USE OF E-LEARNING MODELS FOR LESSON ACTIVITIES ON MICROCONTROLLER'S EYES TO IMPROVE STUDENT LEARNING OUTCOMES IN VOCATIONAL EDUCATION IN ELECTRICAL ENGINEERING SULTAN AGENG TIRTAYASA UNIVERSITY

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ABSTRACT

The purpose of this study is to determine whether the use of E-learning with lesson activities can improve the learning outcomes of vocational education students in electrical engineering. Especially the class of 2017 who took microcontroller courses in odd semester 2019/2020 academic year. When compared with conventional learning used in learning. The research method used in this study is a quantitative research method with a quasi experimental approach. In the study conducted by providing treatment of the relevant research subjects using the pretest-posttest control group design experimental design. The results of the study found that the increase in learning outcomes with E-learning learning media with lesson activities was higher than the normalized gain index value of 0.36 when compared with student learning outcomes with conventional learning with the normalized gain index of 0.26. In increasing the learning outcomes of PVTE students by utilizing E-learning learning media lesson activities are better than increasing student learning outcomes by utilizing conventional learning media. T-Test Test Results prove that student learning outcomes using E-learning are better than student learning outcomes that apply conventional learning.

Keywords: e-learning model, lesson activities, microcontroller, learning outcomes

INTRODUCTION

In the world of education, especially vocational education or also referred to as vocational education has experienced quite rapid development. The development of science and technology is increasingly encouraging renewal efforts in the use of technological results in the learning process. The teachers are required to be able to use the tools provided by the school and do not rule out the tools provided by the school in accordance with the development and demands of the times [1].

Learning is the acquisition or acquisition of knowledge about an object or a skill with learning, experience and instruction [2]. With learning, it is expected that lecturers can provide information and knowledge to the maximum so that changes occur in students positively. Lecturers must be able to create fun, skilled learning so that students gain knowledge easily and correctly. Information technology either implicitly or explicitly is not just in the form of computer technology but also telecommunications technology. In other words information technology is a combination of computer technology and telecommunications technology: (1) Computer Technology Is computer-related technology such as printers, CD rooms. (2) Telecommunications Technology Is technology related to long distance communication [3].

In addition to helping to create conducive learning conducions for students, the important role of information and communication technology in the learning process is to provide a set of media and tools to simplify and accelerate student work, and of course to provide advanced technology use skills [4]. In addition, between students and learning resources can occur anytime and anywhere, not limited by space and time (space and time), as well as the process of delivering and presenting learning materials and ideas can be more interesting and fun. The form of the development of information technology that is applied in the world of education is E-Learning.

E-Learning is an innovation that has a very large contribution to changes in the learning process, where the learning process no longer only listens to the description of the lecturer but students also carry out other activities such as observing, doing, demonstrating and so on. Teaching material material can be visualized in a variety of formats and forms that are more dynamic and interactive so that students are motivated to engage further in the learning process.

Entering the era of globalization requires each individual to prepare reliable resources, especially in the field of science and technology. In order to be able to master technology properly, adequate knowledge is needed so that we can utilize it in the face of the demands of a globalized world that is

conditional on competition. Currently there has been progress in information and communication technology (ICT) which is developing very rapidly. The use of ICT has been implemented starting from elementary, secondary, to university level. In the world of education, especially learning the development of information and communication technology began to have a positive impact because with the development of information and communication technology the world of education began to show significant changes. Educational institutions should immediately introduce and start using information and communication technology as a more sophisticated learning base [5]. This is important, considering the use of ICT is one of the important factors that allows the speed of transformation of knowledge to students, the generation of this nation more broadly.

Defines e-learning as just any teaching and learning that uses electronic circuits (LAN, WAN, or the internet) to convey learning content, interactions, or guidance [6]. Others interpret e-learning as a form of distance education through internet media. E-learning as asynchronous learning activities through computer electronic devices that obtain learning material that suits their needs [7]. E-learning is defined as follows: e-Learning is a generic term for all technologically supported learning using an array of teaching and learning tools as phone bridging, audio and videotapes,

teleconferencing, satellite transmissions, and the more recognized web-based training or computer aided instruction also commonly referred to as online courses [8]. Emphasizes that e-learning refers to the use of internet technology to deliver a series of solutions that can enhance knowledge and skills [9]. This is in line with [7] which essentially emphasizes the use of the internet in education as the essence of learning. [10] explains that the term "e" or the abbreviation of electronics in e-learning is used as a term for all technologies used to support teaching efforts through internet electronic technology.

