

# The Practicality of Mathematics Learning Model Based on RME and Literacy in Junior High School

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## ABSTRACT

This study aims to determine the practicality of the Mathematics Learning Model Based on Realistic Mathematics Education and Literacy (MLB-RMEL Model) in facilitating the attainment of mathematics literacy of 8th grade students in junior high school. The study was focused on the field test phase in 3 junior high schools, each representing high, medium, and low school levels. At this stage, a teacher applied the MLB-RMEL Model at each school. The practicality of the MLB-RMEL Model is determined based on the results of the observers' assessment of the implementation of the MLB-RMEL Model in learning, the results of the teacher's assessment of the practicality of the Teacher Book, and the results of students' assessments of the practicality of the Student Book. Data on the practicality of the Teacher Book were obtained from the MLB-RMEL Model Teacher Book Practicality Questionnaire sheets which were filled in by three teachers. Each teacher came from the three schools where the field test was conducted. Data on the practicality of the Student Book were obtained from the MLB-RMEL Model Student Book Practicality Questionnaire sheets which were filled in by 89 students who had taken the field test. Data on the implementation of the PMB-PMRL Model in learning was obtained from the results of observations by observers at each meeting through the Observation Sheets of the Learning Process Implementation of the MLB-RMEL Model. The data obtained were analyzed using descriptive statistical techniques. The results of the analysis of the questionnaire that had been filled in by 3 teachers showed that the practicality value of the MLB-RMEL Model Teacher Book on average was 91.63% in the very practical category. The results of the analysis of the questionnaire that had been filled in by the students showed that the practicality value of the MLB-RMEL Model Student Book was 81.66% in the very practical category. The results of the analysis of the observation sheet that had been filled in by 2 observers showed that the average percentage of the MLB-RMEL Model implementation in the three schools was 84.93% which was in the very good category. Based on these results, it can be concluded that the MLB-RMEL Model fulfills the practical criteria for the three school level categories.

**Keywords:** *Realistic Mathematics Education, Mathematical Literacy.*

## 1. INTRODUCTION

Mathematics is a subject that is very important to be hold by students in school by the reason of its substantial uses in daily life [1]. In addition, mathematics is also a basic science that is indispensable as a foundation for modern technology and knowledge. This is confirmed in the Regulation of Minister of National Education No. 22 of 2006 related to Content Standards for Education in Primary and Secondary level, that mathematics underlies the expansion of technological forward that have significant part in any kind of sciences.

Students' mastery of mathematics is strongly influenced by the quality of mathematics education itself. This is because education is a means of developing human resources [2]. The students' proficiency level of mathematics and the Indonesia education quality can be shown from the Program for International Student Assessment (PISA). The results of international assessments of student attainment are a landmark that indicate the education quality[3]. PISA purposes to evaluate systems of education around the world by examining students' skills and knowledge in reading, science and, mathematics [4].

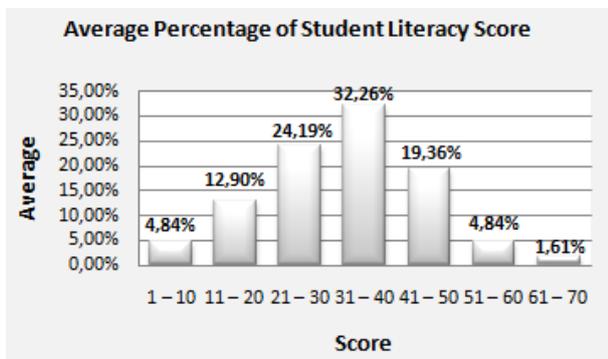
There was no far progressed of Indonesian students in mathematics Literacy since 2000 until 2018 based on the international data below (Table 1).

**Table 1.** Indonesian Student Mathematical Literacy [5]

Year	Indonesia		Number of Participant Countries	International Average Score
	Score	Rank		
2000	367	39	41	500
2003	360	38	40	500
2006	391	50	57	498
2009	371	61	65	496
2012	375	64	65	494
2015	386	63	70	490
2018	379	71	79	494

The results of the PISA assessment indicate that the quality of education in the country, especially mathematics education, is still low compared to other international countries. These results also indicate that after approximately nine years of studying mathematics, Indonesian students have not been able to use the provisions they get at school to solve math problems in everyday life. In addition, students have not been sensitive to mathematical tendency surrounding.

