



The Development of a Blended Learning Model Based on a Learning Management System

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Abstract. This study aims to develop, determine the feasibility and effectiveness of a blended learning model based on the Learning Management System (LMS) in the course of Curriculum Development in Learning at Educational Technology Study Program Postgraduate School of Ibn Khaldun University Bogor. The method is Research and Development (R & D). The sample in this study consisted of 17 third-semester students. Data analysis in the study used qualitative and quantitative descriptive analysis. The qualitative data were taken through observation of the learning environment and interviews. The quantitative data were taken through the validation test of instructional media experts, learning design experts, small group tests, and large group tests. The results showed an achievement level of 93.47% for small group tests, 95.81% for large group tests, 79.23% for learning media expert validation, and 80% for learning design expert validation. The comparative analysis of the post and pre-test mean obtained the t value of 4.279 which is greater than the t table value of 2.119. It indicates there is a significant difference in the mean of the post and pre-test scores with the average post-test being higher than the pre-test. Conclusions: the model is very feasible to be used in learning and effective for improving student learning outcomes.

Keywords: Blended Learning · Learning Management System · LMS

1 Introduction

Education as one of the important areas in life is expected to be able to adjust to technological advances and the changing needs of the industrial world which expects human resources with HOTS (Higher Order Thinking Skills) thinking skills, namely inquiry skills, data processing skills, and additional critical thinking skills (Arief 2016). Several things that encourage the achievement of these goals are the change in the educational approach from teacher-centered learning to student-centered learning and the use of technology-based learning media.

In the student-centered learning approach, students are expected to be able to build and construct new knowledge by themselves through the process of synthesizing old and new knowledge and experiences so that ultimately increasing the achievement of cognitive, affective, and psychomotor learning objectives (Suparman 2012).

In the field of technology, currently have also been developed many technology-based learning facilities and media to help students improve their learning outcomes, including computer-based learning, web-based learning (e-learning), computer-assisted learning, and the application of blended learning models that combine online learning and face-to-face learning (Rusman et al. 2013).

The Educational Technology Study Program Postgraduate School of Ibn Khaldun University Bogor, as a higher education institution that has a vision of becoming a center for scientific studies and educational technology products with an Islamic and integral approach based on technology in 2025, always strives to provide the best academic learning environment by continuously adapting to changing needs of the world of education.

With the characteristics of students who are all in the productive age range (25–50 years), predominant work as teachers, principals, and school supervisors, accustomed to using digital media and internet connections for daily study and work, already know about blended learning and have used an online learning system, hence encouraging the need to develop blended learning that combines online learning based on Learning Management System (LMS) with face-to-face learning that currently does not exist.

In this blended learning, students will follow the learning process according to the Learning Implementation Plan that has been made by the educator in a sequence starting with online learning through the LMS then followed by face-to-face class meetings with the educators.

2 Method

This study aims to develop, determine the feasibility and effectiveness of the blended learning model that will be used in the learning process at Educational Technology Study Program Postgraduate School of Ibn Khaldun University Bogor by taking the example application in the course of curriculum development in learning. The research was carried out throughout the odd semester of the 2019/2020 academic year, which is between December 2019 and February 2020.

2.1 Development Model

This study uses a combined method of Borg & Gall's research and development model and the Dick and Carey learning design model. These two models are combined and adapted to produce a development model that suits the research needs and conditions. The steps are preliminary study, planning, model design to develop a draft 1 model, one-to-one test to produce a draft 2 model, small groups test to produce a draft 3 model, and finally a large group test to produce a final model that suitable for use in learning.

2.2 Feasibility Test

To assess the feasibility of the model using a Likert scale for expert validation questionnaires and the Guttman scale for small and large group test questionnaires. Likert scale and Guttman scale (Sugiyono 2017).

After the percentage score is found, then determine the criteria for the level of achievement by looking at the following Table 1 (Arikunto 1997).

