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## DEVELOPING INSTRUCTIONAL MATERIALS COMPLEMENT OF SET BASED ON INDONESIAN VERSION OF REALISTIC MATHEMATICS EDUCATION IN 7<sup>th</sup> GRADE OF JUNIOR HIGH SCHOOL

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### **Abstract**

*This study aims to development assessment instrument in Indonesian version of Realistic Mathematics Education (PMRI) with the material is a complement of a set and difference of two sets in student's book form where the student's book is valid, practice, and must have potential effect. The methodology used in this study is development research where there are analysis, design, evaluation, and revise. This form of research consists of self evaluation and prototyping. The college data were using observe, test, and documentation. The subject of this study is 31 students in 7<sup>th</sup> grade of SMPN 1 Palembang. Expert review and documentary analysis were used in collecting data. For evaluating process, observation sheet, learning log, the use of student's strategy and solution from the result of their achievement. The collected data were analyzed using qualitative descriptive. The findings show that assessment instruments in PMRI in the topic special a complement of a set and difference of two set. Could be categorized as valid, practical, and effective. The validity is measured by using the aspects of contents, construction, and language based on assessment's principles of PMRI. Based on the expert comments, the assessment instruments developed can be practically in the teaching learning process. The result of this study is the student is very happy and enthusiastic in their study. And then the students show positive attitude in mathematics study. It can saw from their commenter and the result of observe. The effect potential shows that 12 students have very good category and 14 students have good category, so it can call student's understanding of concept is good.*

**Keywords:** *Development research, Set, PMRI*

### **INTRODUCTION**

Mathematics is one of subject which is passed to student since elementary until high school. In KTSP compiled in such a manner later the student can own ability think logical, analysis, systematic, critical, and creative so that later all educative competitor able to compete and adapt. According to Nila (2008) saying that one of mathematics material which is a lot of used in life is set. And then set also represent basic concept from mathematics. Fact that happened in set material study is the presentation is too abstraction especially at difference of two sets and complement. Same thing meet in SMPN 1 Palembang, the school use student's book with publisher of erlangga and directorate Jakarta. Book used still too the abstraction even erlangga book not early use existing real context in life. Others in used student book, the book have direct give congeniality from the items students do not given a break to release their opinion. Somakim (2009) also suggest that can develop book of mathematics base on realistic mathematics education.

To handle problem, researcher try to develop a student's book with PMRI approach. With PMRI approach student book later do not become abstraction because by using this PMRI student given their opinion to find the mathematics conception with teacher guided by constructivist. To come to the invention the concept and formula of mathematics do by activity of investigation so that the educative competitor will learn informally to tip of formal form (Hadi, 2005).

Somakim (2009) saying that activity of conventional study result the happening of memorization process conception or procedure, understanding of mathematics concept become to lower effect of the conventional study is that student in learning the mathematics more aimed by a process memorize from comprehending concept. According to the mentioned of researcher will develop teaching items yielding student book product base on PMRI. according to the background, so we can find the question research is how developing instructional materials of set based on Indonesian version of realistic mathematics education in 7<sup>th</sup> grade of junior high school and how the potential effect to understanding of concept in SMPN 1 Palembang?

### **DEVELOPING MATERIAL**

According to Gravemaijer in Misdalina (2009:64) development is process or way of deed to develop a substance to be tested step by step and regular so that can yield better result again. Tessmer (1993) in Zulkardi (2006:56) by explicit define formative evaluation as consideration (hitting strength and febleness of substance teach in growth phase) review of substance teaches to increase effectiveness and fascination. There are 4 step in formative Evaluation, that is: 1.) Expert Review: Expert evaluate substance teach with or without evaluator. 2.) One To one: one student at one time evaluates substance teach by evaluator and give [his/its] comment. 3.) Small Group: evaluator try substance teaches with a group of student and note appearance and comment. 4.) Field test: evaluator perceive substance of teaching which test in situation that of real with a group of educative competitor.

