The Effect Of Electrical Installation Trainer Media On Undergraduate Students Learning Outcomes Of Domestic Electrical Installation Practice Course

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Abstract

This study aims to analyze the effect of using an electrical installation trainer media on the learning outcomes of students practicing domestic electrical installations in the electrical engineering department of the State University Of Padang. This type of research is quantitative research. The research method used is an experimental research method with a True experimental design with a Posttest-Only Control Group Design type of research design. Collecting data using a research instrument that was given a post test in the form of multiple choice questions using random sampling, by dividing the sample into two, namely some undergraduate students as the experimental class and some undergraduate students as the control class by giving the same questions to all samples of undergraduate students in the class. domestic electrical installation practice. The hypothesis is carried out using T-test analysis, the T-test was used to analyze differences in undergraduate students learning outcomes using the electrical installation trainer media and other undergraduate students without using the electrical installation trainer media. The results showed that the use of the electrical installation trainer media had a significant effect on the learning outcomes of undergraduate students and indicated that there was a significant difference between the post test results of the experimental class using the electrical installation trainer media and the control class that did not use the electrical installation trainer.

Keywords: Electrical Installation Trainer Media, Undergraduate Students Learning Outcomes, Domestic Electrical Installation Practice Course.

INTRODUCTION

Education has an important role in shaping human character to interact with each other. ("Law of the Republic of Indonesia Number 20 concerning the National Education System," 2003) states that education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential. With the aim of education, the government takes various ways to make it happen. Formal educational institutions such as universities are required to produce graduates who are able to keep up with technological developments so as to produce graduates who are competent in their fields.

University is an educational institution at the highest level which has the task of providing education and teaching above secondary level tertiary institutions as well as providing education and teaching based on the Indonesian culture and science. University is a facility designed so that the educational process runs in accordance with the Law of the Republic of Indonesia No. 20 (2003). Along with the progress of the times and technology, universities are expected to be able to meet all student needs for science and technology.

Student learning experience is strongly influenced by learning facilities and infrastructure (learning resource equipment), academic atmosphere, teaching methods by lecturers, and learning environment. [1]. Practical facilities at the University, especially the Faculty of Engineering, are the

main requirements to support the success of the learning process. One of the most important things in practical learning is learning media (trainer). The trainer is one of the learning media that contains the characteristics of the concepts undergraduate students have in the learning process [2]. With the trainer, students are not only required to remember and see the existing jobsheets but also directly practice from the jobsheets, so that undergraduate students have a better understanding of the material.

There are several factors that determine the quality of learning including the competence of educators, class characteristics, class size, learning atmosphere, available learning facilities and resources, as well as school or college characteristics. All of these factors influence each other. If one of the factors that affect the quality of learning activities is not met, then the quality of a learning activity is less than optimal. Factors that have a very important role in this are facilities and learning resources, including learning media. The media in this case acts as an intermediary between lecturer and undergraduate students when learning activities take place [3].

Learning media are everything that can be used to convey messages (learning materials), so that it can stimulate the attention, interests, thoughts and feelings of students in learning activities to achieve learning goals [4]. In engineering study, the use of learning media is different from learning in other fields, This is because learning in the field of engineering focuses more on the types of learning media that are not projected, namely real working media, learning media has a collaborative system with actual tools. The relationship between creativity and critical thinking on learning outcomes has a very close relationship [5].

Trainer is one of the educational media to help the teaching and learning process so that the communication process can be successful and effective [6]. Actual objects or model objects that are very similar to real objects will provide a very important stimulus for undergraduate students in learning tasks involving psychomotor skills. The use of trainers in the learning process is able to convey planned information so that it will produce a conducive learning environment so that undergraduate students can learn efficiently and effectively [7].

National Standards for Higher Education Part Seven Standards for Learning Facilities and Infrastructure chapter 32 subsection 1 states "Standards of learning facilities as referred to in chapter 31 at least consist of: (1) furniture; (2) educational equipment; (3) educational media; (4) books, electronic books, and repositories; (5) information and communication technology facilities; 6) experimental instrumentation; (7) sports facilities; (8) art facilities; (9) public facilities; (10) consumables; and (11) maintenance, safety and security facilities [8].

Based on the results of the researchers' observations, in the lecture activities of the domestic electrical installation practice, undergraduate students experienced limited media and less effective practicum time. So that the competence in the domestic electrical installation practice needs to be optimized for the learning process, so that undergraduate students have an understanding of the competencies that each student must possess after finishing college and are ready to work. Based on these problems, the authors are interested in knowing how the effect of the electrical installation trainer media with efforts is expected to foster enthusiasm, interest, activeness and maximize undergraduate student learning outcomes in the domestic electrical installation practice course.

