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THE DEVELOPMENT OF MATHEMATICS ASSESSMENT MODEL IN ELEMENTARY SCHOOL

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Abstract

Based on observation in the field through KKG activity, it was shown that some teachers have not implemented the assessment's procedures which agree with learning approach that they have already used, especially learning through Realistic Mathematics Education approach. The goal of this study is to yield an assessment's book for Elementary School lessons which is practical, valid, and effective. The research method was developmental research which consisted of three phases, namely analyzing, designing, and evaluating. Data was collected from documents and test analysis. The try-out session was conducted at SD Plus Marhamah, Padang. The potential effect of Assessment in Learning Mathematics' book in Elementary School which was aimed to assess learning mathematics process in the classroom was included in the good category, after the try-out session. So, it can be concluded that the book of Assessment in Learning Mathematics in Elementary School which was designed was effectively used in learning mathematics.

Keywords: RME, assessment, developmental research.

INTRODUCTION

Background

Permendiknas No. 16. 2007 about Academic Qualifications and Teachers' Competencies Standard stated that: "One of teacher core competencies is doing assessment and evaluation of process and learning result." Based on observation in the field through KKG activity, it was shown that some teachers have not implemented the assessment procedures which agree with learning approach that they have already used, especially learning through Realistic Mathematics Education (RME) approach.

Assessment in Learning Mathematics in Primary School is an important part of teachers' assignment so that they know about their students; students' abilities, students' achievement, students' interest, weakness, and strength.

Assessment in learning mathematics in Primary School is the valuable part of teacher's work since without conducting suitable assessment the teacher cannot be a good teacher. A good teacher needs more effective and more efficient way to help students in learning. Because of this reason, teachers have to know more about their students, their abilities, their achievements, their interests, their weaknesses, and their strengths. Students' assessment in learning mathematics states how important it is since by the assessment teachers collect all the information about students' understanding, and the strengths, also the weaknesses in learning mathematics.

Moreover, assessment helps educators identify the strategies to improve teaching and learning mathematics, curriculum, and students' learning. Assessment is united in teaching and learning, and it plays a great role how and what we teach and how and what students learn (NCTM, 1989; and Pidgeon, 1992).

The implementation of any assessment techniques could be done through using methods, tasks, strategies, and activities in the classroom. The implementation of the assessment which is held by the teachers is to determine about what students have already known or what they could do (Sadler, 1989). On the other hand, the assessment of students' understanding cannot be evaluated directly but it has to be evaluated through any strategies and any conclusions (Fey. J.T, 1990). Thus, teachers ought to develop any assessment techniques which are suitable and vary. The data from the field showed the unsuitability between teaching learning mathematics in Primary School and the assessment system that had been used. Assessment process used by the teachers at that time assesses merely students' achievements, yet focuses on knowing the learning mathematics process. In the light of it, it is need to be boosted any kind of techniques which agree with RME approach. Jan de Lange affirmed the technique namely implementation of RME assessment. Assessment according to de Lange (1996) ought to fulfill the demand of learning goals in *KTSP (BNSP, 2007)*.

Problem in this research study is: "How is the effect of the development of valid, practical, and effective learning assessment model according to De Lange in assessing mathematics learning in primary school?"

Based on the observation through *MD* activity, it is showed that most teachers have not implemented a suitable assessment which agrees with the learning approach that they used, especially learning through RME approach. This problem should be coped immediately. If it is not, learning mathematics in this country will keep on the bottom. To handle problems which stated above, according to the researcher, it is necessary to hold any changes on the assessment model which is suitable to teaching learning mathematics students at primary school. Students need an assessment model which agrees with RME approach used by the teachers. To be expected, through a relevant and relative assessment book, mathematics teachers at primary school attain knowledge, skills, and experiences about a good assessment process. Thus, it is expected that mathematics learning goals and a suitable assessment process improve teaching and learning mathematics quality at primary school.

Research Question

Research Questions in this research study are:

1. How is the development of a valid and practical mathematics assessment's book based on PMRI in Grade 4 at *Marhamah Primary School, Padang*?
2. How is the effectiveness of the use of assessment book in teaching learning mathematics based on PMRI in Grade 4 at *Marhamah Primary School, Padang*?

