

DEVELOPMENT OF A BILINGUAL WORKSHEET-BASED MATHEMATICS MODULE WITH REALISTIC MATHEMATICS EDUCATION (RME) APPROACH ON MATERIAL OF TWO-DIMENSIONAL FIGURE

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ABSTRACT

This study's background was students who were less independent and still had difficulties in solving abstract things. The purpose of this study was to develop a module with the RME approach so that students would get a better understanding of the concept of the material being taught, especially on the two-dimensional figure. To identify the module's feasibility was based on the assessment of material experts, media experts, and student responses to the modules that have been made. The study was conducted using the Research and Development (R & D) method. The steps include (1) potential and problems, (2) data acquisition, (3) product design, (4) design validations, (5) design improvements, (6) product trials, (7) product revisions, (8) usage test. Subjects of the trial included: (a) product review experts, (b) education practitioners, (c) Class VII junior high school students. Development of modules included: (a) gathering information, (b) module design, (c) validate the material expert, (d) product revision. The next step is the feasibility of the module, which includes: (a) validation by experts, (b) expert revision, (c) product trial, (d) revision I, (e) test try usage, (f) revision II. Data collection techniques are interviews and questionnaires. Types of data used quantitative and qualitative data. This study uses qualitative descriptive analysis, which is converted into quantitative values based on the Likert scale. The study results indicated that the study successfully developed the mathematics learning module on the two-dimensional figure for the second semester's seventh-grade students with the RME approach. The results of the study by material experts obtained an average score of 201 with an outstanding category. The results of the assessment by media experts obtained an average score of 129 with very good categories. Student response results to the module included in the good category with an average score of 89.3. These results indicated that the mathematics learning module on the two-dimensional figure for the seventh-grade junior high school students was feasible and effective in the learning process.

Keywords: Module, RME Approach, two-dimensional figure

INTRODUCTION

Education is a process to help humans develop their potential to face every change that occurs. In general, education has the meaning of a life process in developing themselves to live and develop into a better person and character. As a nation's successor, we must speak foreign languages, especially international languages, namely English, to prepare qualified human resources (HR) to compete in the international arena. A school is a place of education that must be obtained and continued to a higher level to become an educated person in gaining knowledge in the teacher's school as a facilitator who provides his knowledge by his abilities. The teacher's role as an educator, among others, provides assistance and encouragement and tasks related to disciplining children to have a sense of responsibility with what is done. The teacher must also strive so that the lessons given are always varied to attract the child's interest, using exciting media and teaching materials to be enthusiastic in learning. One of the teachers' media is teaching material.

Teaching materials that can be used by teachers include the use of modules in the presentation of certain materials, is expected to support the ability of students and develop independence and creativity in an integrated manner, this is by Minister of National Education Regulation (Permendiknas) number 41 of 2007 concerning the standard process, which regulates the process standards about

planning the learning process that requires educators to be able to develop a lesson plan. Teaching materials used by educators in schools to teach are modules with the aim of students being able to study independently with guidance from educators. According to Daryanto (2013: 9), a module is one type of printed teaching material systematically packaged, which contains planned learning experiences and is designed to help students learn independently to master learning goals.

One of the learning strategies that educators can use is the mathematics module using the Realistic Mathematics Education (RME) learning approach known as the Indonesian Realistic Mathematics Education (PMRI). The RME learning approach is oriented towards real-life and applying mathematics in daily life or the surrounding environment. Based on the results of an oral interview with a mathematics teacher at SMP Muhammadiyah 2 Depok and SMP Negeri 4 Patuk and students who have studied mathematics in class VII. Interview results obtained at SMP Muhammadiyah 2 Depok are teaching materials used: textbooks available at school, attendance, and a list of values, still use expository methods, in the learning process, teachers do not use modules but only use textbooks. Consequently, students are less independent. Also, there are no modules available using the RME approach to link learning with the environment around students only following the teacher without being directly involved in the learning process. As a result, students lack an understanding of the concepts taught, especially on flat material that requires knowledge to understand.

In the second interview at SMP Negeri 4 Patuk, it was found that in the learning process, the teacher only uses textbooks available at school. Teaching materials used by students to buy Shiva Worksheets, in this case, can be seen that teaching materials used are still lacking in reference. There is a need for teaching materials to help students learn independently, such as modules using the RME approach. Hence, students find it easier to understand the concept of learning specifically in the material build flat oriented to the environment or everyday life. The researcher also interviewed five students randomly, then the researcher asked about how the textbooks students learned. One student responds to the first question about teaching materials used in learning. The first student reveals that learning that takes place is difficult to understand because mathematics is hard to add to the teaching materials used or textbooks are too many formulas and words. From the two interview results, it was concluded that there is a need for teaching materials that make students more independent and oriented towards the environment. Students more easily understand the concepts given by the teacher when learning takes place.

