning media used by Mr. Kristianta S.Pd as a mathematics teacher already exists, but has not been fully utilized because the teacher only explains it without giving examples in real life. The teacher also only uses the worksheets and practice questions sheets as commonly used. From the expressions of some students of SMPN 4 Patuk Gunung Kidul, they like learning mathematics using modules because it is easier to understand and remember the material discussed. Through the module, it is hoped that students will find it easier to conclude and understand a given subject. Very rapid global progress in education should produce new generations of quality, able to compete, and think critically in solving existing problems. In this case, of course, every teacher must be more creative in presenting the material. The teacher must have exciting ideas so that students play a little active role in teaching and learning activities. It is not only the teacher who is the source of student learning, but students must also be able to be a source of learning so that the position of the teacher and students in a class is balanced. Even better if the source of learning is students, while the teacher is only a facilitator.

Therefore, we need a learning approach that can connect learning material that is considered abstract for students with real things in daily life and can make students actively complete their knowledge so that the meaning of learning can be obtained. Based on the description above, the approach that feels suitable to the problem is learning using the Indonesian Realistic Mathematics Education Approach (PMRI). Using the PMRI approach to a module might be able to increase student learning resources and be able to link students in teaching and learning. Modules are learning materials that are designed systematically based on a particular curriculum and are packaged in the form of the smallest learning unit and allow learning independently in a particular time unit (Ministry of National Education Information and Communication Technology Center (2007: 9). Students can associate learning with environmental situations by providing mathematical activities or mathematical tasks related to daily life, especially on plane figure in class VII students even semester.

Based on the description above, the researcher took the initiative to compile a learning module with plane figure material using the PMRI approach through a study entitled Development of PMRI-Based Mathematics Modules (Indonesian Realistic Mathematics Education) on the subjects of grade VII plane figure of even semester. This module is expected to be a useful learning resource to improve student learning independence so that it can facilitate students' understanding of mathematics, especially

on plane figure material. Also, this module is expected to help teachers in teaching mathematics become more attractive.

METHODS

The type of research conducted is research and development (Research and Development). According to Sugiyono (2015: 407), research and development methods are research methods used to produce specific products and test their effectiveness. To produce specific products used, research that needs analysis, and test the effectiveness of these products to function on the broader community, research is needed to test these products. This research is focused on developing learning media in the form of modules. The development procedure is the steps that must be taken to produce a particular product. In this research development, researchers will develop a product in comics as a learning medium. According to Sugiyono (2015: 409), the steps of research and development are (1) Finding potential and problems, (2) Collecting data, (3) Designing products, (4) Conducting design validation, (5) Conducting design revisions, (6) Conducting product trials, (7) Conducting revisions, (8) Conducting user trials.

Based on the above research procedure, the design of the trials in module development is as follows: 1) Determine Competency Standards (CS), Basic Competencies (BC), Indicators, and material to be presented. 2) Develop a draft module. 3) Do a module that will later be validated. 4) Develop research instruments that include questionnaires for material experts and media experts and questionnaires for students.

Subjects in the research development of this mathematics learning module are material experts (UAD Mathematics Education Lecturers and Middle School Mathematics Teachers), media experts (UAD Mathematics Education Lecturers and Middle School ICT Teachers), and students of Muhammadiyah 2 Depok Sleman Middle School and Patuk Gunung Kidul Middle School Class VII Even semester. In collecting data in this study using interview and questionnaire instruments. Interviews were conducted with mathematics teachers to find out the potential and problems in the school. Simultaneously, the questionnaire was used to assess the product of the mathematics learning module that was made. The questionnaire used in this study was the module feasibility test questionnaire by media experts. The module eligibility test questionnaire by material experts and student response questionnaires.

The data obtained through the questionnaire material experts, media experts, and students in the form of qualitative values will be converted into quantitative values. The scoring rules can be seen in Table 1.

