JURNAL EDUNITRO
JURNAL PENDIDIKAN TEKNIK ELEKTRO
HTTPS://EJURNAL.UNIMA.AC.ID/INDEX.PHP/EDUNITRO
E-ISSN 2776-284X
P-ISSN 2776-2920
Vol. 3, No. 2, October 2023

The Effect of Website-Based E-Learning on Learning Outcomes of Electrical Engineering Drawings for Students of SMKN 3 Tondano

Verico Emma Kumakau[1] and Eka Priyana[2*]
[1] SMK Negeri 3 Tondano, North Sulawesi Province
[2] Department of Electrical Engineering Education, Faculty of Engineering, State University of Manado
[*]Corresponding author, e-mail: eka.zky02@gmail.com[1]

Received: June 2nd, 2023. Accepted: September 15th, 2023. Revised: September 22nd, 2023.
Available online: October 1st, 2023. Published: October 1st, 2023

Abstract— This study aims to determine the effect of website-based e-learning on student learning outcomes in Electrical Engineering Drawing Class X TITL SMK Negeri 3 Tondano. This type of research is truly experimental in the form of a pre-test and post-test-only control group design with a population of all students of class X TITL totalling 50 students, and the sampling technique is simple random sampling. The sample taken is 50 students consisting of 2 classes, each class consisting of 25 students. Documentation techniques and knowledge tests obtain research data. Documentation techniques are used to obtain data and information in the form of numbers, student learning outcomes, and knowledge tests given at the beginning (pre-test) and at the end of the meeting (post-test). The collected data were analyzed using descriptive statistics. The descriptive statistical analysis showed that the average student learning outcomes for the experimental class pre-test were 65.20, with a standard deviation of 7.83. The average pre-test student learning outcomes for the control class was 59.00, with a standard deviation of 9.57. For the post-test, the average student learning outcomes for the experimental class were 81.20 with a standard deviation of 8.93, and the average post-test student learning outcomes for the control class were 74.80 with a standard deviation of 8.35. There is a significant difference in student learning outcomes in the electrical engineering drawing subject between groups treated using conventional methods and groups treated using website-based e-learning in class X TITL students of SMK Negeri 3 Tondano.

Keywords: website-based e-learning, electrical engineering drawings, learning outcomes

I. INTRODUCTION

The success of students in achieving learning outcomes for each student is different. The factors influencing student success in achieving learning outcomes are grouped into internal and external factors (Lembong & Tatali, 2023; Saptono, 2016). Internal factors come from within the student, which is included in this internal factor, namely physical factors and psychological factors. Physical factors include health and disability factors. At the same time, psychological aspects include intellect, curiosity, motivation, and others (C. E. J. Mamahit, 2019). While external factors are all factors outside of students, including the family environment, community, association, learning facilities, family socio-economic conditions and others, thus the learning success achieved by students is the result of the interaction between these two factors, which influence both from within (internal factors) and from outside (external factors) students.

The method used by the teacher during the learning process can affect the level of student learning outcomes (Koloway & Kattie, 2023; Nasution, 2017). Using varied and relevant methods can stimulate student activity during the learning process. Teachers must carefully choose the suitable method to use in a lesson and avoid using monotonous methods that can lead to boredom in students. Then the ability of students to accept the subject matter conveyed by the teacher also affects student learning outcomes (Mohammad Saleh et al., 2023; Rizaldi et al., 2019). Ideally, student learning outcomes must reach KKM (Minimum Completeness Criteria). Students are said to be successful in learning if the grades obtained by students can meet the KKM set in that subject (Mardapi et al., 2015)."

These problems show that low attention causes student learning outcomes not to be optimal (Usman et al., 2022; Wahyudi & Neviyarni, 2021). So that researchers want to make improvements in the learning process so that it can assist teachers in increasing attention, interest, and student learning outcomes. One of the suitable alternatives that can be developed to overcome this problem is to apply website-based e-learning learning media. Website-

based e-learning learning media was chosen because it suits the needs of students; students want teachers to be more creative and innovative when teaching in class. With e-learning combined with the teacher's teaching methods, students will be more interested in learning the material. This learning media facilitates students during the learning process. With the implementation of this e-learning media, it is hoped that it can make students more interested in participating in learning activities in and outside the classroom (Pradiatiningtyas & Suparwanto, 2017).