Aims

The aim of this research study are:

1. To know the development of a valid and practical mathematics assessment's book based on PMRI in Grade 4 at *Marhamah Primary School, Padang*.

2. To know the effectiveness of the use of assessment book in teaching learning mathematics based on PMRI in Grade 4 at *Marhamah Primary School, Padang*.

Method

This study is a type of research methods, namely developmental research. Developmental research on this study oriented to definition by Lesh R & Comon S. J (1992). Developmental research is a systematical study about planning, developing, evaluating of a teaching program, a process and a product which have to fulfill an interval consistency criteria and effectiveness. The design was aimed to yield products, namely an assessment book of guidance for mathematics teachers at primary school.

The subject of this research study is a mathematics assessment book according to De Lange for primary school teachers in some regions of West Sumatera. The book was tried at *Marhamah Primary School, Padang*. This school was selected because based on an early study; this school satisfies some aspects as follows,

1. It is based on what the researcher needs
2. There was positive acceptance from any sides.
3. School location makes easier for the researcher to conduct the study.
4. School facilities are available.
5. There were experienced teachers.

Data collected from validation sheets about the product, namely Mathematics assessment book. The sheets utilize assessment formats which have rubrics or scoring criteria about the book.

The developmental procedure of the mathematics assessment book by De Lange divided into three steps, namely:

1. Self Evaluation
 - a. Analysis.

This phase encompasses analyzing of curriculum material and studying of basic competency, formulating indicators, observing, and studying mathematics learning assessment, based on De Lange, and also analyzing a better mathematics learning assessment process. In this phase, researcher also chose which materials that suitable to be applied in the classroom based on difficulty levels and could be geometrized. The analysis phase consists of two parts, namely:

- a) Analysis of *Garis Besar Program Media (GBPM)*

Analysis of curriculum material.

In this phase, it was conducted analysis of main material namely the three dimensional figures to be adapted with its basic competency. In KTSP, learning goals was mentioned in Standard competency and Basic competency which is stated on the appendices of Ministry Regulation No. 22, 2006 about Content Standard of KTSP.

- b) Making a flowchart.

This phase was aimed for determining material boundaries which will be showed on the book and determining which materials could be geometrized.

2. Designing

In this phase, researcher designed materials which were put on the mathematics assessment book according to De Lange. The designed was called prototyping. Each

prototype has to focus on the three main characteristics, namely content, structure, and interface. Content has chapter, subchapter, paragraphs, and etc. Structure has to be making sense and flows, also is built from chapter and subchapter above. Interface consists of visual aspect, for instance pictures, graphs, colors, and etc. It should be interactive and should have additional features and better appearance.

This phase divided into 2 phases, namely:

a. Making a storyboard

Before making the story board, we did the paper based phase. Paper based phase consisted of designing which started form sketches of pictures on paper. This phase was aimed for getting pictures about shapes and what should be appear on macromedia flash. After designing on paper based phase, it was continued on making storyboard. Storyboard is a description of visual and audio of each flow in flowchart. Every column in storyboard represents every slide on monitor. Thus, there were some storyboards.

b. Designing computer-based program

The design started from the book's framework. The design of the materials displayed consisted of learning goals, learning materials, simulations, and evaluation problems. After designing, it yielded some prototypes. The prototyping process in this research study formed from two phases with one cycle namely prototyping. At the end of the research procedures it was held a formative study of evaluation and revision.

3. Prototyping (validating, evaluating, and revising).

In this phase, the product had been evaluated. In the evaluation phase, the product was tried-out. There are 3 groups of the try-out, namely:

Expert review and One-to one.

The result of the design on the prototype which had been developed based on self evaluation was given parallel to the experts, and mathematics teacher at primary school. From the reviews, there were materials to do some revisions. Validation test held was content validation test and construct validation test. Validation test held was based on experts. Experts of materials and media studied the contents, structure, and interface from each prototyping. Their suggestions were used to revise and state that the media was valid and practical. Djaali (2004) confirmed a media has good content validity if it is able to measure the mastering ability of materials which have to be mastered based on learning content stated in KTSP. On the other hand, a media will have good construct validity if it is able to measure what has to be measured based on construct or concept or conceptual definition stated.

