The Effects of Blended Learning Model on the Learning Outcome of Students in the Electrical Department of the University of Padang

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Abstract--- The purpose of this research was to determine the difference in learning outcomes through the use of blended learning models and conventional teaching of Electrical Machines subject for students of the Electrical Department, Technical Faculty University of Padang. The research was conducted as a quasi-experiment using 64 students of the electrical department as subjects. The class was randomly divided into experimental and control groups with data collected using an objective test and the lattice questions formulated with reference to the syllabus and learning of the implementation plan of Electrical Machines subject. The results revealed significant differences in the grades of students from the two groups. The average grade of the experimental class was 80,87 while the control class was 74,37. Statistical analysis t-test was used to analyze the hypotheses and the result showed a t-value (2,436)> t-table (2,03) at 0,05 significance level. This means there are differences in learning outcomes using blended and conventional learning models in Electrical Machines for students in Electrical Department, Technical Faculty Padang State University.

Keyword--- Blended Learning, Learning Outcomes.

I. Introduction

E-Learning is a teaching and distance learning method which involves the use of computer technology, computer network and/or the Internet [1-2]. It enables learners to acquire knowledge through the use of personal computers without being physically present in a classroom [3]. The concept is also defined as a form of web-based teaching and learning which is accessible from an intranet of a local network or the Internet [4-6]. However, the materials used in e-Learning do not need to be distributed online, it may be through offline distribution using any dense disc media [7-8]. In this case, the application and learning material is developed according to the purpose and disseminated through the media. This makes it easy for learners to study remotely from anywhere they reside.

There are several challenges attached to the implementation of e-learning, such as the loss of education nuance between educators and students. Therefore, there is need for a method to integrate the elements of conventional and electronic methods of learning. This led to the development of a model of e-learning known as Blended Learning [9]. This model adopts the elements of e-Learning into the conventional teaching and learning model and vice versa.

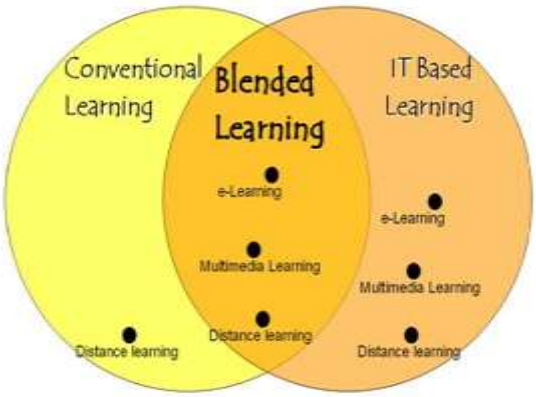

Figure 1: The Implementation of E-Learning Model

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Blended learning or hybrid teaching and learning has become increasingly important in higher education due to its ability to merge the advantages of the two models. Generally, the model combines web-based with conventional teaching and learning methods [10-13]. However, there is a need to ensure a balance between conventional and web-based learning methods in the implementation of this model to have the highest impact [14-15]. Therefore, this makes it important to distinguish between blended and full web-based teaching and learning methods.

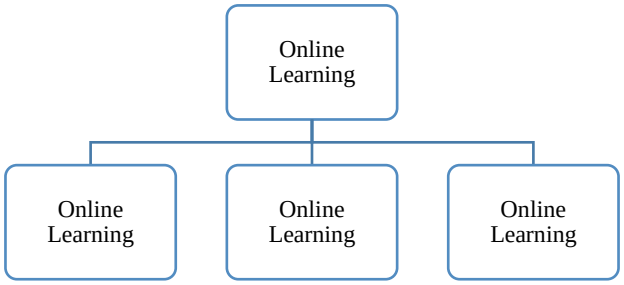

Figure 2: The Continuum Systems of Web-based Teaching and Learning

Blended learning is realized in teaching and learning environments where there is an effective integration of different modes of delivery, models of teaching and styles of learning by adopting a strategic and systematic approach involving the use of technology combined with the best features of face to face interaction [16-19].

This model has gained global acceptance but there is currently no generally accepted definition. Scholars outside the education sector have approached blended learning from a scientific angle, drawing on the connection of its title to biology and botany. For example, it was noted that since the word 'hybrid' refers to the offspring of two different genetically dissimilar parents, teaching and learning in this framework involves the successful joining of opposing parts, in this case, online and face-to-face methodologies [20]. Blended models are also observed to be "pedagogies that change according to the unique needs of learners. Those using blended learning environments are trying to maximize the benefits of both face-to-face and online methods using the web for what it does best and class time for what it does best" [21]. There are numerous definitions of blended learning at the course level. According to Rossett[9], "blended learning is the use of two or more distinct methods of training." House [9] defined it as "...training delivered by a combination of methods." Blended learning is a method for organizing the learning environment facilitated by an effective combination of different modes of delivery, models of teaching and styles of learning, and is founded on transparent communication amongst all parties involved in a course [22].

In other words, blended learning is an effective combination of face to face teaching and learning which utilizes web-based technology. In order to achieve this model, the academic has to decide which contents are to be moved to the web-based teaching and learning, how they are to be presented, and the technical proficiency required to create the documents. It has also been argued that the study results increase with the integration of the dynamics of rich, fast information technology with traditional teaching and learning.

According to [24], online teaching and learning do not only advance the application of technology in education but also creates a new more competitive business model for higher education. There are several methods that have been implemented to accommodate different needs of students in higher education institutions and these include providing teaching and learning materials, having a podcast for learners that prefers to listen at their convenience, using email and discussion forum for in-depth information, as well as using internet for the delivery of tasks and feedback.