METHOD
Types of research

This type of research is quantitative research. Quantitative research is a research method used to examine samples from a particular population by collecting data based on research instruments and then analyzing the data with the aim of testing the established hypothesis.

Research subject

The subjects in this study were undergraduate students of the Department of Electrical Engineering at State University of Padang. The target population in this study were all undergraduate students of the domestic electrical installation practice class in the semester of July-December 2021.

Research design

The research method used is experimental research method with True experimental design with Posttest-Only Control Group Design. True experiment is a research method used to investigate the effect between being treated (treatment) and not being treated to another with a real design there is an experimental group and a control group, the class that is treated is called the experimental class and the class that is not treated is called the control class [9].

Table 1. Posttest-only control group design

Group	Treatment	Learning Outcome
Experimental	X	O_2
Control		O_4

Data collection

The data collection instrument is a tool used by researchers in collecting research data related to research objectives so that the work becomes easier, systematic so that the results to be obtained are better and easier to process [10].

1. Instrument validity analysis
   a) Jobsheet validation questionnaire
      Validity aims to measure the level of validity of the jobsheet that has been made.
   b) Validity analysis of test questions
      The validity of the test items aims to measure the validity of the test items that have been made. The validity test of the test questions was carried out in the domestic electrical installation practice class. The validity of the test items was tested using the biserial point correlation coefficient formula. From the test results, 28 questions are valid and 7 questions are invalid.
2. Reliability analysis of test questions
   Reliability refers to the consistency of measurement which means that the difference in scores obtained in the measurement reflects the actual difference in ability, not the difference caused by measurement errors. The reliability of this study was calculated using the Alpha Cronbach formula.
3. Analysis of the difficulty level of questions
   The difficulty level of the questions is the ratio between answering questions correctly and the number of examinees. Theoretically it is said that the level of difficulty is an empirical probability of passing on certain items for certain examinees. Good questions are questions that are not too difficult and not too easy. To measure the level of difficulty of the questions, the formula developed by Suharsimi Arikunto was used. The results of the test of the difficulty level of the test instrument were found that 32 questions were classified as moderate, 2 were classified as easy.
4. Dissimilarity of questions
   Dissimilarity of questions is the ability of a question to distinguish between high-ability students and low-ability students. Dissimilarity of questions was calculated using the formula developed by Suharsimi Arikunto. The results of the Dissimilarity of Questions instrument test

are: 4 questions of good classification, 21 questions of sufficient classification and 10 questions of poor classification [11].

Based on the results of the calculation of validity, reliability, level of difficulty and dissimilarity of test instrument questions. Of the 35 questions, 28 items were obtained that can be used to test post-test knowledge

Data analysis

Data analysis techniques is the process of finding data, systematically compiling data obtained from interviews, observations, research processes, and documentation, by grouping data into categories, describing them into units, perform a synthesis, arrange into a pattern to choose which ones are important and which will be studied, and make conclusions so that they are easily understood [12].

For the research hypothesis, the experimental class and control class student learning outcomes data must meet a prerequisite test consisting of a normality test and a homogeneity test. If the results obtained are normal and homogeneous, then the hypothesis can be tested using the parametric statistic T-test.

1. Normality test

   Normality test aims to determine the distribution of the data obtained is normally distributed or not, if the data distribution is normally distributed then hypothesis testing can be carried out, the data is normally distributed if the significant number generated is greater than 0.05. Normality test was carried out using Chi-Square. The normality test criterion is if $\chi^2_{count} \geq \chi^2_{table}$, it means that the data distribution is not normal. If $\chi^2_{count} \geq \chi^2_{table}$, it means that the data is normally distributed with a significant level = 0.05 and degrees of freedom (dk) = k − 1.

2. Homogeneity test

   Homogeneity test was carried out to determine the similarity between two variances or both groups. The homogeneity test was carried out by using the two-variance homogeneity test, the homogeneity test formula used was Fisher's exact test. The homogeneity test criterion is if $F_{count} < F_{table}$, meaning that the data has a homogeneous variance. On the other hand, if $F_{count} > F_{table}$, it means that the data is not homogeneous [13].

3. T-test

   T-test is used to test the truth or falsity of the hypothesis. After the data is said to be normal and homogeneous, the hypothesis can be tested to determine whether there is an influence of the electrical installation trainer media on the learning outcomes of students practicing domestic electrical installations. To find out whether there is a difference in treatment, the T test formula is used, with the provisions for acceptance of the research hypothesis: Ho is accepted if $t_{count} < t_{table}$ and Ha is rejected, Ho is rejected if $t_{count} > t_{table}$ and Ha is accepted [14].