Table 1. Level of Achievement criteria

Level of Achievement	Description
81–100%	Very Feasible, No need for revision
61–80%	Feasible, No need for revision
41–60%	Less Feasible, needs for revision
21–40%	Not Feasible, need for revision
<20%	Very Not Feasible, need for revision

2.3 Effectiveness Test

To assess the effectiveness of the learning model that has been created, it is carried out by conducting tests before the implementation of the blended learning process (pre-test) and after (post-test) in the same group of the respondent. The pre-test and post-test instruments were made with the same questions, the types of multiple-choice questions and the total were 10 items that previously tested for content validity, item validity, and instrument reliability.

The instrument validity test is used to assess whether the instrument measures exactly what it wants to measure (Sukardi 2015). The content validity test assesses that if the items of the instrument cover all the variables to be measured, then the instrument in terms of content can be declared valid (Sugiyono 2017). The item's validity test of the instrument is to see the alignment or correlation between the item scores and the total score using the product-moment correlation formula (Widoyoko 2010).

Then compare the correlation coefficient value of rxy with rxy criticism for the validity of the instrument item which is 0.3, with the interpretation: if rxy count > 0.3 means the item is said to be valid (Widoyoko 2010).

The reliability test is carried out to assess the persistence (consistency) if the test is carried out repeatedly. This study assesses internal reliability by analyzing data from one data collection. The reliability test carried out was using the Spearman-Brown formula (Widoyoko 2010).

The reliability index (r count) obtained is then compared with the value of the r product moment table with the same number of N at the 5% significance level. If the r count is greater or equal to the r table, it is said that there is a significant correlation and the instrument is considered reliable.

The next step taken was to test the significance of the difference in the mean value of the pre-test and post-test using the t-test. Previously, the normality test was conducted using the Liliefors test (Supardi 2013). Due to data analysis from the same sample group, the t-test used is the paired sample t-test (Supardi 2013). The test steps are to determine the hypothesis $H_0 = \mu_1 \leq u_2$ and $H_1 = \mu_1 > u_2$ with μ_1 is the average post-test and u_2 is the average pre-test.

Then determine the t table value with a significance level of $\alpha = 0.05$ for $DF = n - 1 = 16$ and after that check it to the test criteria. The interpretation: if H_0 is rejected then there is a significant difference between the average value after treatment and before treatment where the average value after treatment is higher than before treatment.

3 Result and Discussion

3.1 The Model Framework

The scheme of learning activities made in the blended learning model follows the Online - In Class (On-In) scheme and its implementation is following the learning implementation plan for each material topic. The activity begins with taking online learning through the LMS and continues with face-to-face activities in class 2 weeks after that.

The topic of the material used as an example is curriculum design and ICT-based learning (blended learning), which is one of 14 topics in the course of curriculum development in learning, the learning process is carried out by team teaching in the 3rd semester of lectures in the Educational Technology Study Program Postgraduate School of Ibn Khaldun University Bogor.

During the online learning period through the LMS, students can view the schedule of activities, follow scenarios of learning activities by studying material, do pre-tests and self-assessment tests that have been prerequisite in the syllabus menu, work on and collect assignments given, participate in online discussions, online chat and video conference and see the progress of the learning process through the Progress menu in the system.

In the online learning process, educators can correct and assess student assignments and see the learning progress of each student in detail through the Reporting menu. In this menu, educators can see the progress of learning and student scores in following the learning scenario in the syllabus, progress on assignments, and the level of participation in discussion forums.

All results of assessments in online and face-to-face learning activities are collected in the Gradebook menu. Educators can determine the value components and the weight of each component in this valuable book, as well as determine whether the value will be entered manually or automatically by the system. In the model in this study, the components of assessment and weight were 10% attendance, 20% assignment, 20% participation, and 50% post-test.

After 2 weeks of implementing online learning through LMS, the activity was continued with face-to-face learning in the form of discussions on topics that had been studied through previous online learning. In this activity, educators will absent student attendance and carry out post-tests through the LMS.