62 ninth graders at SMPN 1 Bukittinggi held Testing of Mathematics literacy on 25<sup>th</sup> and 31<sup>st</sup> August 2016 which the result was the students only answered 36.24% the questions correctly. Average score was 31.87 (Figure 1). From the result, it may be sum up that the the low students' mathematics literacy of SMP 1 Bukittinggi.



**Figure 1** The Ninth Grade Students' Score of Mathematical Literacy in SMPN 1 Bukittinggi

Some elements lead the students' low mathematics literacy are: 1) the low teachers' knowing toward mathematical literacy, 2) the unrelated learning approach toward material with students' circumstance, 3) the unexpected evaluation tool of the mathematical literacy, 4) uncombined approach and concept of realistic mathematics education 5) Unsupported teaching materials to achieve mathematical literacy of the students [6]. According to the results, it is required to extend an MLB-RMEL Model for the reach of mathematical literacy of the students.

## 2. METHODS

### 2.1 Type of Research

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Educational design research with the type of development studies is kind of this research. This is because this study designs and develops an educational intervention as a solution to educational problems [7]. The educational intervention was carried out in the form of an MLB-RMEL Model, as a solution to mathematics education problems, especially the matter of students' low gain in mathematics literacy.

### 2.2 Model Design Research

The development in this study uses the Plomp model which consists of three stages, namely a) preliminary research, b) development or prototyping phase, and c) assessment phase [8]. These three stages of development are described as follows.

Preliminary research aims to elaborate the key matters that underlie the significance of the MLB-RMEL Model. This stage is divided into 3 parts, namely: a) need and context analysis, b) review of the literature and c) development of a conceptual and theoretical framework. The results of this preliminary research analysis become the basis for designing the product to be developed. Development or prototyping aims to design the MLB-RMEL Model product or prototype. Activities at this stage are cyclic, and consist of three steps, namely a) designing a prototype, b) conducting a formative evaluation, and c) revising the prototype. The assessment phase aims to conduct a more in-depth assessment of the revised prototype. At this stage, the assessment is carried out using the summative evaluation to prove the practicality and effectiveness of the product designed through field test activities in large groups.

The discussion in this paper focuses on the practicality of the MLB-RMEL Model on the field test phase. Field tests were conducted on 8th graders in junior high school at three junior high schools, namely SMP Negeri 1 Bukittinggi, SMP Negeri 1 Padang Panjang, and SMP Negeri 7 Bukittinggi, each representing high, medium, and low school levels. In each junior high school, 2 classes were selected. One class is given the MLB-RMEL Model, and one control class is not given the MLB-RMEL Model.

### 2.3 Data, Data Collection Technique, and Instruments

The practicality of the MLB-RMEL Model is determined based on the results of the observers' assessment of the implementation of the MLB-RMEL Model in learning, it was in a good or very good category, the results of the teacher's assessment of the practicality of the Teacher Book, and the results of students' assessments of the practicality of the Student Book meet the practical or very practical category.

Data collection techniques are techniques or methods that can be used to collect data [9]. In this study, the data collection technique used to test the practicality of the MLB-RMEL Model was a questionnaire and observation.

The data collection instrument is a tool used when collecting research data [10]. Data on the practicality of the Teacher Book were obtained from the MLB-RMEL Model Teacher Book Practicality Questionnaire sheets which were filled in by three teachers. Each teacher came from the three schools where the field test was conducted. Data on the practicality of the Student Book were obtained from the MLB-RMEL Model Student Book Practicality Questionnaire sheets which were filled in by 89 students who had taken the field test. Data on the implementation of the MLB-RMEL Model in learning was obtained from the results of observations by observers at each meeting through the Observation Sheets of the Learning Process Implementation of the MLB-RMEL Model.