MAIN SECTION**Result and Analysis**

A. Data Analysis and Development Result Based on Assessment from Experts and Educators.

1. Instrument

a. Instrument (Observation Sheets) Students' Activities

Table 1. *Assessment Result of Observation Sheets of Students' Activity. (The instrument was assessed by six valuator)*

No	Descriptions	TV	KV	CV	V	SV
1.	The clearness of each indicators			1	5	
2.	The relation between indicators and theories				5	1
3.	The agrrement of indicators and goals				6	
4.	The language used				6	

Information:

TV = Not Valid

KV = Less Valid

CV = Quite Valid

V = Valid

SV = Very Valid

From the Table 1, more than 91,67 % of valuator stated that the instrument for observing students' activities was valid. It means the instrument has already fulfilled one of the requirements which can be used to observe students' activities.

b. Instrument (Observation sheet) teacher's activities in facilitating students

Table 2. *Assessment result of observation sheet of teachers' activities (Instrument was assessed by six valuator)*

No	Descriptions	TV	KV	CV	V	SV
1.	The activity observed			1	5	
2.	The relation of teacher's activities in the classroom			1	5	
3.	The agreement with the goals				6	

According to Table 2, 92,59% of valuator stated that the instrument to observe teacher's activity was valid. It means that this instrument has fulfilled one of the requirements for validation.

The numbers stated on the assessment result Tables shows the number of valuator. Take a look at Table 9 below:

Table 3. *Assessment result of rational aspects of sets*

Aspects	Scores					Scores Means	Conclusions
	0	1	2	3	4		
The characteristic of sets				4	2	3,88	Very clear
Motivation ability				3	3	2,75	High
The benefits for teachers					6	4	Many

Table 3 shows that special characteristic of sets of mathematics assessment books is clear and different from other assessment models. Special characteristic here is started from an assessment process which is served by using scoring rubric in which student learning processes is assessing more in understanding, reasoning, and solving a mathematical problem as daily activities.

Valuators also stated that the set of mathematics assessment book is able to give an assessment amongst aspects which are on the components or book's frameworks as in Table 4 below:

Table 4. *Assessment result of compatibility of any aspects*

Aspects	Scores					Scores Means	Conclusions
	0	1	2	3	4		
Goals and Materials				1	5	3,88	High
Goals and Activities				1	5	3,88	High
Materials and Activities					6	4	High

The assessment results stated on Table 4 shows that there is compatibility of goals, materials, and activities in the sets of mathematics assessment book. The compatibility is high.

Table 5. *Assessment result of language used*

Aspects	Scores					Scores Means	Conclusions
	0	1	2	3	4		
Sentences			2	3	1	3,13	Clear
Difficulty levels			2	4		2,75	Easy

Validation result from Table 5 shows that the language used in the product of mathematics assessment book in primary school is clear and easy to understand. The sentences are clear, but some valuators suggested that the used of the long sentences should be reduced, unless it is need.

Findings

Based on the observation sheets which were validated by six valuators, it can be concluded a product, the mathematics assessment book in primary schools is suitable with the characteristics of assessment books namely measuring the achievement, using evaluation, using instrument of assessment and interactivity.

A link between assessment and teaching learning process matches with 2006 curriculum (*KTSP*). Valuators also suggested that the assessment format has to agree with 2013 curriculum and the development of assessment models.

The other indicator of validation achieved was the language used by the researchers has already based on EYD. The sentences' formulas are communicative and understandable. Those did not give double or wrong interpretations. Nevertheless, some valuators suggested using more effective sentences.

CONCLUSION AND SUGGESTIONS

The conclusion:

The developed model in this research study was valid, practical, and has potential effect to the students learning result in grade four *Marhamah* Primary School, *Padang*.

The suggestions:

1. Since the first to the third grade use a classroom teacher system, it is suggested that the assessment learning models which serve some subjects are able to be designed.
2. Information about the effectiveness of learning assessment books is limited so that there is a chance for other researchers to do research in the effectiveness of learning assessment mathematics books.

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