3.2 Preliminary Study Results

To get an overview of the characteristics of the respondents and the analysis of their needs, a questionnaire was given to respondents with the results:

- a. The development of an online learning system and a blended learning model is needed by the Educational Technology Study Program Postgraduate School of Ibn Khaldun University Bogor, supported by all respondents who have digital media and internet connection and are accustomed to using the internet for daily activities including for studying. Almost all respondents are still in their productive age, work as teachers, already know, have used, and need online learning systems and blended learning.

- b. The online learning system needed is characterized by quick accessible, user-friendly, and easy to use and complete with features or menus to support the learning process.

3.3 Model Development Results

3.3.1 Draft 1 Model

The online learning system is created using Chamilo's Learning Management System (LMS) which is installed on Cloud Hosting with the location of Datacenter Jakarta. The following is the LMS package and its support system are the domain for LMS is tpuikabogor.net with an email address tpuikabogor@gmail.com and equipped with cloud storage on google drive (drive.google.com) and Youtube channel with the name TPUIKA Bogor. And for the LMS, the designs are the header color is green with the UIKA Bogor logo is installed on the upper left side, there are two language option Indonesian and English, a welcome note on the front page of the LMS, creating several courses which grouped into one semester, the subject used as an example is the topic of curriculum design material and ICT-based learning (Blended Learning) in the course of curriculum development in learning, the tools menu used are the course explanation, syllabus, exams, discussion forums, online chat, assignments, grade books, video conferences.

3.3.2 Draft 2 Model

In this model there are improvements by providing the tutorial video on how to use the system, the material is in PDF form and is made into 4 sub-materials and included in the prerequisite sequence of learning scenarios, self-assessment test in each sub material, discussion room in the discussion forum menu, assignments examples, online chat feature, grade book menu with components of assignment scores, discussion participation, face-to-face attendance in class and post-test.

With this draft 2 model, the small group test was carried out with 6 respondents taken randomly from the sample, using a questionnaire and testing the test instrument, validation of instructional media, and design experts using a questionnaire. And the results obtained will be used to test the feasibility of the model. The test results of the test instruments will be tested with the item validity and the reliability of the instruments. While the advice is given to add the learning video, make question packages, material summaries, printed manuals on how to use the system, and learning.

3.3.3 Draft 3 Model

Complementing the lack of features in the draft 2 model by providing video conference features, learning videos material, question packages, material summary, and blended learning manual book for lecturers and students. The next stage is a large group test with 17 respondents from third-semester students with questionnaire, pre-test, and post-test to test the effectiveness of the model. And the results obtained will be used to test the feasibility of the model and the results of the pre-test and post-test will be used to test the effectiveness of the model.

3.3.4 Final Model

This model has been equipped with all the features, learning scenarios, and learning materials from the previous draft models by increasing the font size in the navigation menu.

3.4 Feasibility Test Results

The following is a table of the overall results of the small and large group test analysis (Table 2).

All aspects have a score above 80, which means that based on the assessment of small and large groups the level of achievement of the model is very feasible and does not need revision.

And the following are the results of the instructional media experts validation (Table 3).

The performance, usability, and technical aspects have a score of 80 or an achievement level of 80% which means the system is feasible and does not need revision. The learning aspect has a score of 76.92 or an achievement level of 76.92% which means the system is feasible and does not need revision. Overall the level of achievement is 79.23% which means that the model is feasible and does not need revision.

Next are the results of the instructional design expert's validation (Table 4).

Table 2. The scores of small and large group test analysis

Groups	Aspects	Score
Small	Display	93.33
	Usability	100.00
	Technical	94.44
	Learning	86.11
Large	Display	90.59
	Usability	98.53
	Technical	96.08
	Learning	98.04

Table 3. The scores of instructional media experts validation

Aspects	Score
Display	80.00
Usability	80.00
Technical	80.00
Learning	76.92

Table 4. The scores of instructional design expert's validation

Aspects	Score
Usability	80.00
Learning	80.00

The usability and learning aspects have a score of 80 which means that the level of achievement of the model is feasible and does not need revision.