All instruments before use are validated by experts in order to obtain a valid instrument so that the data obtained from the instrument is also valid. The results of the expert's assessment were analyzed to determine the validity level of the instrument, as well as the consistency and agreement between raters in assessing the instrument. Assessment of the instrument is related to the aspects of instructions, content, and language. The results of the validator's assessment are all instruments used are very valid, have very high reliability, and good ICC (Table 2).

**Table 2.** The results of instrument validation

Instruments	Validity	Reliability	ICC
Teacher Book Practicality Questionnaire sheets	4,2	0,667	0,643
Student Book Practicality Questionnaire sheets	4,27	0,703	0,703
Observation Sheets of the Learning Process Implementation	4,53	0,75	0,771

**2.4 Data Analysis Technique**

The results of the questionnaire sheet for the practicality of MLB-RMEL Model Teacher Book and MLB-RMEL Model Student Book and

observation sheets of the learning process implementation were analyzed using a formula [11].

$$P = \frac{R}{SM} \times 100\% \tag{1}$$

Description:  
 P = value of practicality  
 R = score obtained  
 SM = maximum score

Furthermore, the category of practicality was determined based on the following criteria (Table 3).

**Table 3.** Instrument Validity Criteria

Practical Value (%)	Category
$P < 20$	Not Practical
$20 \leq P < 40$	Less Practical
$40 \leq P < 60$	Pretty Practical
$60 \leq P < 80$	Practical
$P \geq 80$	Very Practical

**3. RESULT AND DISCUSSION**

**3.1 The Practicality of Teacher Book**

The results of the analysis of the questionnaire that had been filled in by 3 teachers obtained the practicality value of the Teacher Book on an average of 4.58 or 91.63%. These results indicate that the MLB-RMEL Model Teacher Book developed meets the very practical category (Table 4).

Thus it can be concluded that users feel the MLB-RMEL Model Teacher Book has ease of use. This means that the developed teacher's book is in accordance with practical aspects. The very practical criteria also indicate that a) the teacher can carry out the activities listed in the learning syntax and b) the teacher can manage to learn and carry out its role properly.

**Table 4.** The practicality of teacher book

No	Aspect	Rating	Average	Percentage	Category
1	Instructions	4.67	93.33	Very practical	
2	Learning objective	4.58	91.67	Very practical	
3	Syntax	4.67	93.33	Very practical	
4	Teaching material	4.67	93.33	Very practical	
5	Worksheet	4.43	90.00	Very practical	
6	Language	4.56	91.07	Very practical	
7	Display	4.33	88.87	Very practical	
8	Benefits	4.67	93.33	Very practical	
Average		4.58	91.63		

Graphically, the average percentage of practicality for the MLB-RMEL Teacher Book Model is shown in the following figure.

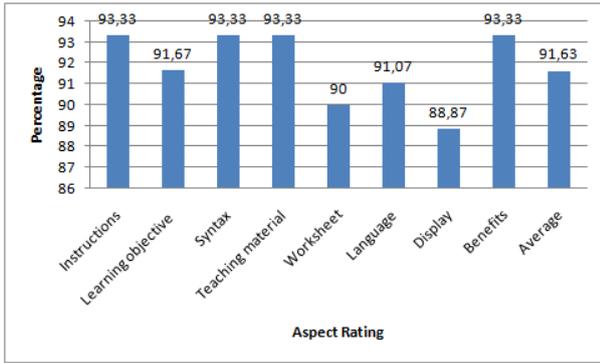


Figure 2. Graph of the Practicality of Teacher Book

### 3.2 The practicality of Student Book

Data on the practicality of the Student Book was obtained from the MLB-RMEL Student Book Practicality Questionnaire sheet which was filled in by students who had taken the field test, namely 29 students of Class VIII.G SMPN 1 Bukittinggi, 31 students of Class VIII.B SMPN 1 Padang Panjang, and 29 students Class VIII.2 SMPN 7 Bukittinggi. The results of the analysis of the questionnaire that the students had filled in the practicality score of the PMB-PMRL Model Student Book averaged 4.08 or 81.66% (Table 5). These results indicate that the MLB-RMEL Model Student Book developed meets the very practical category, and can be used in high, medium, and low-level schools.