### **INDONESIAN VERSION OF REALISTIC MATHEMATICS EDUCATION**

One of approach study which is start from real context problem where student by their self to find the understanding of concept is Realistic Mathematics Education (RME) which now we have Indonesian version of realistic mathematics education (PMRI). Hadi (2005) say that since year 1971, institute Freudenthal develop a theoretical approach to study of mathematics recognized by RME (Realistic Mathematics Education), RME combine view about what is mathematics, how the student learn mathematics, and how mathematics have learned. Introducing RME is Hans Freudenthal from Holland who say mathematics is human activity which is student activity, finding and develop; building by their self the knowledge that is needed so that the study become to bent the mind to by student. In PMRI the students give chance to find their mathematics conception with teacher guided by constructivist.

Zulkardi And Ilma (2010:4) say that PMR or RME is theory of study starting from things which real or have been experienced of by the student, emphasizing skilled process 'doing mathematics' discussing and collaboration, discussing with classmate, so that they can find by their self (' student inventing') as its conversion from ('

teacher telling') and in the end use that mathematics to finish problem of either through individual and also group.

Zulkardi And Ilma (2010: 11) say that PMRI as according to Principle RME 1.) Guided Reinvention and Didactical Phenomenology, 2.) Progressive Mathematization 3.) Self Developed Models. According to (de lange, 1987, 1996, Treffers 1991; Gravemaijer 1994) in Zulkardi (2010:5) There are 5 characteristic PMRI that is: 1.) Using Problem contextual, 2.) Using Bridge or Model by Instrument Vertical, 3.) Using student contribution, 4.) Interactivities and 5.) Intertwined.

**RESEARCH METHOD**

This research is development research (Akker, 1999) which the material development using 2 step, that is preliminary and formative study.

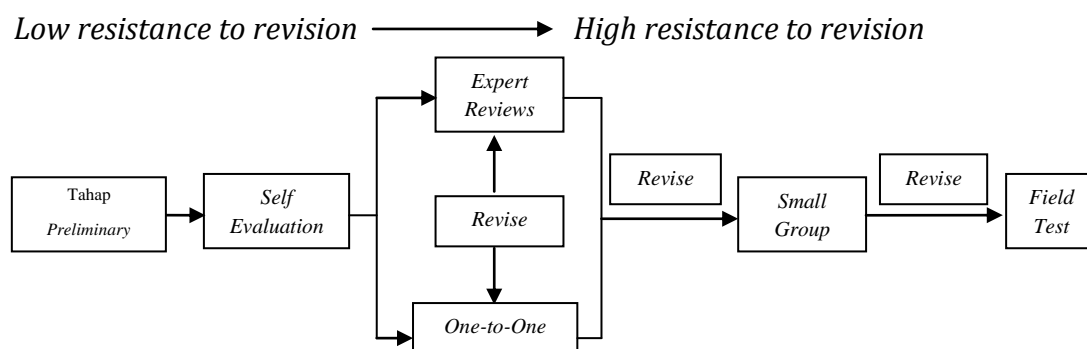


Diagram 1. Flow charts of Formative Evaluation (Tessmer 1993 in Zulkardi 2006)

This research is executed at even semester 2012/2013 in SMPN1 Palembang class VII.1 with 31 students.

No	Collecting Data	Analyze Data
1.	Documen	Data from One to One, and Small Group
2.	<i>Walkthrough</i>	From expert Review
3.	Observation	Analyze student activity when field test
4.	Student's book result	Analyze result from student's book
5.	Exercise	Analyze exercise when field test
6.	Test	Analyze test when field test
7.	Documentaries	Analyzed as additional data to support observation.

Table 1. Technique Collecting Data and Analyse Data

**RESULT AND DISSCUSION**

**Development student's book**

This research there are 2 big step that is Preliminary and the Formative Study, like that: Preliminary, this step is analyzing student, analyze curriculum, and analyze material. Formative study, this step is self evaluation and prototyping.