E-Learning or electronic learning is a method carried out in the teaching and learning process using electronic media, especially the Internet as a learning system. However, e-learning does not replace the teaching and learning process in the classroom but supports learning through existing content (Kumar Basak et al., 2018).

E-Learning is often called an online course (Kusmana, 2011). Online courses can simply be defined as virtual classroom learning. However, in practice, learning relies on online courses and face-to-face learning (Hussain, 2012). It can be concluded that student learning outcomes decreased due to choosing a monotonous and inappropriate learning method in learning electrical engineering drawings, namely by using the teacher-centred lecture method, lack of student motivation in participating in electrical engineering drawing lessons due to the teacher's lack of innovation in using models learning, the low interest of students in electrical engineering drawing lessons, the lack of learning resources and learning tools in schools, students need access to broad, active, and creative learning to show independence in learning.

The formulation of the problem in this study is: Does website-based e-learning influence the learning outcomes of the Electrical Engineering Drawing subject for class X TITL students at SMK Negeri 3 Tondano? This study aimed to determine the effect of website-based e-learning on learning outcomes in Electrical Engineering Drawing class X TITL at SMK Negeri 3 Tondano.

The results of this study are expected to be helpful as a reference for future research and contribute to the development of science, especially in the field of learning strategies and methods in Electrical Engineering Drawings. The practical benefits are: (a) For researchers, it can be used as a reference in conducting research, adding insight and knowledge regarding attention, student learning outcomes, and appropriate learning methods. (b) For students it makes it easy for students to understand the material and play an active role. Students can enjoy learning, be enthusiastic about learning, be more active, and concentrate on getting maximum learning results (Mokalu et al., 2021). (c) For teachers, increasing knowledge about various student-centred learning media, especially electrical engineering drawing material. (d) For schools, make an excellent contribution to the school as input for the learning process to improve the quality of schools (C. J. Mamahit, 2021).

II. METHOD

In order to gather data for this study, the research method used is a type of experiment. The forms used are Pre-test and Post-test Only Control Design. In this design, two groups are randomly selected and then given a pre-test to determine whether there is a difference in the initial state between the experimental and control groups. The pre-test results are good if the experimental group values are not significantly different, as shown in Table 1 (Sugiyono, 2014).

Table 1. Research Design

Kelompok	Pre-test	Perlakuan	Post-test
Eksperimen	O1	X	O_2
Kontrol	O3	X	O_4

This research was conducted at SMK Negeri 3 Tondano for class X students in the odd semester of the 2021/2022 academic year. This research lasted for one month, namely in April 2022.

The population used in this study were all students of class X TITL SMK Negeri 3 Tondano, totalling 50 students. The samples were all students of class X TITL, where the experimental class X TITL 1 consisted of 25 students and the control class X TITL 2 consisted of 25 students. Simple Random Sampling will take the sample in this study (Sugiyono, 2014) (Figure 1).

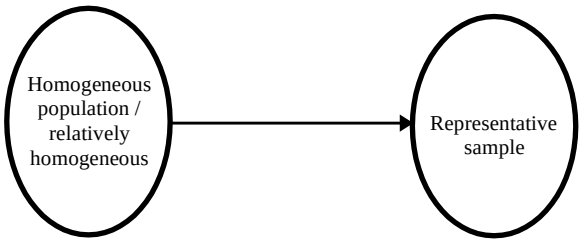

Figure 1. Simple Random Sampling Technique

An independent variable (X) is a website-based E-Learning Learning Model. This variable is a variable that is given specific treatment when the learning process is carried out. Here the researcher divides the experimental class using the website-based E-Learning Learning Model. In contrast, the control class uses the Conventional Learning Model as the dependent variable (Y) is Learning Outcomes.

Learning outcomes are students' final tests after completing the learning process for a particular subject.

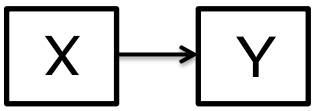

Figure 2. Research Variables - Variable X Affects Variable Y

The operational definitions of the variables from this study are as follows: (a) The learning media used is the website. (b) Learning outcomes are scores or grades obtained by students from tests given after the learning process by the sequence of learning materials studied.

