

# The Development of Mathematics Bilingual Module with the Help of Realistic Mathematics Education in Grade VII Junior High School

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**Abstract:** The research was conducted due to the limited number of students' characteristic base learning module in Indonesia. This research aimed to develop a suitable module for the bilingual classroom which adapted realistic mathematics education. Research and Development, used in this research, was carried out in three stages, which were Preparation, Implementation, and Analysis. In the preparation stage, the initial design was made. Then, it validated by 6 expertise for 3 aspects (material, language, and media). In the implementation stage, the design has experimented in two terms (small group test and field test). In the analysis, data from expertise validation, interview with a teacher and 3 students, and questionnaires from the students in the small group test, were analyzed in order to develop the final design for the module. The final design module was designed in a complete way, from informal mathematics until formal mathematics which fully equipped by formative test and students' worksheet. The average score of the expert test was 74.83 (appropriate) whereas the average score of small group test was 80.8 (very appropriate). During the field test, student's learning outcomes were improved after learning with the module. In conclusion, there is a mathematics bilingual module focusing on algebra and arithmetic with the help of realistic mathematics education.

## 1 INTRODUCTION

Learning resource is an important component in the mathematics learning process. The type of learning resource gives some different impacts to students' understanding and thinking because it has its own advantages and disadvantages. With this learning resource, the role of teacher changes as a teacher is not the main source of learning but as a facilitator organize students. A good learning resource is preferable based on students' characteristic. The teacher who knows the students' well is expected to develop learning material through a type of learning resource which has been written in Government Regulation number 19 of 2005 section 20 (Peraturan Pemerintah RI, 2005). In fact, some schools are provided some learning resource from the government. The government's learning resource means generalized for all students but the students' characteristic in each school are different, so it is not matched to the adjustment. The international standard school is not available in Indonesia anymore, but there is a private international school. Those school-use a learning resource such a book

which written in Bahasa Indonesia not in bilingual or even English. The school learning process is textbook oriented and less to ask students to be active in the classroom. So, it is also called as a teacher-centered learning process. Teachers have some careless about the students' thinking capability and group discussion. These things have made the students only memorizing without an understanding.

During observation and interview, students in Kafila International Islamic School said that it is easier to study with module than the book because a module gives simple material, evaluation test, and feedback. Students may learn individually and still can ask the teacher if they have any confusion. The students showed that there is a misunderstanding in learning algebra and arithmetic. The algebraic concept is not being understood entirely. Students need more examples of algebra and arithmetic related to the real world or something which can be imagined. They suggest constructing the problem individually or in a group discussion with a module. This problem has made the researcher to develop one kind of learning resource like a module with help of a learning method. A learning method here

means a learning method which fit to the students' characteristic. Realistic mathematics education is one type of method which can be applied to the module. So, there will be a development of mathematics bilingual module focusing on algebra and arithmetic with the help of realistic mathematics education in grade VII junior high school.

## 2 LITERATURE REVIEW

To develop a module, we need some theory which supports the content. The researcher thinks that these theories have been encouraged the script.

### 2.1 Module Development

Houston and Howson said a module can be interpreted as some activities which certain to help students easier in their learning (Wena, 2010). While, Surahman said a module is the smallest type of learning which studied by students individually (self-instructional) (Prastowo, 2011). So, a module is an activity which interprets to help students in learning individually. There is some characteristic of a module which is self-instructional, self-contained, adaptive, and user-friendly. Self-instructional means provide material in worksheet and communicative. Self-contained means to provide complete material in one chapter. Adaptive means a learning resource should follow by good information technology. While user-friendly means every information in a module could be understood easily by the students (Asyhar, 2011). Beside the definition of a module, this research is about how to develop a mathematics bilingual module. The development of mathematics bilingual module means a science and technology activity which is used to get a product prototype and analyze design methodology to increase small learning as a resource for students and teachers with two languages. There are steps of how to develop a mathematics module are (1) analyze the basic competencies and indicators so that the purpose can be achieved. (2) decide the content and design and (3) write from the opening, content, and closing.