METHODS

This research uses a research model called Research and Development. Sugiyono (2014: 407) states that Research and Development is a research method used to produce specific products and test their effectiveness. This research focuses on developing a learning module based on a bilingual worksheet with a Realistic Mathematics Education (RME) Approach for Grade VII Even Semester Middle School. The researcher will develop a product in the form of a bilingual worksheet-based learning module with a Realistic Mathematics Education (RME) approach for Grade VII Junior High Schools. An overview of the steps of development research can be seen in Figure 1. The following pictures and explanations in detail.

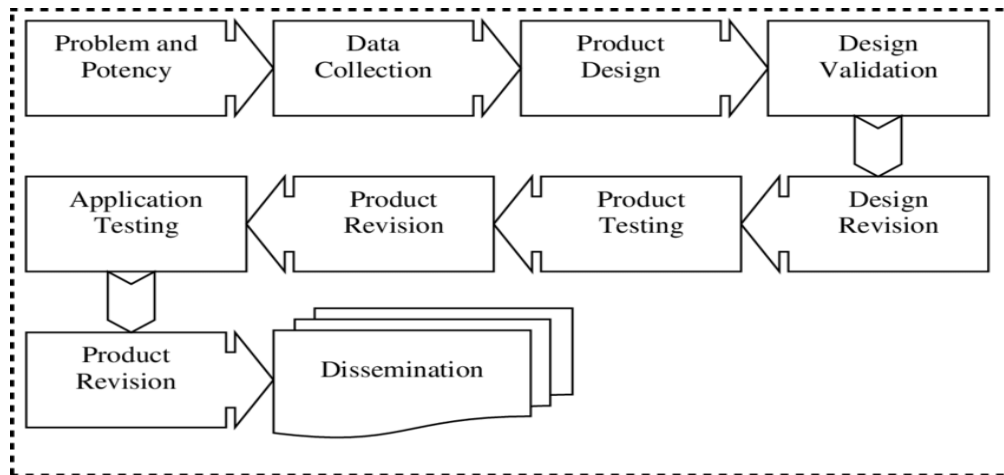


Figure 1. Steps for using the Research and Development Method

1. Potentials and Problems. The potential that is owned is in the form of high student motivation. Simultaneously the problem is the limited teaching materials they have. The making of this module begins with a curriculum analysis based on the potentials and problems that have been studied through Andi Prastowo's module-making stages.
2. Data Collection. The next stage of data collection is to strengthen the first stage of curriculum analysis.
3. Product Design. The product design should be embodied in a picture or chart to be used as a guide for assessing and treating it. In this study, the study will develop teaching materials in the form of a bilingual worksheet-based module with the RME approach using steps according to Andi Prastowo's opinion.
4. Design Validation. Product validation can be done by presenting several experts or experts. Validation is adjusted to evaluation. The evaluation in question is an evaluation of the components of the Ministry of National Education.
5. Design Revision. Once the experts and known weaknesses and weaknesses have validated the design, the researcher who developed the product will correct the weaknesses and shortcomings.
6. Product Testing. Product trials are carried out to find out whether the product being developed works as expected or not. Product trials were conducted twice, namely in the small class and the large class.
7. Product Revisions. The product revision aims to overcome the shortcomings and weaknesses of the module product tested in the first trial with a limited number of samples and to improve the module to be more effective.

Research and Development Steps

1. Trial Design. The trial design is the steps taken by researchers to carry out research.
2. Test Subjects. The trial subjects in this development research consisted of media experts, material experts, and grade VII students of SMP Muhammadiyah 2 Depok and SMP Negeri 4 Patuk.
3. Data Types. The data used in this study are qualitative and quantitative data

This development research uses several data collection techniques, namely: questionnaire. This study's data were obtained using the following data collection instruments: Material Expert Test Questionnaire, Media Expert Expert Questionnaire, and Student Response Questionnaire. In this research, to determine and measure mathematics learning media's feasibility and analysis of the evaluation sheet, data feasibility is carried out by media experts, material experts, and students. Qualitative data obtained will be converted into quantitative data on a scale of 5 (Likert Scale). The provisions are as follows:

Table 1. (Likert Scale)