The procedure of this research is as follows:
(1) The preparation stage, the steps taken at this stage are: (a) Making observations at the school where the research is taking place, (b) Taking samples, (c) Determining the subject matter, (d) Developing a plan for implementing the lesson plan (RPP), (e) teaching tools, and test kits, and (f) preparing teaching materials.
(2) Giving pre-tests to the experimental and control classes to determine student learning outcomes before learning using Website-based E-learning learning media.
(3) Implementation Phase, implementing learning using website-based e-learning learning media in the experimental and control classes using conventional methods.
(4) Give a post-test in the experimental and control classes to determine student learning outcomes.
(5) Managing the results of student learning data.
(6) Conclude experimental research.

The data collection techniques used in this study include the following:
(1) Observation makes direct observations. Observation or observation guidelines are needed, especially if the researcher sets focused observations in the data collection process. In focused observation, the researcher focuses on only a few aspects of the behaviour or phenomenon that is the target object.
(2) The research instruments used were Digital Simulation books, lesson plans, and practice and post-test questions. Post-test is the final data to determine student learning outcomes. The experimental and control classes held post-tests but were given different treatments.

The data analysis techniques used in this study are:

1. Test Requirements Analysis

a. Data Normality Test

The normality test was carried out to determine whether the distribution of scores on academic procrastination and conscientiousness variables was normal. The normality test for the distribution of research data used the Kolmogorov-Smirnov technique with the help of the SPSS program. The rule used to test normality is the Sig score in the Kolmogorov-Smirnov calculation results. The data is usually distributed if the Sig number is greater than or equal to 0.05.

b. Homogeneity Test

This variance homogeneity test was conducted to determine whether the population has a homogeneous variance. The variance homogeneity test was calculated using the SPSS 25 program using the Levene test. The criteria are if Sig. Levene > 0.05, then the data is homogeneous and vice versa.

2. Hypothesis Test

a. T-test

The t-test, called the partial test, shows how far one independent variable individually explains the dependent variable with a test tool using SPSS software.

b. Decision-making criteria:

Ho is rejected, and Ha is accepted if t count > t table or t sig > 0.05.
If t count < t table or if t sig < 0.05, Ho is accepted, and Ha is rejected.

III. RESULTS AND DISCUSSIONS

The data taken in this study are student learning outcomes in Electrical Engineering Drawings. The test used to see student learning outcomes is the learning outcomes test before learning (pre-test) and after learning (post-test). The range of pre-test and post-test values is 0-100. Data processing is carried out using the help of Microsoft Excel and SPSS software.

The analysis results of the frequency distribution of learning outcomes data can be seen in Table 2.

Table 2. Frequency Distribution of Experimental Class Pre-test Scores

Class	Interval Class	Frequency	Relative (%)
1	50-54	1	4.00
2	55-59	3	12.00
3	60-64	4	16.00
4	65-69	10	40.00
5	70-74	3	12.00
6	75-80	4	16.00
Total		25	100.00

Based on Table 3, the most frequent pre-test experimental class scores are in the 65-69 range, where the relative frequency is 40% of the total 100%.

Table 3. Frequency Distribution of Experimental Class Post-Test Values

Class	Interval Class	Frequency	Relative (%)
1	65-69	3	12.00
2	70-74	0	0.00
3	75-79	5	20.00
4	80-84	6	24.00
5	85-89	6	24.00
6	90-95	5	20.00
Total		25	100.00

Based on Table 4, the most frequent post-test experimental class scores were in the range of values 80-84 and 85-89, where the relative frequency was 24%, each of the total 100%.

Table 4. Frequency Distribution of Control Class Pre-test Values

Class	Interval Class	Frequency	Relative (%)
1	45-49	5	20.00
2	50-54	1	4.00
3	55-59	4	16.00
4	60-64	6	24.00
5	65-69	5	20.00
6	70-75	4	16.00
Total		25	100.00

Based on Table 5, the most frequent pre-test control class scores are in the 60-64 range, where the relative frequency is 24% of the total 100%.

Table 5. Frequency Distribution of Control Class Post-test Values

Class	Interval Class	Frequency	Relative (%)
1	65-69	6	24.00
2	70-74	5	20.00
3	75-79	5	20.00
4	80-84	5	20.00
5	85-89	2	8.00
6	90-95	2	8.00
Total		25	100.00

Based on the analysis results of the most frequent experimental class values obtained in the range of values 70-84, the total relative frequency of the three is 60% of the total 100%. The analysis of the frequency distribution of the pre-test and post-test of the experimental and control classes above shows that the experimental class has the highest frequency of scores above KKM (minimum completeness criteria). In contrast, in the control class, the highest frequency is found in scores below KKM. To provide a broader picture, the frequency distribution calculation data can be seen in the form of bar graphs in Figure 3 and Figure 4.