### 2.2 Realistic Mathematics Education

Realistic Mathematics Education is a kind of learning mathematics approach theory which develops from Dutch. This theory is invented by Hans Freudenthal who said that mathematics is a human activity and related to human reality

(Gravemeijer, 1994). According to Hans, students should not accept mathematics concept passively, but a teacher should give them chances to reinvent mathematics by guiding (Apati, 2017). The reinvention means there is a relation between mathematics and the real world. Blum and Niss said that a real world is everything in real life or habit which linked to mathematics (Hadi, 2017). Two types of mathematization in realistic mathematics education are vertical and horizontal mathematization. A vertical mathematization starts with contextual problems and rearranges according to a procedure to solve the problems. A horizontal mathematization also starts with contextual problems but students may solve their symbol and language which can be different from one another (Ningsih, 2014). Realistic Mathematics Education learning approach has five characteristics which are (1) the use of contexts, starts a lesson by giving a real-world problem. (2) construction, students can explore their knowledge to solve the problems freely. (3) the use of a model, students develop another mathematization model as a bridge to formal mathematics. (4) interactivity, students can discuss the problems with their friends. (5) Intertwinement, the learning material has a relationship with the previous and next chapter (Wijaya, 2012).

### 2.3 Methods

Research and Development are used in this research. Sugiyono said that research and development is a kind of research method where it used to produce a product and tested the effectiveness (Sugiyono, 2015). The design research is shown in figure 1.

The design research is separated into the procedure of module development in three stages which are Preparation Implementation, and Analysis. The preparation stage, the researcher arranges the module with many kinds of learning resources like school book, realistic mathematics education book, and information from the internet. Besides that, the researcher also prepared some score table for expertise and students' validation. In the implementation stage, it was followed liked the design research.

First, identify the potential and problem, junior high school students have the ability to communicate in English, active, and less understand in algebra and arithmetic. Within those potentials, there is a problem from the students who have less understanding in both chapters and a school does not have a mathematics bilingual module as the learning

resource. That is why the researcher has the motivation to make a module focus on algebra and arithmetic.

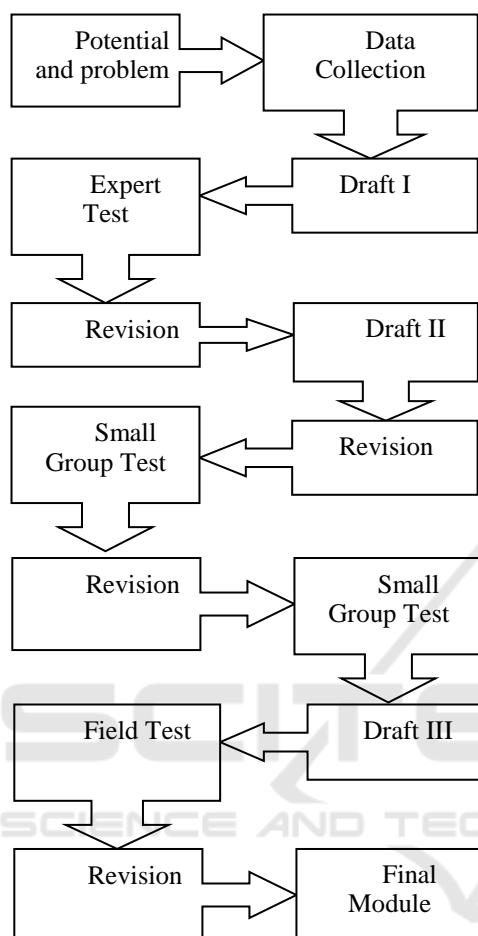


Figure 1. Design Research Steps.

Next is the data collection, collect the data needed from many resources and design the learning trajectory of how to write the module nicely and easy to understand. During module writing, the researcher also refers to score table on BSNP 2006. Data validation is validated by expertise and students after the draft I and II module finished. The score for validation on expert and small group test can be scored and measured by Likert scale. The method is shown as follow (Puspita et al., 2014):

$$p = \frac{\sum x}{\sum xi} \times 100. \text{ (blm dikasih keterangan)}$$

The result of  $p$  which is measured by Likert scale includes the category:

84 – 100: very good,

68 – 83: good,  
 52 – 67: average,  
 36 – 51: bad,  
 20 – 35: worst.

### 3 RESULTS

The result of this research is there is a new type of module development with the help of realistic mathematics education in which focused on algebra and arithmetic. The average score of an expert test is 74.83 and small group test is 80.8, these scores were categorized as good. Whereas the field test given by pre and post-test, there is an improvement in students' learning outcomes after using the module.

#### 3.1 Validation Result

The table below shows the average mark result of validation by six expertise.

Table 1. The result of Expert Validation.

