

The Development of Blended Learning Media in Math Learning of Senior High School

^{1*}Juanda BJ, ²Cut Morina Zubainur and ³Taufik Fuadi Abidin

¹Department of Mathematics Education, Master of Mathematics Education, University of Syiah Kuala, Banda Aceh 23111, Indonesia

²Department of Mathematics Education, Faculty of Teacher Training and Education, University of Syiah Kuala, Banda Aceh 23111, Indonesia

³Department of Technical Information, Faculty of Mathematics and Science, University of Syiah Kuala, Banda Aceh 23111, Indonesia

*Corresponding author: juandabj@unsyiah.ac.id

Abstract

This research aims to develop Blended Learning media which is built using Moodle base in such a way as to simplify the process of use in high school math learning by using Research and Development (R & D) research type. The development method used a model designed by Plomp with three stages of research: 1) Preliminary Research, 2) Prototype Phase, and 3) Assessment Phase. Determination of valid and practical Blended Learning media was based on the validation test of the experts and users of teachers and students through a questionnaire. Subjects in this research were selected using purposive sampling technique, who were Mathematics Teachers at Madrasah Aliyah Negeri Model Banda Aceh School. Besides the teachers, this research also used tools such as smartphones and laptops. The research instrument consists of two instruments. Individual instruments were used to measure the criteria of validity and practicality. The validity criterion was obtained through the blended learning media validation sheet, while the practicality criteria were obtained through a response questionnaire. The results of this study showed that the acquisition of this research development is as follows: 1) The validity of Blended Learning Media is stated very valid, and 2) Practicalities Blended Learning Media based on user responses, including teacher and student, were expressed very practically. Based on the findings, it can be concluded that Media Blended Learning is very valid and very practical.

Keywords: blended learning, media, Moodle, mathematics.

Introduction

Undang-Undang Republik Indonesia Nomor 20 Tahun 2003 (SISDIKNAS Act, 2003) mentioned that distance education is education that learners apart from educators and learning using various sources of learning through communication technology, information, and other media. Distance learning and classroom learning (face-to-face) can be incorporated into specific methods. Watson (Kaur, 2013) explains that blended learning is a combination of face-to-face learning and distance learning. So blended learning is to combine offline learning (face-to-face) and online learning (e-learning), combining structured and unstructured learning. Based on the issues and trends of the world of blended learning education is very promising for improving the quality of the learning system, as published by the scientific journal publication site partner of Syiah Kuala University that is Science Direct which has published more than 1800

journals related to blended learning in 2016 and increased rapidly to 2283 journals in 2018, at this time there are many learning media that have been created to help the learning process becomes more structured so that learning becomes directed and flexible due to facilities that enable educators and learners to communicate in classroom meetings and apart distance, namely Moodle, one of the most popular in various countries, but the operation that is not simply makes it difficult for laypeople, most of the moodle users come from universities including Indonesia including the Bandung Institute of Technology (ITB) with Blended Learning and Syiah Kuala University (Unsyiah) by E-Learning.

To realize an ideal media, it must consider the availability of assessment reporting facilities that play an important role as a result of learning, and it certainly requires the commitment of educators to input the value of students continuously then the assessment of the assessment should be carried out continuously. *Peraturan Pemerintah No. 66 Tahun 2013* about the Education Assessment Standard (*Permendikbud, 2013*), mentions assessment of learning outcomes by educators conducted on an ongoing basis aims to monitor the process and progress learners learn and to improve the effectiveness of learning. Teachers in Indonesia have conducted the assessment process by the Government Regulation. However, to simplify the process of input and value, also to manage the assessment data, both researchers offer learning media using moodle developed to facilitate the management of blended learning system (called blended learning media). It hopes to help teachers so that the process and inform the value becomes faster.

Moodle (short for Modular Object-Oriented Dynamic Learning Environment) is a very commonly used tool known for its electronic learning concept or e-learning and is very popular and well-tested in handling distance learning process. Utilizing the Moodle source code that will be developed in the hope of facilitating the teacher in identifying the students, whether regarding the assignment, instruction, reading material, temporary ranking to the interactive and informative awarding using quick and easy data input method. The media use mobile devices such as smartphones and laptops as a recommended device to access *blended learning* media through the internet. The camera feature on the smartphone is also used as a support for capturing certain patterns as inputs to the learning media in the hope of being more flexible and allowing the assessment process to occur immediately during the teaching and learning process to bring practicality to every teacher in the process.

Literature Review

Blended learning is an advanced Learning Management System from e-learning method that is a learning method that combines e-learning system with the face-to-face method. Blended learning departs from the advantages found in the traditional way of learning so that blended learning aims to combine face-to-face learning with e-learning in a homogeneous or heterogeneous manner. Prabowo (2014) states that blend learning done face-to-face in the classroom allows teachers to assess students 'affective competencies, transfer values, and monitor students' moral growth. On the other hand e-learning, interactive will facilitate learners during the learning process so that the benefits of learning can be achieved optimally. Blended learning media in question is a medium that facilitates teachers in applying mathematics learning that will utilize online server through website address <https://b-learning.id> so it can be accessed from anywhere and anytime.

Using the online container of the website leads to the learning media having the advantage of making it accessible to a wide range of devices that have internet channels and web browsers, including PCs, laptops, smartphones, and many other devices. Blended learning media is also developed in android versions that can be installed on mobile devices with the Android operating system to add to the list of

options that can be used by teachers and learners. Therefore, of course, regarding ease of access to learning media can be relied upon.

Research Methods

This type of development research was the type of research that was most appropriate for me to use in this study. It was reinforced by Arifin (2012) who argued that "Development research is the best strategy for developing and validating educational products." This research was development research that aimed to develop blended learning media.

