Development of M-Learning Media With Indonesian Realistic Mathematics Education's Approach

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Abstract

This study aimed to develop a valid and practical M-learning based learning media using an approach of Indonesian Realistic Mathematics Education (PMRI). The study adopted Tessmer's Development Research. The study produced an M-learning medium being able to lead students to go through the learning process based on the characteristics of PMRI, starting learning from the problem, actively participating in learning through learning stages and being able to project mathematics learning with other learning.

Keywords: M-Learning, PMRI, Development

1. Introduction

The development of the curriculum occurred in Indonesia to date, applying the 2013 curriculum. The learning concept of the 2013 Curriculum refers to PISA by applying innovative learning, creative innovation, critical thinking to solve problems, communication, and collaboration [1]–[4]. Based on the above reference to developing students' knowledge and skills in mathematics, one needs an ability to identify, understand, and process information to further make the right decision in solving problems [5]–[9]. Realistic Mathematics Education (RME), the starting point for the development of mathematical ideas and concepts with the real world. The real world is lessons outside mathematics, as well as everyday life objects of the learner [10]–[13].

In terms of the concept, RME, PISA, and Curriculum 2013 are very visible to be able to run in one strand of the learning process. In the current technological era, the need to integrate mathematical literacy movement with technology-based media; therefore, the writer wanted to do the study on M

Learning-based RME learning media. Mathematics learning using the RME approach consists of the following aspects [14]:
- Learning begins by asking real problems to students.
- Problems certainly have relevance in learning objectives
- Then the students create symbolic models of the raised problems
- The created learning is the interactive learning

The characteristics of PMRI include using Context in exploration, using a model as a bridge from mathematical knowledge, using students' creations and contributions, using the principle of interactivity, using linkages with other knowledge, using the Indonesian natural and cultural characteristics [15].

Advances in technology have an impact on learning practices [16]–[18]. Lately, there has been the development of mobile technology in school learning. Mobile learning (m-learning) is learning that utilizes smartphone and tablet technology [19], [20]. We know that humans are inseparable from today's smartphones. Students cannot be separated from smartphones. The feeling familiarity with the device could have contributed to their high mobile phone self-efficacy

[21]. It is inevitable that smartphones also have a negative impact [22]. As a teacher, of course, we must take the positive side of smartphones as learning media. Mathematics is not separated from the context of life. Realistic mathematics brings the context of real-life problems in learning mathematics [23], [24]. The success of teaching with realistic mathematics has been demonstrated [10], [11]. Need for the development of realistic mathematics learning with mobile learning technology. Besides being meaningful students will feel happy because they can use a smartphone while studying. This study used the development research method, which developing M-Learning with PMRI approach for junior high school students on the subject of Number Patterns.

2. Method of Development

The general question in this study was: How a valid and practical M-Learning with PMRI approach on the subject of Number Patterns. For the specific question, the formulation of the problem was what characteristics of a valid and practical M-Learning medium were using the PMRI approach on the subject of number patterns. The study was conducted in two stages, as follows:

a. Preliminary
- Literature study on the development of M-Learning using RME approach and learning Material of Number Patterns
- Preparing the learning Material of Number Patterns to be used as contents on M-Learning
- Preparing all the requirements for designing M-Learning, such as Templates, features, video clips, problem-solving questions supporting the material as the first Survey.
- Preparation
- The Research Subjects, namely Junior High School Students, as a sample to be selected.

b. Prototyping
The researcher created and designed M-Learning using the RME approach with the Learning Management System (from now on abbreviated as LMS), converted to a Mobile view with interesting contents fitting in RME characteristics.

To be more communicative, the researcher planned to insert chat features, social media walls, video conferences so that students could share their experiences and with the teacher directly outside the regular teaching and learning hours in the classroom. The resulting project was called Prototype I.

c. Expert Test
The experts' validity for Prototype I are content suitability, content, layout, the support provided, interactivity, material clarity. Hoping that the users of M-Learning with the RME approach using the LMS) would not have difficulties in learning the provided material and get comfortable.

Fig. 1. Screenshot's Initial Application

d. Small-Group
The suggestions and results of the expert validation and the results of the One to One trial were the basis for revising the Prototype I. The revision result was named Prototype II.

e. Revision
The revision required for Prototype II and the result was named Prototype III

f. Field test
At this stage, the Prototype III was uploaded on the internet and tested on a large group or class to find out the potential effect of using Prototype III. Students fill the activity analysis and questionnaires.

3. Result and Discussion

Fig. 2. Capture Clip Video

This study began with a preliminary study as follows 1) Surveying the schools to be selected as the object of research and discussing the subject. The analysis and discussion resulted in the chosen material to be the number of patterns as objects of the study. There were three selected junior high schools, SMP Negeri 27 Palembang, SMP Negeri 6 Palembang, and SMP Negeri 1 Palembang considering that the researcher got permission to use mobile phones and media as research aids. Most of the junior high schools in Palembang strictly prohibit their students from using cellphones and smartphones at schools. 2) The literature study which supports the development of M-Learning media, PMRI Approach, Principal Material of Number Patterns. Making of video clips for content were intended as a means to start learning by PMRI characteristics that began the learning with a contextual activity and problem (fig. 2).

The results of the validation derived from the expert indicated there was no comment for the revisions. The principle of mathematical interlace as relations with problems given, such as the discussion of the number of leaves in one stalk. In-plant morphology, there are two types of leaves on the stalk, namely stems with odd and leafy leaves with their respective characteristics. It shows that this learning is associated with biology subject. Given the group and chat features, students could collaborate in communication to discuss the learning even though they were far away at home. Students have the opportunity to rediscover the problem in order to find the mathematical concept of the problem. Students are interested in the media (fig. 3).

Fig. 3. Resolving problems without using formulas

However, some students got confused because the provided command buttons were not visible; there was only a command test button. They thought the M-Learning was a test application. The students seemed very enthusiastic about the application presentation starting with the problem, which was a characteristic of PMRI. In line with previous findings, Mobile learning gives students a positive learning experience and has an impact on learning motivation [25]. Even when they got home, they tried to use this application again with high curiosity. The following are the WhatsApp chats sent by the students to the researcher. At this stage, the researcher conducted the study in SMP Negeri 1 Palembang. The sample to be taken was one full class. The researcher did not get permission from the school for the students to use their smartphones, like in most public junior high schools in Palembang. However, SMP Negeri 1 allowed the researcher to use computers and school internet networks in the computer laboratory. At this stage, the use of mobile replaces to desktop computers.

After trying out the media, the researcher distributed the questionnaires to the students. Here are some sample comments from them:

The results of the questionnaire responses of students to the media are as table 1:

Table.1 Results of the questionnaire responses of student

No	Statement	Positive Response in percentage	Negative Response in percentage
1.	Problems with the applications motivated to learn	98%	2%
2.	Suitability of the problems with daily life	100%	0
3.	Do not feel like studying mathematics	85%	15%
4.	The relationship of the problem with other subjects	98%	2%
5.	The desire to discuss	98%	2%
6.	Criticism and suggestions	95%	5%

We can conclude that the use of M-Learning media has met the level of practicality in use due to the given simple button according to the function and benefits.

4. Conclusion

M-Learning with the PMRI approach is valid, ease of use of several trials to students. Teachers can apply the M-Learning supporting the learning outside the classroom to help provide convenience in the teaching and learning process. Student activities that can't be separated with a smartphone provide motivation for teachers to use this technology in learning. The challenge for teachers in this development is that most schools in Indonesia still restrict access to smartphone use in learning.

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