Expertise Validation	Total Score	Score Maximum	Mark	Category
Content	218	280	77.8	Good
Language	41	70	58.5	Average
Media	128	145	88.2	Very Good

The validation was done by six expertise who are the lecturers and person who are able in their sector. The average score of content expertise is 77.8 which categorized as good. Where language expertise gives 58.5 which categorized as the average score. Last but not least, the average score of media expertise is 88.2 which is very good. Where the students in small group test give a highly good score in which the average is 80.8 as good. To define the result in detail, we will show the graph of the scoring with two experts in each part.

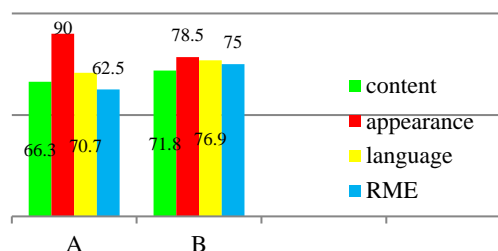


Figure 2. Content Validation

Content validation assesses four points which are content, appearance, language, and realistic mathematics education. Both of the expertise valued by questionnaires given. A refers to the first expertise and B refers to the second expertise. It occurs in each part of the expert validation. After content validity, the graph below shows language validity.

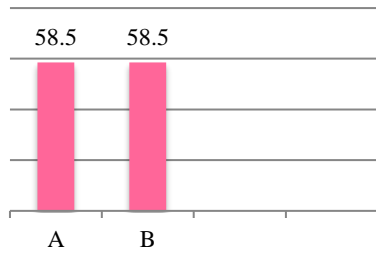


Figure 3. Language Validation.

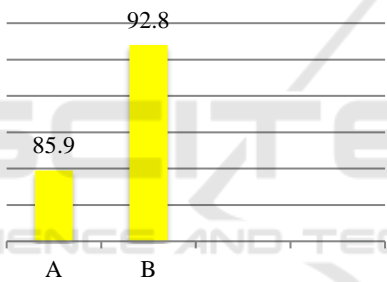


Figure 4. Media Validation.

### 3.2 Small Group Test

The small group is the next step after expert validation. It requires nine students of grade VII from a different school. The purpose to do small group test is to find out whether students understand or not. The researcher gave them three days to learn the module and also give some questionnaires and exercises. The questionnaires have points 1 – 4 in each category which can be filled after learned and did the exercise in the module. The table 2 shows the result of students' validation in small group test.

### 3.3 Field Test

The field test is the last test before doing the revision and being a final module. It was conducted in two classes which contain 30 students respectively. During the field test, the researcher also gives pre-

test and post-test to look before and after learning by the module. If the score of the post-test is higher than pre-test after learning the module, so it can be concluded that the module is easy to use. The table 3 shows the result of the pre-test and post-test of students in Kafila International Islamic School. The table 3 can be converted into a graph in figure 4.

Table 2. The result of Small Group Test.

Students' Validation	Mark	Category
R <sub>1</sub>	74	Good
R <sub>2</sub>	87	Very Good
R <sub>3</sub>	81	Good
R <sub>4</sub>	80	Good
R <sub>5</sub>	84	Good
R <sub>6</sub>	91	Very Good
R <sub>7</sub>	80	Good
R <sub>8</sub>	76	Good
R <sub>9</sub>	75	Good
<b>Average Mark</b>	<b>80.8</b>	<b>Good</b>

Table 3. The result of the Field Test.

Class	Average Pre-test score	Average Post-test score	Category
7A	59.5	69.6	Increasing
7B	57.9	68.6	Increasing

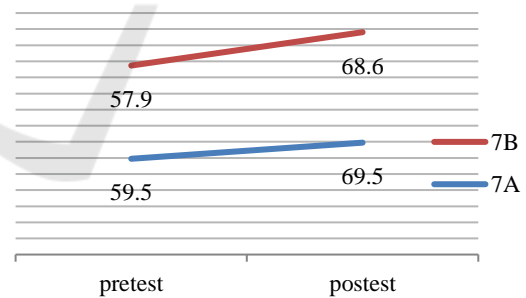


Figure 4. The result of Pre and Post-Test.

## 4 CONCLUSIONS

The problem in which there is a limitation in mathematics learning source has made the researcher to produce a mathematics bilingual module which believed can increase students' understanding because it helps by realistic mathematics education. So that students can learn without their teacher but just combine the lesson

with real things and group discussion. Within that, the English language provided in the module has made students improve their language and vocabularies. The stages of research have concluded that most students in the junior high school are able to understand and there is an improvement of learning outcomes after learning by the module. The mathematics bilingual module with the help of realistic mathematics education is able to be used as a learning source.

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