Table 1. Rules for Scoring

Information	Score
Very Good (SB)	4
Good (B)	3
Less (K)	2
Very Poor (SK)	1

Module feasibility assessment data obtained from questionnaires filled out by material experts and media experts and student response questionnaires were analyzed with the following steps:

From the data collected, the average is calculated using the formula:

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

Information:

\bar{X} : Average score

X_i : Scores obtained from the i-appraiser

N : Number of Assessors

Furthermore, the data obtained from the research questionnaire by material experts, media experts, and students were converted into qualitative values based on the ideal assessment criteria shown in Table 2.

Table 2. Criteria for Ideal Rating Categories

No.	Score	Category
1	$\bar{X} > (\bar{x}_i + 1,80 SB_i)$	Very good
2	$(\bar{x}_i + 0,60 SB_i) < \bar{X} \leq (\bar{x}_i + 1,80 SB_i)$	Well
3	$(\bar{x}_i - 0,60 SB_i) < \bar{X} \leq (\bar{x}_i + 0,60 SB_i)$	Enough
4	$(\bar{x}_i - 1,80 SB_i) < \bar{X} \leq (\bar{x}_i - 0,60 SB_i)$	Less
5	$\bar{X} \leq (\bar{x}_i - 1,80 SB_i)$	Very less

RESULTS AND DISCUSSION

The results of data calculation from the assessment questionnaire by material experts can be seen in table 3.

Table 3. Results of Data Calculation from the Assessment Module Questionnaire by Material Experts

No.	Assessor	Score
1.	Dra. Sumargiyani, M.Pd	156
2.	Kristianta A.B, S.Pd	167
3.	Ratnaningsih, S.Pd	161
Amount		484
Average		161,3
Criteria		Good

The results above show that the Mathematics Module Based on PMRI Plane Figure Materials for Junior High School Students Grade VII Even Semester is assessed in terms of the material included in both criteria.

The results of data calculation from the assessment questionnaire by media experts can be seen in table 4.

Table 4. Results of Data Calculation from the Questionnaire Assessment Module by Media Experts

No.	Assessor	Score
1.	Dra. Sumargiyani, M.Pd	102
2.	Kristianta A.B, S.Pd	102
3.	Ratnaningsih, S.Pd	96
Amount		300
Average		100
Criteria		Very Good

The results above show that the Mathematics Module Based on PMRI Plane Figure Material for Junior High School Students of Class VII Even Semester is assessed in terms of the media included in the criteria very well.

While the results of data calculation from the questionnaire responses of students to the modules that have been generated can be seen in table 5.

Table 5. Results of Data Calculation from the Student Response Questionnaire

No.	Activity	Number of students	Average Combined Score	Qualitative Criteria
1	Trial I	20	73.25	Good
2	Trial II	52	74.25	Good

Based on table 5, it can be seen that the results of student responses to the module are good with a score of 73.5 in the trial I, and have increased to 75 with a very good category in trial II at SMPN 4 Patuk Gunung Kidul. Whereas in SMP Muhammadiyah 2 Depok Sleman, the results of student responses to the module were good with 73 in the first trial. An increase also became 73.5, with a very good category in the second trial.

Then based on table 5 above, it can be obtained the results of a combined assessment of the questionnaire responses of students of SMPN 4 Patuk Gunung Kidul and SMP Muhammadiyah 2 Depok Sleman in the trial I and trial II. The results of the combined assessment of data from students' questionnaire responses in the first trial and the second trial of the modules that have been generated can be seen in table 6.