Based on literature studies, blended learning seems to be more effective than other forms of teaching and learning due to its ability to combine the advantages of both face-to-face interactions and web-based teaching and learning. This is in line with the theory of media which states that the wealth of rich media involving the distribution of the same material using multiple channels helps to improve the learning ability, especially for doing tasks. A meta-analysis conducted by the U.S. Center for Technology in 2009 found a blended learning model averagely has a greater advantage in comparison with the use of face to face instruction.

The combination of face to face and web-based methods can provide ease-of-learning experience simultaneously, independently and collaboratively [14, 25-26]. This means it is possible for teaching and learning to be independent in terms of space and time and at the same time working together. This is, however, achieved with the maintenance of a high level of commitment by the learners [13]. Moreover, in addition to fostering a community

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of learning, blended learning is also expanding the scope of teaching and learning to produce greater reflection and better results.

The results obtained from the Electrical Department of the Technical Faculty showed the use of conventional methods of learning in the classroom. The lecturers and students are required to be physically present, face to face, in a place and a simpler learning media are used. This is observed to be limiting the knowledge and scope of the students considering the fact they are restricted to some specific topics and package of skills. Therefore, there was a need for improvement and the blended learning was proposed to make the students study independently under the guidance of a lecturer.

II. Method

The research was conducted experimentally using the quasi-experimental design. All the 64 students of the Electrical Department of Technical Faculty, Padang State University were grouped into two groups. The first group was treated with blended learning and tagged the experimental class while the second group was treated with conventional methods and named the control class after which the learning outcomes were compared. The instrument used for assessment were lattice objective test questions formulated with reference to the syllabus and the learning implementation plan for Electrical Machines in the school.

III. Result and Discussion

Based on the results, the average value ($\bar{X}$) obtained for the experimental and control classes are shown in Table 1.

Table 1: Summary of Completeness of Experimental and Control Class

Class	The Number of Students	$\bar{X}$	Completeness Percentage
Experiment	32	80,87	78,12
Control	32	74,37	56,26

Table 1 shows the learning outcome for Electrical Machines of students experiment class had an average value of 80,87 and the completeness percentage of 78,12% which is higher than the values obtained for control class.

3.1 Data Analysis

The data obtained were analyzed to determine the difference between the learning outcomes of the experimental and control classes. This was conducted through the use of a t-test to determine whether the subjects were distributed normally and had homogenous variants. Obtaining higher learning outcomes for the experimental class compared to the control class was associated with the treatment of blended learning given to the experimental class.

3.2 Normality Test

In order to determine whether the data of the research subject class were normally distributed, a normality test was conducted using the Kolmogorov-Smirnov method. The results obtained with $\alpha = 0.05$ are shown in Table 2.

Table 2: The Summary of Normality Test Final Test

Class	N	D_{max}	D_{table}	Distribution
Experiment	32	0,123	0,234	Normal
Control	32	0,123		Normal

Table 2 shows the two classes have the same value, 0,123, which is lesser than the value, 0,234, obtained from the table. This means the research subject class were normally distributed considering Dmax<Dtable.

Homogeneity test was conducted to determine whether the classes were homogeneous or not through the use of the Levene test and the results obtained are shown in Table 3.

Table 3: Homogeneity Test Final Test Results

Class	n	F_{hitung}	F_{table}
Experiment	32	2,213	2,55
Control	32		

Table 3 shows the value of F_{table}on the experiment class and control class with dk_1=1and dk_2 = 22 was 2,55 at a significance level of 0.05 while F_{hitung} was 2,213. Therefore, the classes had homogenous variance considering $F_{hitung}<F_{table}$.

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Hypothesis Test. From the results of normality and homogeneity tests, the classes were found to be normally distributed and had homogeneous variance. Therefore, a t-test was conducted to determine the difference between them and the result is as shown in the following table.

Table 4: The Result of Hypothesis Test Final Test

Class	n	$\bar{X}$	S	t_{hitung}	t_{table}
Experiment	32	80,87	9,99	2,436	2,039
Control	32	74,37	10,64		

From the t-test conducted a value of 2,436 was obtained for t_{hitung} while the t_{table} had 2,039 at dk = n-1 = 31 and a significance level of 5%. This means 2,436 > 2,039 (t_{hitung}>t_{table}) leading to the rejection of the Ho and simultaneous acceptance of Ha. Therefore, the learning outcomes of *Electrical machines* by students that used a blended learning model were better than those with conventional learning model at the Electrical Department of Technical Faculty of Padang State University.

The average value of the experiment class (3La) was observed to be higher than the control class (3Lb). Class 3L1 had only 7 students or 21,88% while 3Lb had 18 students or 43,75% that failed to have good pass after the assessment. This clearly shows an improvement in student learning outcomes after the treatment. Therefore, it can be concluded that the use of a blended learning model was very influential to the results. This is can be associated with an effective teaching and learning process, proper explanation of the materials delivered, and understanding of the student through the implementation of the blended learning model.

IV. Conclusion

The results showed a significant difference between the application of blended and conventional learning models towards student learning outcomes on *Electrical machines* subject at the Electrical Department of Technical Faculty, Padang State University. This is observed from a greater t-test, t_{hitung}, value of 2,436 obtained in comparison with the t_{table}, 2,03 with dk 31 and a significance level of 0.05.

Suggestion

Based on these results, it is suggested that the lecturers teaching Electrical Machines should implement a blended learning model for lecturing and learning process. It is also recommended that the heads department provide periodic training to lecturers on the utilization of the web as an effective teaching and learning media to improve the quality of graduates of the technical faculty, especially those in the electrical department.

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