Table 4. The practicality of teacher book

No	Aspect Rating	Average	Percentage	Category
1	Instructions	3.88	77.67	Practical
2	Learning objective	4.03	80.53	Very practical
3	Syntax	4.03	80.33	Very practical
4	Teaching material	4.08	81.60	Very practical
5	Worksheet	4.08	81.67	Very practical
6	Language	4.01	80.27	Very practical
7	Display	4.37	87.27	Very practical
8	Benefits	4.08	81.66	Very practical
Average		4.08	81.66	

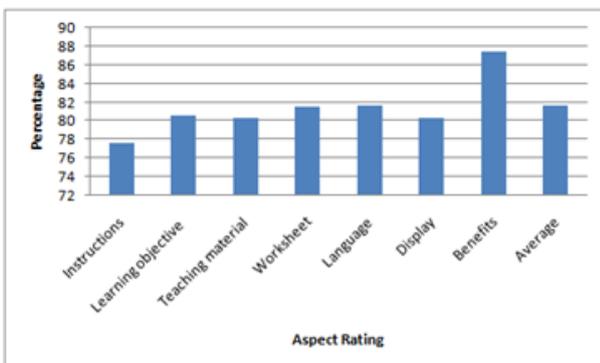


Figure 3. Graph of the Practicality of Student Book

These results indicate that the MLB-RMEL Model Student Book developed meets the very practical category, and can be used in high, medium, and low-level schools.

### 3.3 Implementation of the MLB-RMEL Model

Furthermore, the data on the implementation of the MLB-RMEL Model in learning was obtained from the results of observations by observers at each meeting through the MLB-RMEL Learning Process Implementation Observation Sheet. The results of the analysis of the observation sheets that have been filled in by 2 observers, obtained the average rating for the three aspects of each school in 5 meetings shown in the following table.

Table 5. Implementation of the PMB-PMRL Model

Aspect Rating	SMPN 1 Bukittingg (%)	SMPN 1 Padang Panjang (%)	SMPN 7 Bukittingg (%)	Average
Syntax	85,11	86,22	85,78	85,7
Social System	83,25	84,25	83,75	83,75
Principle of Rection	84,89	85,78	85,33	85,33
Total	253,25	256,25	254,95	245,8
Average	84,42	85,42	84,95	84,93
Category	Very Good	Very Good	Very Good	Very Good

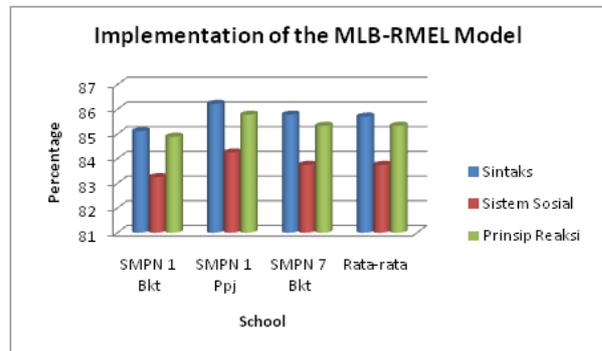


Figure 4. Graph of Implementation of the PMB-PMRL Model

Based on the table and graph above, it can be seen that the average implementation of the MLB-RMEL Model in each school is above 80% in the very good category. This shows that the MLB-RMEL Model can be applied to high, medium, and low-level schools.

### 4. CONCLUSION

The results of the analysis of the questionnaire that had been filled in by 3 teachers showed that the practicality value of the MLB-RMEL Model Teacher Book on average was 91.63% in the very practical category. The results of the analysis of the questionnaire that had been filled in by the 89 students showed that the practicality value of the MLB-RMEL Model Student Book was 81.66% in the very practical category. The results of the analysis of the observation sheet that had been filled in by 2 observers showed that the average percentage of the MLB-RMEL Model implementation in the three schools was 84.93% which was in the very

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