Table 6. Results of Composite Data Calculations from Questionnaire Responses from SMPN 4 Patuk and SMP Muhammadiyah 2 Depok

No.	School	Activity	Score	Qualitative Criteria
1.	SMPN 4 Patuk	Trial I	73,5	Well
2.		Trial II	375	Very good
3.	SMP Muh 2 Depok	Trial I	73	Well
4.		Trial II	73,5	Well

Based on table 6 above, it can be seen that the combined results of the responses of students of SMPN 4 Patuk Gunung Kidul and SMP Muhammadiyah 2 Depok Sleman to the module are good with a score of 73.25 in trial I. This score was obtained from the assessment of 10 students of SMPN 4 Patuk Gunung Kidul and 10 Muhammadiyah 2 Depok Sleman Junior High School students combined. Based on table 4.4 above, it can also be seen that the combined results of the responses of students of SMPN 4 Patuk Gunung Kidul and SMP Muhammadiyah 2 Depok Sleman to the module are good with a score of 74.25 in trial II. This score was obtained from the assessment of 23 students of Patuk Gunung Kidul Middle School and 29 students of SMP Muhammadiyah 2 Depok Sleman combined.

CONCLUSION

Based on research and development that has been done by researchers, the following conclusions are obtained:

1. Develop Modules

In developing classroom mathematics learning modules, VII Middle school plane figure material steps taken according to predetermined development procedures. In this study, the procedures for developing the R & D model described by Sugiyono. The steps taken include:

At the potential and problem stage and data collection, observations were made at SMPN 4 Patuk Gunung Kidul and SMP Muhammadiyah 2 Depok Sleman and interviews with mathematics teachers at the junior high school with results obtained in the form of information that for teaching materials at SMPN 4 Patuk Gunung kidul and SMP Muhammadiyah 2 Depok Sleman has been fulfilled, but has not been able to arouse students to study spirit, especially in mathematics. Also, the teaching and learning process at SMPN 4 Patuk Gunung Kidul and SMP Muhammadiyah 2 Depok Sleman is still centered on teachers. Students lack an active role in the learning process. The teacher still uses the lecture method to teach the material in school, so the approach that feels best suited to the problem is learning with the Indonesian Realistic Mathematics Approach (PMRI).

- a. At the product design stage, researchers created a mathematics learning media design for grade VII in plane figure material in modules using Microsoft Word 2010 applications.
- b. At the product validation stage, product validations that have been designed for media experts and material experts are carried out. After being validated, the developed learning module was declared worthy of a trial with several revisions that had to be done.

- c. At the design revision stage, a revision is made to improve the learning module based on input and suggestions from the validator at the product validation stage, including aspects of content eligibility, aspects of language assessment, and aspects of appearance.
- d. In the product trial phase, testing of the learning module was developed by 10 VIIC grade students of SMPN 4 Patuk Gunung Kidul and VIIC grade students of SMP Muhammadiyah 2 Depok Sleman. From these tests, it was obtained that the module developed was declared to be feasible with an average value of 3.33 so that it was included in the good criteria.
- e. At the product revision stage, improvements are made to the learning module based on input, suggestions, and product trial data analysis. Improvements made include aspects of the feasibility of the contents of the form of exercises reduced because there are too many exercises.
- f. In the usage test phase, testing of the learning module was developed by 29 VIIC grade students of SMP Muhammadiyah 2 Depok Sleman and 23 VIIC grade students of SMPN 4 Patuk Gunung Kidul. From these tests, the results were obtained that the learning module developed was declared feasible with an average value of 3.37 so that it was included in the good criteria.

2. Module Eligibility Level

Based on the results of the development and analysis of the data in Chapter IV, it can be concluded that the results of the research and module development

Mathematics learning for VII grade middle school Plane Figure material has been declared feasible as a learning module. This module is included in the right category because it has an average score of 3.26 with the following details:

- a. The level of eligibility of modules by material experts who were developed in the aspect of content eligibility obtained an average rating of 3.4 (very good), the feasibility aspect of presentation gained an average value of 3.5 (very good), aspects of language assessment gained an average value of 3, 26 (right), the PMRI assessment aspect obtained an average grade of 3.4 (very good).
- b. The level of eligibility of modules by media experts developed in the aspect of the feasibility of graphics
- c. get an average rating of 3.57 (very good).

Thus, mathematics learning media for grade VII Middle School developed plane figure material and is suitable for students as a mathematics learning module in class.

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