3.5 Effectiveness Test Results

The effectiveness test begins with the content and item validity test and the instrument reliability test. For items, a grid is made regarding the learning objectives of the material topic. After calculating all the items, the results show that all items have a correlation coefficient of r_{xy} greater than r criticism of 0.3 so that it can be concluded that all items are valid.

To test the reliability, the results obtained r count 0.910, and the value of r table for the number of respondents (N) 6 with a significance level of 5% is 0.811. This means that r count $>$ r table ($0.910 > 0.811$). So it can be concluded that there is a significant correlation and the instruments are reliable. So seeing that all the items are valid and the instruments are reliable, it can be concluded that the test instrument can be used for the implementation of pre-test and post-test.

The next step was to test the significance of the difference in the pre-test and post-test values using the paired-sample t -test with the normality test previously carried out as a prerequisite for analysis. Normality Test.

Testing for normality uses the Lilliefors test by determining the hypothesis $H_0 =$ data is normally distributed and $H_1 =$ data is not normally distributed. Then do the calculation of the value of L count and determine the value of L table from the table of critical values for the Lilliefors test with a significance level of $\alpha = 0.05$ for $n = 17$ is 0.215. The test criterion for this test is to reject H_0 if L count $>$ L table. From the calculation results, it is obtained that the value of L count for pre-test and post-test is 0.156 and 0.153, which means that both are smaller than L table = 0.215, then H_0 is accepted at the significance level $\alpha = 0.05$. So it can be concluded that the pre-test and post-test values are data that are normally distributed.

3.6 Average Comparison Test

Testing using the t -test. Because the value data came from the same group with 2 different treatments or measurements (pre-test and post-test), the t -test used was the paired sample t -test. The test steps are to determine the hypothesis $H_0 = \mu_1 \leq \mu_2$ and $H_1 = \mu_1 > \mu_2$ with μ_1 is the average post-test and μ_2 is the average pre-test and then entering the pre and post-test values in the table.

The test criterion is to reject the H_0 if the t count greater than the t table. The t table value at $\alpha = 0.05$ and $DF (n - 1) = 16$ is 2.1199. The results of the t -test calculation or the

Table 5. Pre-test and post-test paired sample t-test

Pre-test	Post-test	Difference (d _i)	X _d	X ² _d
70	90	20	-0.58824	0.346021
60	80	20	-0.58824	0.346021
30	100	70	49.41176	2441.522
50	70	20	-0.58824	0.346021
50	90	40	19.41176	376.8166
60	60	0	-20.5882	423.8754
30	40	10	-10.5882	112.1107
60	90	30	9.411765	88.58131
30	30	0	-20.5882	423.8754
80	90	10	-10.5882	112.1107
20	30	10	-10.5882	112.1107
80	100	20	-0.58824	0.346021
30	90	60	39.41176	1553.287
50	60	10	-10.5882	112.1107
50	70	20	-0.58824	0.346021
40	50	10	-10.5882	112.1107
50	50	0	-20.5882	423.8754
Jumlah (Σ)		350		6294.118

t count are 4.2799, which means greater than the t table so that the H₀ is rejected. This means that there is a significant difference between the average score of the post-test and the pre-test where the average value of the post-test is higher than the pre-test. So it can be concluded that the blended learning model can improve student learning outcomes (Table 5).

4 Conclusion

Based on the research process and results it can be concluded that:

- a. Development of the model starts from the characteristic and needs analysis, analysis of the syllabus and subject learning topics, development of a draft learning model, one-to-one test, experts validation, small group test, and large group test to obtain a blended learning model based on LMS that is suitable for use in learning.
- b. The blended learning model developed consists of LMS-based learning and face-to-face learning is very feasible to use at Educational Technology Study Program Postgraduate School of Ibn Khaldun University Bogor.

- c. The trial using the blended learning model resulted in a significant difference in the results of the post-test and pre-test. This means that the blended learning model is effective for improving learning outcomes and achieving predetermined learning objectives at the Educational Technology Study Program Postgraduate School of Ibn Khaldun University Bogor.

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