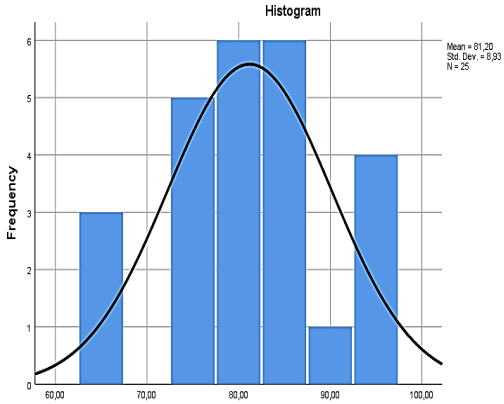

Figure 3. Histogram of Experimental Class Post-Test

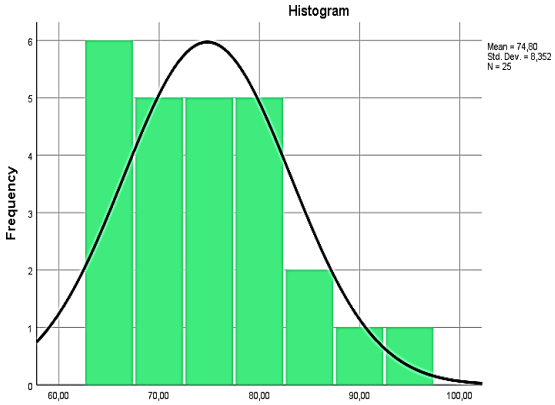

Figure 4. Histogram of Control Class Post-Test

The difference between the experimental and control classes may be seen in the post-test histograms: the experimental class's highest score exceeds the KKM score (75), while the highest score of the control class is less than the KKM (75).

Researchers have established which part is the experimental group and which is the control group, each given different treatment and subjects so that the sample is independent. Df, or degree of freedom, shows the number of samples. If the number of samples used is large from 50 respondents who are divided into 25 respondents from the experimental class and 25 respondents from the control class, then the Kolmogorov-Smirnov normality test is used, and if the sample is smaller than 50 respondents, the Shapiro-Wilk is used (Arikunto, 2019). From the data examined by the researcher, 50 respondents were used, so data based on the Kolmogorov-Smirnov normality test was used. Based on the acquisition of the normality test in Table 6, the data acquisition is evidenced by the post-test results for the experimental class of 0.200 and the control of 0.112; thus, this shows that the two data are normally distributed; it can be seen from the normal conditions if P >0.05 is normally distributed. Furthermore, knowing the results of homogeneity is done by leveraging statistics.

Table 6. Normality Test Results

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Class	Statistic	df		Statistic	df	Sig.
Student learning outcomes	Experimental Pre-Test	.230	25	.120	.922	25	.057
	Experimental Post-Test	.135	25	.200*	.924	25	.062
	Control Pre-Test	.142	25	.200*	.921	25	.055
	Post-Test Control	.157	25	.112	.915	25	.067

A homogeneity test was carried out to determine whether the sample studied was homogeneous. The statistics used to test the similarity of variance used the T-test (Sugiyono, 2015).

Based on the results obtained in Table 7 shows the results of the data using the homogeneity test on the post-test of the two classes, where based on the average value of the two data (Based on Mean), the significance value is 0.927, means this value is > 0.05. This means that the two data have the same or homogeneous variance. Researchers only use one basic standard for making decisions about this homogeneity test because the average and median values have a significance value of more than 0.05. The hypothesis test is carried out after calculating the average good results of learning outcomes from the pre-test and post-test, normality test, and homogeneity. This study uses hypothesis testing by looking at the significance value of the t-test, and then the hypothesis's conclusion is drawn.

Table 7. Homogeneity Test Results

		Levene Statistic	Sig.
Results	Based on Mean	.008	.927
	Based on Median	.018	.895
	Based on Median and with adjusted df	.018	.895
	Based on trimmed mean	.016	.900

The t-test was conducted to test the research on the regression coefficient partially; this test was conducted to determine the partial role of the independent variable on the dependent variable by assuming that other variables are considered constant (Sugiyono, 2014). The t-test called the partial test, shows how far one independent variable individually explains the dependent variable.

Test form:

Ho : There is no difference in learning outcomes using Web-Based E-Learning learning media with conventional learning models in the Class X TITL Electrical Engineering Drawing subject at SMK Negeri 3 Tondano.