Key words for future education: flexible, open, varied, access, virtual reality, internet, multimedia, multiple paths, equality of opportunity, lifetime, sharing, interactivity, network, distance, on-line, two-way or dialogical, timely, integrated, collaborative, interdisciplinary, appropriate, multi-disciplinary, and competitive. Overall this implies that future challenges are in the form of how new technology can be used wisely and appropriately to address global needs. One thing that needs to be emphasized and understood is that e-Learning cannot completely replace conventional learning activities in the classroom. However, e-Learning can be a partner or complement each other with conventional learning in the classroom. e-Learning, Independent learning is a "basic thrust" of electronic learning activities, but this type of learning activity

still requires adequate interaction in an effort to maintain its quality [11].

The Difference between Traditional Learning and e-learning is "traditional" class, lecturers are considered as knowledgeable people and assigned to channel knowledge to their students. Whereas in e-learning learning the main focus is students. Students are independent at certain times and are responsible for their learning. The e-learning atmosphere 'will force students to play a more active role in their learning. Students make the design and search for material with their own efforts and initiatives.

That after the presence of lecturers in the true sense, the internet will be a supplement and complement in making teacher representatives who represent important learning resources in the world. [12] explains the philosophical e-learning as follows. First, e-learning is the delivery of information, communication, education, training on-line. Second, e-learning provides a set of tools that can enrich the value of conventional learning (conventional learning models, studies of textbooks, CD-ROMs, and computer-based training) so that they can answer the challenges of the development of globalization. Third, e-learning does not mean replacing conventional learning models in the classroom, but it strengthens the learning model through enriching content and developing educational technology. Fourth, student capacity varies greatly depending on the form of content and the

way it is delivered. The better harmony between content and conveyer tools learning style, it will be better capacity of students which in turn will give better results.

The characteristics of e-learning, among others, First, Utilizing electronic technology services; where lecturers and students, students and fellow students or lecturers and fellow lecturers can communicate relatively easily without being limited by protocols. Second, Utilizing the advantages of computers (digital media and computer networks). Third, Using self-learning materials are stored on computers so that they can be accessed by lecturers and students anytime and anywhere if they need them. Fourth, Utilizing the learning schedule, curriculum, learning progress results and matters relating to education administration can be seen at any time on the computer.

Nevertheless the use of the internet for learning or e-learning is also inseparable from various shortcomings. Various criticisms [13] [14], among others. First, the lack of interaction between lecturers and students or even between students themselves. This lack of interaction can slow the formation of values in the learning and teaching process. Second, the tendency to ignore the academic aspects or social aspects and vice versa encourage the growth of business / commercial aspects. Third, the learning and teaching process tends towards training rather than education. Fourth, Changing the role of lecturers from

previously mastering conventional learning techniques, is now also required to know learning techniques that use ICT. Fifth, students who do not have high learning motivation tend to fail. Sixth, not all places have internet facilities. Seventh, Lack of personnel who know and have internet skills. Eighth, Lack of mastery of computer language.

Based on the results of observations to obtain preliminary data, obtained information that the value of the microcontroller course most of the students still get grades below the average. The average value of student learning outcomes is 65 so it can be said that the acquisition of student scores has not been able to reach an assessment above 80. Therefore, in an effort to improve student learning outcomes and also optimize the utilization of internet network facilities on campus, if necessary to build the system in the form of an interesting learning media and also utilizes the internet in the learning process, one example is the introduction of e-learning. With this e-learning learning media, it is hoped that it can make the learning process more conducive, it can influence motivation in the learning process of students towards learning, which in turn is expected to improve the learning outcomes achieved. This is because e-learning requires students to be able to interact with the internet, such as accessing extensive information, raising student activity caused by challenges, as well as the availability of material for learning microcontroller courses.