### First Prototype

From result of self evaluation obtained by draft of book of student using approach of PMRI which aim to measure ability of student as first prototype. First prototype focused content, construct, and Language. Example of student's book at first prototype is

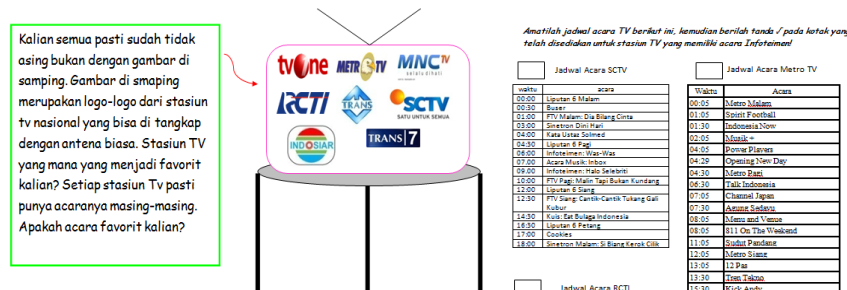


Figure 1. Student's Book at First Prototype

### Expert Review

This step in first prototype is student's book validated by mathematics teacher and expert. This step aim to get valid material instruction. And then the first prototype validated content, construct, and Language. Process validating expert ( expert review) using Walk through method, where prototype given to the expert and then one by one validated by expert.

No.	Validator	Suggestion / comment
1.	Nasrullah, M.Pd	<p>Change sentence of second question in first student's book in fourth problem in first student's book don't start with word of set.</p> <p>in the first exercise there are wrong words and try to make problem which is the solution use diagram Venn.</p> <p>in the second student's book problem no 3, what is the difference blue box and the question in yellow box?</p> <p>Change the sentence of the problem which is related to conclusion from complement.</p>
2.	Farida Nursyahidah, M.Pd	<p>At problem 5 and 7 there are typing mistake.</p> <p>At the second student's book question 4 decomposing become 3 questions.</p> <p>Check language in problem.nguage in problem.</p> <p>the Context in the first student's book there must be in RPP as motivation to start learning set or be a introductory.</p>
3.	Christy Matitaputhy, M.Pd	<p>Limit the schedule in list of station TV schedule.</p> <p>At first problem in first student's book give the list of station TV name so, they can answer the first and second problem .</p> <p>Give the space to answer the introduction question.</p>

At ninth problem in first student's book asking their conclude. From their thinking, the student instructed to comprehend order and simbol in set.

Change problem evaluate to become exercise

The second problem in excsrcise is better be ordered to draw Venn.

Change the sentence the second problem from second student's book.

Table 2. Result of Validating Expert

### **One to One**

The first prototype had test to 2 students seventh grade class. The students becoming object are Rischka Salsabila Maulini from SMPN 1 Palembang, and M. Fayad from SMP Al - Furqon Palembang. one to one use to see difficulty that happened during process of study when the students use student's book.

### **Revise**

According to the suggestion from expert review and one to one, so the student's book at this first prototype revised to obtain get the material is better and to be the second prototype.

### **Second Prototype**

The result from One to one and expert review made basis for revise first prototype become prototype second. From The picture second prototype have giving space for the student answer and some sentence which wrong repaired by according to suggestion from validate. Following is the second prototype:



Figure 2. Appearance second picture

### **Small Group**

Small group is doing in SMPN 1 Palembang using 6 students from class 7.2 and 7.3 owning heterogeneous ability. In this step they work together to finishing the student's book. See there is no difficulty when they do student's book. And then the researcher revises according to result from small group.

### **Third Prototype**

After the second prototype revised so will result third prototype. So the student's book is operate in English version.

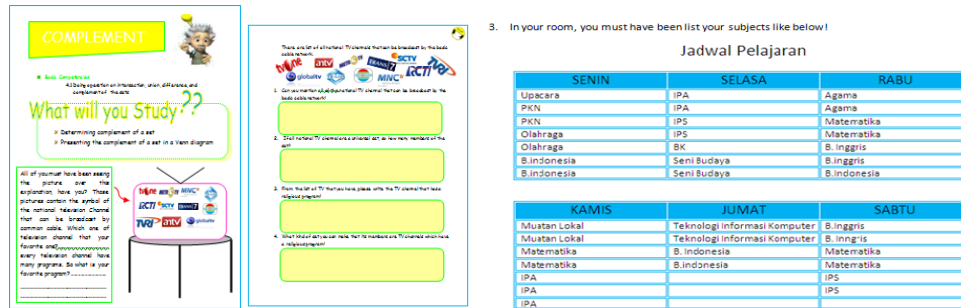


Figure 3. Design Third Prototype

**Field Test**

After third prototype was born which practical and valid. Field test is use to see potential effect to understanding concept. Field test executed on 13 - 14 February 2013 in class VII. 1 SMPN 1 Palembang amounting to 31 students who divided to become 13 heterogeneous group which have member 2 until 3 people. Learning executed during 2 times meeting.