RESULTS AND DISCUSSION
Description of data

The following is a description of the posttest data of the experimental class and control class:

1. Posttest data for experimental class (using an electrical installation trainer)

   The research was conducted in the experimental class with a total of 15 undergraduate students. The experimental class is a class with treatment using an electrical installation trainer in a practical domestic electrical installation course. The posttest results are then presented in the form of frequency distributions, histograms and polygons.

Table 2. The value of the posttest frequency distribution of the experimental class

Interval	Edge of Class	Frequency
64 – 70	63,5 – 70,5	3
71 -77	70,5 – 77,5	1
78 – 84	77,5 – 84,5	3
85 – 91	84,5 – 91,5	6
92 - 98	91,5 – 98,5	2
Total		15

The presentation of data in the form of histograms and polygons is presented in the following figure:
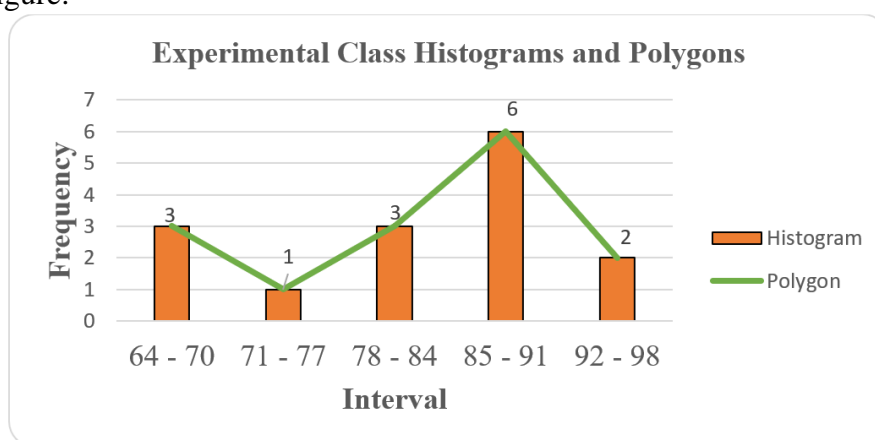

Figure 1.   Experimental class histograms and polygons

2. Posttest data for control class (without using an electrical installation trainer)

The research was conducted in the control class with a total of 15 undergraduate students. The control class is a class without using an electrical installation trainer in a domestic electrical installation practice course. The posttest results are then presented in the form of frequency distributions, histograms and polygons.

Table 3. The value of the posttest frequency distribution for the control class

Interval	Edge of Class	Frequency
46 – 54	45,5 – 54,5	2
55 – 63	54,5 – 63,5	2
64 – 72	63,5 – 72,5	3
73 – 81	72,5 – 81,5	5
82 - 90	81,5 – 90,5	3
Total		15

The presentation of data in the form of histograms and polygons is presented in the following figure:
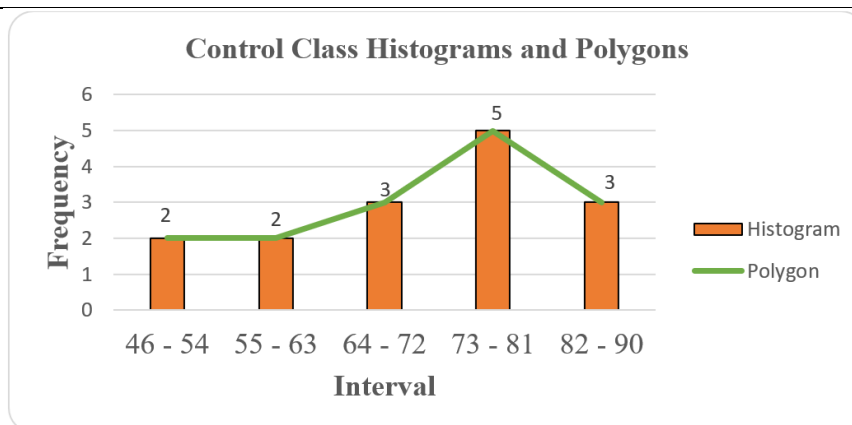
Figure 2.   Histogram and polygon posttest control class.

3. Statistical data analysis

The next step, the researcher calculated the descriptive statistical data from the posttest results needed from the experimental class and the control class. Descriptive statistical data from the two classes are presented in the form of a comparison table.

Table 4. Comparison of descriptive statistical data for experimental class and control class (posttest)

Statistics	Posttest	
	Experimental Class	Control Class
Lowest Score	64	46
Highest Score	93	89
Class Range	29	43
Number of Interval Class	5	5
Class Length	6	9
Mean	82,40	71,00
Median	85,06	73,40
Modus	87,44	77,00
Standard Deviation	9,29	11,70

Based on the mean value, it can be concluded that the comparison between the experimental class and the control class is 11.4, which means that there is a significant effect of the electrical installation trainer media on the learning outcomes of students practicing domestic electrical installation.