Thus in this study the author tries to raise the theme regarding the use of e-learning models for lesson activities on microcontroller courses to improve student learning outcomes in electrical engineering vocational education at Sultan Ageng Tirtayasa University. The e-learning that will try to be implemented is Moodle-based e-learning with lesson activities. This lesson activity intended so that lecturers can create activities that contain interesting and flexible content. The lesson is divided into several pages and ending with each page there are usually questions that have several answers. The answers chosen by students will determine which pages will be accessed, in other languages if the questions asked are correct then further teaching materials are provided for study [15].

Based on the background of the problems outlined above, the problems in this study can be formulated in the form of questions as follows: (1) how is the implementation of e-learning with lesson activities in the microcontroller course in PVTE Untirta? (2) whether the application of e-learning with lesson activities can improve learning outcomes in the Untirta PVTE student microcontroller course? (3) is there a difference in the improvement of student learning outcomes between those who apply learning media e-learning lesson activities

and students who apply conventional learning?

RESEARCH METHODS

This research is an experimental research in which there are treatments. The experimental research method can be interpreted as a research method used to look for the effect of certain treatments on others under controlled conditions [16]. In this study using the pretest-posttest control group design experimental design. The experimental group was given the treatment of the use of e-learning learning media and the control group was given the conventional treatment, namely the lecture media by the lecturer.

The population in this study were all odd semester students of the 2019/2020 academic year. To facilitate this research process, a random sample of two classes will be chosen consisting of the experimental class and the control class.

Data collection techniques are tests that are a series of questions or exercises and other tools used to measure the skills, knowledge of intelligence, abilities or talents possessed by individuals [17]. The test technique used is objective, because this research is to measure learning outcomes.

The data analysis technique used is inferential statistics, with data processing steps are (1) normality test used Chi-Square test, (2) homogeneity test, using two variance homogeneity test, (3) t-test test, used for test

the average difference of the two variables by assuming the two samples have the same variance and (5) the normalized gain test is used to provide an overview of the increase in learning outcomes between before and after learning (Sugiyono, 2019). The normalized gain formula developed by Hake in (Sugiyono, 2019) is as follows:

Normalized Gain (g) = Posttest Score - Pretest Score / Ideal Score - Pretest Score

RESULTS AND DISCUSSION
A. Data Description

In this study conducted on two groups namely the experimental group (XA) with 32 students given treatment with the media e-learning learning while in the comparison group with 32 students were given treatment with conventional learning media then both groups were given pretest and posttest as many as 20 multiple choice type questions.

B. Research Results
1. Pretest Test Data Analysis

The analysis of the pretest is done with the aim of measuring the ability of students before accepting the learning process. Initial test data analysis was performed to determine the minimum value, maximum value, average and standard deviation values. Preliminary data can be seen in Table 1 below.

Table 1. Pretest Data

Class	Number of Students	Min	Max	Mean	Standard Deviation
Experiment	32	12	76	45.15	18.05
Control	32	17	69	40	14.36

Normality test is done to find out whether the data is normally distributed or not between the experimental class and the control class. The normality test is performed by the Chi-Square test as in Table 2 below.

Table 2. Pretest Data Normality Test

Class	Xcount	Xtable	α	Conclusion
Experiment	6.89	9.487	.05	Normal
Control	2.17	7.815		Normal

Based on the calculation of normality test using the Chi-Square Test, the results obtained are that the two data are normally distributed. This homogeneity test uses two variance homogeneity tests. Homogeneity test results in the initial data of the experimental class and the control class can be presented in Table 3 as follows.

Table 3. Pretest Data Homogeneity Test

Class	N	S^2	F_{count}	F_{table}	Conclusion
Eksperiment	32	334.28	1.62	2.34	Homogeneous
Control	32	206.25			

Based on the homogeneity test results of the two variants above, it is obtained that the data is variant or homogeneous. After testing the normality and homogeneity of the data, then the next step is to test the hypothesis, testing the hypothesis in this study using the t-Test: Two-Sample Assuming Equal Variances. After the calculation, the t value of 1.31 is obtained by using an error level of 5%. From the pretest data results obtained p value 0.097> 0.05. Means not significant, so it can be concluded that Ho is accepted. So it can be concluded that there is no difference in the initial ability between the experimental class and the control class.