**Analyzed observation**

Result of research from observation sheet to know process of study use PMRI approach. In the following the tables of score process study of student use PMRI approach.

No	Indicator	Mean of Score Obtained At Meeting To		Maen
		I	II	
1	Use Real Context	91,39	86,02	88,70
2	Vertical Instrument Use ( Schema, Model, Scheme)	86,02	88,17	87,09
3	Use the Result Student Work and Construction.	82,79	89,24	86,02
4	Interactivities	87,09	79,03	83,06
5	Intertwine	41,93	40,32	41,12

Table 3. Student Study Process Seen From Each Indicator

From the table we can see that intertwined has the low score. That happened because the student's book developed without intertwined for other subject.

The Result of Third Prototype Test to See Understanding of Concept

Score	Frequency	Category
80 - 100	17	Very good
66 - 79	14	good

Table 4. Categorize Understanding of Concept

From the table we can see that there are 17 students who get very good category for their understanding of concept and there are 14 students who get good category for their understanding of concept. The 14 students get good category because in their test, they are get the low score. Many of them forget to write what known from the question.

### **SOLUTION**

#### Principal and Characteristic PMRI by Prototype

##### Principal PMRI:

- *Guided Reinvention*

Through station TV student subject and context given a chance to do mathematization. Here the student build her knowledge about difference two set and complement. the student guided to go to understanding about difference two set.

- *Progressive Mathematization*

This process the student which given by a real context problem related to station TV which later reach formal storey level about difference two set and complement.

- *Self – Developed models*

In this step the student develop model by their self from context which have been given. Students develop their knowledge either through individual and group.

##### Characteristic PMRI:

- *Use Of Context*

In this research the context is station TV and lesson which they learn at school. The Real problem within call with student life so that assist student to comprehend difference of two sets and complement concept.

- *Using Model or Bridge with Vertical Instrument*

Student instructed in developing model, scheme, diagram, and the symbolizing. In this case student instructing to comprehend symbol - symbol which exist in complement and difference two sets. Student also instructing to understanding diagram Venn.

- *Use Student's Contribution*

Student work in group and individual. They conclude meaning of complement and difference two set with their Language. And answer the question by the understanding of their concept. After they discuss with their group so some group present their answer.

- *Interactivity*

This student's book designing in order to can be discuss in the group. Seen at the learning in class, student work together and discussion of class where student unite mind in order to get the correct understanding. So that from discussion of group and discussion of class seen by existence interactivities.

- *Intertwined*

- in this student's book developed integrated and related/relevant with mathematics area. At study of this set is related/relevant is which emerge trouble-shooting of related to material of set is operation number which can be seen from student answer.

## CONCLUSION

According to the result and the solution, so we can conclusion that:

- Developed material of set in junior high school use PMRI approach is valid according content, construct, and language. And practice to use the students.
- From the field test the material of set have the effect potential :
- Student is active follow study by using PMRI approach, it can see from the result of observation.

Result of final value of student to understanding of concept is equal to 17 student getting very good category for their understanding of concept, 14 students getting good category for their understanding of concept. The 14 students who get score with good category because they get low score from exercise and test, and many of them get low score because they didn't write what is the know from the question, they didn't use previous concept to answer the question. So understanding of concept the students by using PMRI approach is very good. So it can call that the student's understanding of concept is good.

## SUGGESTION

According to the conclusion and result of above research, hence the researcher can suggest for Teacher, must try student to always propose reason in each every study in order to more earn creative. For student, in learning to use student's book base on PMRI is expected can more active in study others shall be more can accustom to give a conclusion to a concept. For other researcher, expected to earn design student's book with the intertwined of other material items learned with other dissimilar Lesson.

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