Information	Score
SS (Strongly Agree)	5
S (Agree)	4
RR (Hesitation)	3
TS (Disagree)	2
STS (Strongly Disagree)	1

While calculating the average score for quantitative data with the formula:

$$\bar{x} = \sum_{i=1}^n x_i$$

Information:

\bar{x} : average score

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

n : number of assessors

The average score is converted into a qualitative value according to the criteria of the ideal rating category. According to Sukarjo (2006: 53), the criteria for the ideal evaluation category with the following conditions:

Table 2. Criteria for ideal rating categories

Score Range (i)	Category
$\bar{x} > \bar{M}_i + 1,8 SB_i$	Very Good
$\bar{M}_i + 0,6 SB_i < \bar{x} \leq \bar{M}_i + 1,8 SB_i$	Good
$\bar{M}_i - 0,6 SB_i < \bar{x} \leq \bar{M}_i + 0,6 SB_i$	Enough
$\bar{M}_i - 1,8 SB_i < \bar{x} \leq \bar{M}_i - 0,6 SB_i$	Less
$\bar{x} > \bar{M}_i - 1,8 SB_i$	Very Less

The results of the percentage criteria for the ideal assessment category by material experts, media experts, student responses, and overall grades are as follows:

Table 3. Expert Material Questionnaire Assessment

Score Range (i)	Category
$\bar{x} > 193,08$	Very Good
$148,36 < \bar{x} \leq 193,08$	Good
$119,64 < \bar{x} \leq 148,36$	Enough
$82,92 < \bar{x} \leq 119,64$	Less
$\bar{x} \leq 82,92$	Very Less

Table 4. Media Expert Questionnaire Assessment

Score Range (i)	Category
$\bar{x} > 37,8\%$	Very Good
$30,6\% < \bar{x} \leq 37,8\%$	Good
$23,4\% < \bar{x} \leq 30,6\%$	Enough
$16,2\% < \bar{x} \leq 23,4\%$	Less
$\bar{x} \leq 16,2\%$	Very Less

Table 5. Student Questionnaire Assessment Assessment

Score Range (i)	Category
$\bar{x} > 75,6\%$	Very Good
$61,2\% < \bar{x} \leq 75,6\%$	Good
$46,8\% < \bar{x} \leq 61,2\%$	Enough
$32,4\% < \bar{x} \leq 46,8\%$	Less
$\bar{x} \leq 32,4\%$	Very Less

Mathematics learning media products are declared worthy of being a source of learning if the minimum quality of each aspect and overall learning media is minimal with good categories.

RESULTS AND DISCUSSION

Trial data in the development of a Bilingual LKS-Based Mathematics Module with the RME Approach on stacking subjects for grade VII junior high school students include:

1. Preliminary Research. From the observations it can be seen that: a) Mathematics is still considered problematic by some students. b) Students need teaching materials that can help independent learning. c) Students need teaching materials related to everyday life, to make it easier to understand concepts. d) RME teaching materials have never been applied to mathematics at SMP Muhammadiyah 2 Depok Sleman and SMP 4 Patuk Gunung Kidul. From these potentials and problems, the researchers provided solutions by developing module products with the Bilingual Worksheet-Based RME Education approach for grade VII SMP students on the Bangun Datar subject.
2. Data Collection. After studying and understanding the data obtained from the results of preliminary research, it is necessary to develop a Mathematics Module approach for RME for Class VII Junior High School Students, Even Semester. In this case, it is necessary to pay attention to competency standards and essential competencies.
3. Product Development. The process of working on a module refers to the steps outlined in the previous chapter. Before compiling mathematics, the module is designed first. The initial module design included:
 - a. Opening Parts: Cover, Foreword, Module Compilation Team, Table of Contents, Introduction, Concept Map.
 - b. Content: subtitles, material, sample questions, practice questions, competency tests.
 - c. Closing Section: Answer key, library list, back page.
4. Product Validation. The validation of the mathematics modules for SMP Muhammadiyah 2 Depok and SMP Negeri 4 Patuk VII class even semester which has been prepared through three stages of assessment, namely:
 - 1) In the first phase of assessment, the mathematics learning media's initial product design based on Bilingual Worksheets for SMP Negeri 4 Patuk and SMP Muhammadiyah 2 Depok for grade VII students was consulted with a supervisor. The consultation first discussed the lattice and study of assessment instruments for media experts, material experts, and student responses. The input from the supervisor is used as revision material for stage I. Grating and reviewing assessment instruments for media experts, material experts, and student responses.
 - 2) In the second phase of the assessment is validated by expert lecturers and the media. Material and media expert lecturers are asked to review and provide input on the products developed. Data validation results from material and media experts are used to determine the feasibility of mathematics modules for SMP Muhammadiyah 2 Depok and SMP Negeri 4 Patuk VII grade even semester. The data is obtained by providing a mathematics module for SMP Muhammadiyah 2 Depok and SMP Negeri 4 Patuk grade VII even semester, developed to lecturers of material experts and media experts by giving product quality assessment sheets. The expert will give a sign in the form of (O) or be circled in the choice of answers by his