2. Final Test Data Analysis (Posttest)

Final test data analysis is performed to determine the minimum value, maximum value, average and standard deviation values. The final test test data can be seen in Table 4 below.

Table 4. Final Test Test Data

Class	Number of Students	Min	Max	Mean	Standard Deviation
Eksperiment	32	5	90	61.06	15.53
Control	32	5	80	52.58	16.54

Normality test is done to find out whether the data is normally distributed between the control class and the experimental class. Testing for normality is done using the Chi-Square test can be seen in Table 5 below.

Table 5. Final Test Test Data

Class	Xcount	Xtable	α	Conclusion
Eksperiment	4.32	7.815	.05	Normal
Control	6.35	7.815		Normal

Based on the calculation of the normality test using the Chi-Square Test, the

value of χ^2_{count} in the experimental class was 4.32 and in the control class the value of χ^2_{count} was 6.35 with of χ^2_{tablet} 7.815 respectively. then it can be concluded that the data is normally distributed.

Homogeneity test is performed to find out whether the data has homogeneous variance or not. This homogeneity test uses two variance homogeneity tests. So the homogeneity test results on the final data (posttest) of the experimental class and the control class can be presented in Table 6 below.

Table 6. Data Homogeneity Posttest Data

Class	N	S^2	Fcount	Ftable	Conclusion
Eksperiment	32	235.56	0.86	2.34	Homogen
Control	32	273.63			

Based on the homogeneity test results of the two variants above, it is found that the data above is of the same variance (homogeneous). Testing the normality and homogeneity of the data, then the next step is to test the hypothesis, testing the hypothesis in this study using the Two-Sample Assuming Equal Variances t-Test using Ms. Excel. By doing the calculation, the t value of 2.16 is obtained by using an error level of 5%. From the posttest results obtained P value of 0.017 < 0.05. Means the learning outcomes of students whose learning uses e-learning is better than the learning outcomes of students who apply conventional learning.

The gain value is obtained from the difference between the posttest value and the pretest value, because learning outcomes are the results obtained by students after learning, so the intended learning outcomes are an increase experienced by students. Result of Normalized gain calculation (g) in the experimental class and the control class can be seen in Table 7 below.

Table 7. Normalized Gain Test for Experiment Class and Control Class

Class	Number of Students	Max Score	Min Score	Average	Interpretation	Standard Deviations
Eksperiment	32	0.71	0.7	0.29	Low	0.17
Control	32	0.71	-0.3	0.2	Low	0.23

From the test results above, it can be seen that the normalized gain value is obtained from the experimental class of 32 students with the smallest score with a normalized gain of 0.7 and the largest score of 0.71 so that an average value of 0.29 can be obtained with a standard deviation of 0.17 so the interpretation of improvement is relatively low. The results of the control class with 32 students with the smallest score of normalized gain of -0.30 and the largest score of 0.63 so that an average value of 0.20 is obtained with a standard deviation of 0.23, so that it can be interpreted with a low increase.

The results of data management can be seen that the average value of the experimental class is 0.29 greater than the average of the control class that is equal to 0.20, so it can be concluded that an increase in student learning outcomes for the

experimental class and the control class is different, with an increase in the experimental class greater than the control class.

CONCLUSION

Based on the results and discussion of the study, the following conclusions can be drawn:

Implementation of e-learning learning with lesson activities can improve the learning outcomes of microcontroller courses in the electrical engineering vocational education study program, Sultan Ageng Tirtayasa University.

Can improve student learning outcomes in microcontroller courses in electrical engineering vocational education study programs with lesson activities better when compared to student learning outcomes that apply conventional learning.

There is a difference between the learning outcomes of electrical engineering vocational education students at Sultan Ageng Tirtayasa University, by the average value of the post-test results of the experimental class 61.06 while in the control class seen 52.58. so the average posttest value seen that the experimental class learning outcomes are higher than the control class.

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