The test subjects in this development research were math teachers and learners at Madrasah Aliyah Negeri Model Banda Aceh. Teachers and learners were purposive randomly selected to whom own tools such as smartphones and laptops. The Banda Aceh Model Madrasah Aliyah School was chosen because it has the availability of internet facilities (school Wi-Fi hotspots) in several corners of the school to facilitate the research process.

In the preliminary phase of this research, the needs and context analysis, literature review, developing a conceptual and theoretical framework for research had been defined. An important element of that phase was gathering information and analyzing as well as defining problems and further plans of the project to be continued. Activities in this phase were related to blended learning media in the learning process including (1) Needs analysis that was aimed to find out the problems encountered in learning mathematics; (2) Material analysis that was aimed to determine the materials in research based on *core competence* (KI) and *basic competence* (KD) of curriculum 2013; and (3) Analysis of existing media that was aimed to obtain input, improvement, or addition which is needed to overcome the weaknesses of existing media. The result of this phase was the problem of blended learning media development in learning mathematics. Thus this result input was inserted into the phase of prototyping.

The next stage was the Prototype stage (prototyping stage), which was done in the cyclical and sequential design process in the form of micro-process research and used formative evaluation to improve the intervention model. Of course, the design of blended learning media in the learning of mathematics is done until the design produced by the reality is being implemented. The last stage was the Assessment phase to conclude whether the solution or intervention was done by the desired. This stage is initiated by the activity of validating blended learning media. Blended learning media validation result data were analyzed and used to revise the prototyping stage.

Furthermore, this phase was also to know the practicality of learning media developed. The practicality of instructional media can be measured using user questionnaires (teachers and learners). Product trials were intended to collect data or information that can be used as a basis for determining whether a product was developed in quality (validity and practicality).

Data analysis technique was aimed to produce quality blended learning media with criteria of validity and practicality. The data in this research was the data about the validation by doing the average calculation and inter-rater test — the following table validity and blended learning media in Table 1.

Table 1. Validity media blended learning interval

Score Interval	Criteria
$\bar{x} > 4.20$	Very good
$3.4 < \bar{x} \leq 4,20$	Good
$2.6 < \bar{x} \leq 3,4$	Enough
$1.8 < \bar{x} \leq 2,6$	Less
$\bar{x} \leq 1,8$	Very less

(Widoyoko, 2009)

Based on the calculation of the table criteria and validity of blended learning media, if the result of the validator's assessment earned an average score, then the blended learning media is said to be valid.

Inter-rater tests were performed to strengthen validation data analysis. The formula used was the formula *Cohen Kappa* as follows:

$$KK = \frac{P_o - P_e}{1 - P_e}$$

Information:

KK = Coefficient of observation agreement

P_o = Proportion of agreement frequency

P_e = Possible agreement (*change agreement*) / matching opportunities between observers

Where,

$$Pe = \frac{1}{N^2} \sum (n_{i+})(n_{+i})$$

(Arikunto, 2010)

Information:

N = Total number of fingers indicating the appearance of observed symptoms

$\sum n_{i+}$ = Number of first-fifth category radius for first observers

$\sum n_{+i}$ = Number of the radius of category 1 for the second observer

Criteria for assessment of *kappa* according to Murti (1997) as follows:

KK < 0.4 : bad category

$0.4 \leq KK \leq 0.75$: well category

KK > 0.75 : excellent category

Blended learning media can be said to be valid if it obtains a minimum of media validity of 3 and a minimum *kappa* value of 0.4. If not by the provisions of the media blended learning should be revised again.

Practicality analysis was done by spreading the questionnaire. Questionnaires spread used Likert scale, with intervals of one to five. The respondent's responses in the form of the Likert scale was converted to a ratio scale. The conversion results multiplied by 2.5 to get Usability. Here's the explanation:

$$V_{sus} = (N_1 + N_2 + \dots + N_{10}) \times 2.5$$

(Brooke, 1996)

Information:

V_{sus} = Usability of the Product

$N_1 + N_2 + \dots + N_{10}$ = Score statement number 1 - 10

The results obtained from the calculations are then compared with the assessment criteria in Table 2.

Table 2. Criteria of usability assessment results

Assessment Range	Qualification
$V_{sus} > 85.00$	Very good
$73.50 < V_{sus} \leq 85.00$	Good
$52.50 < V_{sus} \leq 73.50$	Enough
$38.00 < V_{sus} \leq 52.50$	Bad
$25.00 < V_{sus} \leq 38.00$	Very bad
$V_{sus} \leq 25.00$	Too Bad

(Bangor, Kortum, & Miller, 2009)

Results and Discussion

The result of this research was that the blended learning media which contains facility of online service could be accessed by the mobile device, laptop, or smartphone for some features such as digital absence, reading material, independent task, group assignment, assessment, and reward. The process of developing blended learning media follows the Plomp model through the preliminary research stage, the prototyping phase, and the assessment phase.

Learning media was developed by using the source code Moodle with large modifications to provide ease and simplicity in operation, such as data entry and to see the resulting information. The learning media uses the main logo as in Figure 1.



Figure 1. Media logo blended learning

Assessment of the quality of blended learning media applications obtained through a sheet of validation of media experts and material experts. Furthermore, the interrater test was conducted to see the agreement between validator. The result of the validation of media experts and material experts was that the blended learning media in high school math learning is very valid and very practical.

Conclusions

Based on the formulation of the problem in this research, the following conclusions are obtained: a) the process of developing blended learning media with the development model of Plomp is through preliminary research stage, prototyping phase, and assessment phase, b) the development of blended learning media in learning mathematics has a good quality visible from the validator assessment analysis that shows that validation is on valid criteria and agreement between validator obtained from the interrater test. Practical media is seen from the results of trials that have good quality.

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