opinion on the statement submitted in the assessment sheet. The assessment sheet contains teaching material evaluation items by taking into account the quality requirements, which include: Aspect of Feasibility of Content, Aspect of Eligibility of Presentation, Language Aspects, Graphic Aspects, Aspects of the RME Approach. The material and media expert lecturers provided suggestions and criticisms as product revision material in this assessment sheet. The following are inputs for improvement from material and media experts for improvement from material experts as follows: The use of the unit is placed on the conclusion, the calculation is wrong to be revised, the use of the index to be correct, right angle markings in the picture, while for the module repair from the media expert: the module display is not very attractive, the spacing is too wide, the module cover is not attractive, writing a bibliography, the use of EYD is improved, the source of the image in the module.

- 3) The revised phase III results were subsequently submitted and assessed by two mathematics teachers at SMP Muhammadiyah 2 in Depok and SMP Negeri 4 Patuk. The data was obtained by providing a mathematics module for SMP Muhammadiyah 2 Depok and SMP Negeri 4 Patuk in the seventh semester of the developed semester and giving a product quality assessment sheet. The mathematics teacher will give a mark (O) or be circled on the choice of answers in his opinion on the statement submitted in the assessment sheet. The scores used are a score of 5 for Very Good ratings, a score of 4 for Good ratings, a score of 3 for a Fair Rating, a score of 2 for a Poor rating, and a score of 1 for a Very Poor rating. The input from the Muhammadiyah 2 Depok and SMP Negeri 4 Patuk teachers are as follows: the steps in work on the answer key are more detailed, the picture is too striking, then followed up by the researcher.
5. The first trial was conducted with a sample of 5 VII grade students of SMP Muhammadiyah 2 Depok and SMP Negeri 4 Patuk. The researchers directly guided the trial I process accompanied by a grade VII mathematics teacher at SMP Muhammadiyah 2 Depok. In the first trial at SMP Negeri 4 Patuk. The trial I ran smoothly. The students were very enthusiastic and interested in reading the modules. The trial process gave students a questionnaire or assessment sheet to determine students' responses to the module. Based on trial process 1, there is not much input or criticism. Students only give input so that the exercises are not too many and for the whole is good. For this weakness, the researcher provides follow-up by reducing the question exercises contained in the module. After improving the module based on trial I's results, the module is ready for trial II to use. Trial II was conducted at SMP Muhammadiyah 2 in Depok with a sample of 20 students and in SMP Negeri 4 Patuk with a sample of 20 students. Researchers guide directly the trial process II. The trial process II ended with giving a questionnaire to students to determine students' responses to the modules that had been made after it was felt that there was no meaningful input for improving the modules that had been produced, the final product of the Bilingual-Based Mathematics Module for Junior High School Students of Class VII Even Semester 2016/2017 Academic Year could be used in the learning process.

Based on the data analysis technique used, the data obtained from the assessment of material experts, mathematics teachers, and media experts and students are processed, and the results are as follows:

1. Assessment Questionnaire Analysis. Ahmad Dahlan University assessed the assessment analysis, lecturer in instructional media, and mathematics teacher at SMP Muhammadiyah 2 Depok and SMP Negeri 4 Patuk.

Table 6. Media Rating Scores from Media Experts

No	Validator	Score	Qualitative Criteria
1	Media Expert (Lecturer)	133	Very Good
2	SMP Muhammadiyah 2 Teacher	127	Very Good
3	SMP Negeri 4 Patuk teacher	127	Very Good
	Average	129	Very Good

The results in Table 6 show that the Mathematics Module Based on Bilingual Worksheets with the RME Approach Flat Build Material for Middle School Students Grade VII Even Semester of the media side is included in the excellent category.

2. Material Worthiness. Ahmad Dahlan University assessed the assessment analysis, lecturer in instructional media, and mathematics teacher at SMP Muhammadiyah 2 Depok and SMP Negeri 4 Patuk.