Data analysis

1. Normality test

The normality test is carried out using the Chi-Square formula, the criteria for this test are $\chi^2{}_{count} \leq \chi^2{}_{table}$, meaning that the data is normally distributed. $\chi^2{}_{count} \geq \chi^2{}_{table}$, meaning that the data distribution is not normal. With a significant level = 0.05 and degrees of freedom (dk) = k - 1 [15].

Table 5. The results of the calculation of the posttest data normality test

Class	N	$\chi^2{}_{count}$	$\chi^2{}_{table}$	Criteria	Conclusion
Experimental	15	5,99	9,49	$\chi^2{}_c \leq \chi^2{}_t$	Normal
Control	15	2,28	9,49	$\chi^2{}_c \leq \chi^2{}_t$	Normal

From the results of the calculation of the normality test of the experimental class and control class data, it can be concluded that the data has met the normality test criteria with the results of the experimental class posttest data being $5,99 \leq 9,49$ and for the control class posttest data is $2,28 \leq 9,49$ this means that the data of the two samples is normal.

2. Homogeneity test

The homogeneity test for both classes was measured using Fisher's exact test with the Levene Test statistical formula. From the results of the calculation of the final test data, the largest S_1^2 price is 136.80 while the smallest S_2^2 price is 86.24. Then after testing, the F_{count} value is 1.59. From the Fisher's test table, the value of F_{table} for the numerator = 14 and the denominator = 14 is 2.48. Because $F_{count} < F_{table}$ or $1.59 < 2.48$, it can be concluded that the test data of the two sample classes are homogeneous.

Table 6. The results of the calculation of the homogeneity of the post-test data

Class	Mean $(\bar{x})$	Respondent (n)	Varians (S^2)	Standar Deviation (S)
Experimental	82,40	15	86,24	9,29
Control	71,00	15	136,80	11,70

3. T test

Hypothesis testing for the final test data (posttest) uses the t-test. The test hypothesis is as follows:

Ho: There is no significant effect of the electrical installation trainer media on the student learning outcomes of the domestic electrical installation practice course.

Ha: There is a significant effect of electrical installation trainer media on student learning outcomes of domestic electrical installation practice course.

Table 7. The results of the calculation of the posttest data homogeneity test

	Class	
	Experimental	Control
N	15	15
$\bar{x}$	82,40	71,00
D_k	28	
t_{count}	2,992	
t_{table}	2,048	
Criteria	$t_{count} > t_{table}$	
Conclusion	Rejected Ho	

From the calculation results obtained $t_{count} > t_{table}$ or $2,992 > 2,048$ then Ho is rejected. So it can be concluded that after being given treatment there is a significant difference between the posttest results of the experimental class that uses the electrical installation trainer media better than the control class that does not use the electrical installation trainer media, so there is a significant effect of the electrical installation trainer media on student learning outcomes domestic electrical installation practice course.

Discussion

Based on the research and the results of data processing above, it shows that the posttest value shows the value of $t_{count} > t_{table}$, where $t_{count} = 2,992$ while $t_{table} = 2,048$ then Ho is rejected, meaning

that there is a significant difference between undergraduate student learning outcomes who use electrical installation trainers are better than those who do not use an electrical installation trainer. This is in accordance with the research conducted by [16], which is that there is a significant difference between the posttest results of the experimental class that uses a media trainer better than the control class that does not use a media trainer. In this study, it can be seen from the difference in learning outcomes achieved by undergraduate students, where the distribution of the mean value of the experimental class that uses the electrical installation trainer media is 82.40 while the control class that does not use the electrical installation trainer media is 71.00.

The results of this study conclude that learning using an electrical installation trainer media can prove differences in the learning outcomes of experimental class students compared to the control class who do not use electrical installation trainer media in the domestic electrical installation practice course.

CONCLUSION

Based on research conducted on the effect of electrical installation trainer media on student learning outcomes of domestic electrical installation practice course. The results of data processing and analysis showed that there were differences in student learning outcomes who were treated in the experimental class using the electrical installation trainer media better than the control class which did not use the electrical installation trainer media.

The results of the calculation of the hypothesis test prove that the posttest value shows the value of $t_{count} > t_{table}$, where $t_{count} = 2,992$ while $t_{table} = 2,048$ then Ho is rejected, meaning that there is a significant difference between the posttest results of the experimental class using the electrical installation trainer media and the control class who do not use an electrical installation trainer media, so that there is a significant effect of using an electrical installation trainer media on the learning outcomes of students of the domestic electrical installation practice course.

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