Table 7. Score Calculation Questionnaire Feasibility of Expert Material

No	Validator	Score	Qualitative Criteria
1	Media Expert (Lecturer)	201	Very Good
2	SMP Muhammadiyah 2 Teacher	203	Very Good
3	SMP Negeri Datuk 4 teacher	199	Very Good
	Average	201	Very Good

Based on the results in Table 7 shows that the Mathematical Module Based on Bilingual Worksheets with the RME Approach Flat Build Material for Junior High School Students Grade VII Even Semester in terms of material included in the category of Very Good.

3. Student Response. To determine the students' responses to the Bilingual Worksheet-Based Mathematics Module with the RME Approach Flat Build Material for Junior High School Students Grade VII Even Semester can be seen from the questionnaire results filled out by students during the first try and second try. Student responses are presented in qualitative data and provided input sheets such as criticism and suggestions to improve the Mathematical Module Based on Bilingual Worksheets with the RME Approach Flat Build Material for Middle School Students Class VII Even Semester. Then the results of student responses are converted into data to determine student responses to the modules that have been generated.

Tabel 8. Skor Perhitungan Angket Respon Siswa

No.	Activity	Amount	Average score	Qualitative Criteria
1.	Trial I	10	83,3	Good
2.	Trial II	40	89,8	Good

Based on the results of table 8, it can be seen that the combined results of the responses of students of SMP Muhammadiyah 2 Depok and SMP Negeri 4 Patuk to the module were good with a score of 83.3 in the first trial. This score was obtained from the assessment of 5 students of Muhammadiyah SMP Kretek and five students of State Junior High School 4 Stack combined. Based on table 8, the results of the responses of students of SMP Muhammadiyah 2 Depok and SMP 4 Patuk towards the module were good with a score of 89.8 in the second trial. This score was obtained from the assessment of 20 students of SMP Muhammadiyah 2 Depok and 20 students of SMP Negeri 4 Patuk, which were combined.

CONCLUSION

Based on the research results, several conclusions can be drawn:

1. Develop Learning Modules. At the potential and problem stages as well as data collection, information was obtained that the teaching materials at SMP Muhammadiyah 2 Depok and SMP Negeri 4 Patuk had been fulfilled, but had not been able to inspire student enthusiasm for learning, especially in mathematics. The teaching and learning process at SMP Muhammadiyah 2 Depok and SMP Negeri 4 Patuk is still centered on teachers. Students do not play an active role in the learning process. Teachers still use the lecture method to teach material at school so that the approach that is considered the most appropriate to the problem is learning with the Realistic Mathematics Education (RME) approach. The researcher made a mathematics learning module design for class VII SMP with flat form material in the learning module which refers to the Realistic Mathematics Education (RME) approach.

2. At the product design validation stage. After being validated, the learning module developed is declared worthy of being tested with several revisions that must be made. Design revisions are made revisions to improve the learning module based on input and suggestions from the validator at the product validation stage, including aspects of content feasibility, aspects of language assessment, and aspects of appearance.
3. In the product trial stage, the learning module testing was developed by five grade VII students of SMP Muhammadiyah 2 Depok and five grade VII students of SMP Negeri 4 Patuk. From this test, it was found that the developed module was declared feasible with an average value of 83.3 so it was included in the good criteria. At the product revision stage, the learning module was improved based on input, suggestions, and product trial data analysis. In the use trial phase, the learning module testing was developed by 20 grade VII students of SMP Muhammadiyah 2 Depok and 20 grade VII students of SMP Negeri 4 Patuk. From these tests, it was found that the developed learning module was declared very feasible with an average value of 89.8 so it was included in the good criteria.
4. Module Eligibility. Based on the results of the development and analysis, it can be concluded that the results of the research and development of the Mathematics module of the Flat Build material that have been developed are said to be suitable for use in learning based on learning outcomes, assessment of material experts, media experts, and student responses. The results of the module assessment in material obtained an average score of 201 with very good criteria, and media experts obtained an average score of 129 with very good criteria. Based on the assessment of the material expert, the module media expert, it can be concluded that the flat-shape mathematics module for grade VII SMP / MTs students is suitable for use in learning.
5. Student Response. The mathematics module of the Flat Flat material developed is said to be suitable for use in learning based on the results of student responses to the I and II trials conducted at SMP Negeri 4 Patuk and SMP Muhammadiyah 2 Depok. The results of the module material assessment obtained an average score of 83.3 with good criteria in the first trial and an average score of 89.8 with good criteria in the second trial. Based on the assessment of students' responses to the module, it can be concluded that the flat shape mathematics module for grade VII students of SMP / MTs is suitable for use in learning.

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