Ha : There are differences in learning outcomes using Web-Based E-Learning learning media and conventional learning models in Class X TITL Electrical Engineering Drawing at SMK Negeri 3 Tondano.

Decision-making criteria:

1. If t count > t table or t sig > 0.05, Ho is rejected, and Ha is accepted.
2. If t count < t table or if t sig < 0.05, Ho is accepted, and Ha is rejected.

Based on the t-test in Table 8, it can be seen that the significance value is greater than 0.05, namely 0.927 > 0.05; this indicates that Ho is rejected and Ha is accepted. This means there are differences in learning outcomes using Web-Based E-Learning learning media with conventional learning models in the Class X TITL Electrical Engineering Drawing subject at SMK Negeri 3 Tondano. In the F test, the hypothesis is rejected because the value of the f test is greater than 0.05, namely 0.056 > 0.05.

Table 8. T-test results

		F	Sig.	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Results	Equal variances assumed	.056	.927	41	.025	6.03333	2.59371	.79522	11.2714

Website-based e-learning learning media applied to class X TITL 1 (experimental) and conventional learning media applied to class X TITL 2 (control) SMK Negeri 3 Tondano aims to determine student learning outcomes and whether there is a significant difference between the results of student learning in learning Electrical engineering drawings.

From the research results, the post-test average scores for the experimental class using the Web-based E-Learning learning model and the control class using

conventional learning methods were 81.20 and 74.80, respectively.

This is caused by differences in the level of mastery of the students' material on the material being taught after applying different learning models to the two samples (Ismail, 2006) namely the Web-based E-Learning learning model and conventional learning models. Thus, it can be stated that student learning outcomes in the experimental class using the Website-based E-Learning learning model are better than the control class using conventional learning models.

The results of testing the hypothesis are based on the T-test where the significance value exceeds 0.05, namely 0.927 > 0.05. This data is also supported by normality test data where the data is normally distributed because the significance value of the post-test for both classes is > 0.05, and in the homogeneity test, the data is homogeneous because the value is based on mean 0.927 > 0.05. This shows that Ho is rejected and Ha is accepted, which means there are differences in learning outcomes using Web-Based E-Learning learning media with conventional learning models in the Class X Electrical Engineering Drawing subject at SMK Negeri 3 Tondano.

IV. CONCLUSION

After doing the research and getting the results, it can be concluded that there are differences between conventional learning and learning using the Website-based E-Learning learning model. The experimental class that used the Web-based E-Learning model got an average score of 81.20, and the control class that used the conventional model got an average score of 74.80. Besides that, it can also be seen from the results of hypothesis testing using the t-test, where the significance value of 0.927 is more than 0.05. In learning using the Website-based E-Learning learning model, students are more enthusiastic when the learning process takes place, and there is an increase in student learning outcomes. The learning model does not confuse students and takes the right learning model.

Thus, it can also be concluded that using the Web-based E-Learning learning model is more influential in improving student learning outcomes than using conventional learning methods.

For TITL teachers in the teaching and learning process, especially in teaching Electrical Engineering drawing material, they should apply a website-based E-Learning learning model to foster students' interest in the next learning process. As input material for students and students, the Website-based E-Learning model can improve the learning outcomes of students' Electrical Engineering Drawings. Conduct further research on this issue by comparing the application of the Web-based E-Learning model with other learning models and methods.

REFERENCES

Arikunto, S. (2019). *Dasar-Dasar Evaluasi Pendidikan (Edisi Revisi)*. Bumi Aksara.

Hussain, F. (2012). E-learning 3.0 = e-learning 2.0 + WEB 3.0? *IADIS International Conference on Cognition and Exploratory Learning in Digital Age, CELDA 2012*, *Celda*, 11–18. https://doi.org/10.9790/7388-0333947

Ismail, A. (2006). Penerapan model pembelajaran children learning in science (CLIS) berbantuan multimedia untuk meningkatkan penguasaan konsep Fisika siswa SMA. *Jurnal Petik*, *1*(1), 19–25.

Koloway, J., & Kattie, C. (2023). The Use of Trainer Kits to Improve Learning Outcomes of Electrical Lighting Installation. *JURNAL EDUNITRO Jurnal Pendidikan Teknik Elektro*, *3*(1), 19–30. https://doi.org/10.53682/edunitro.v3i1.5488

Kumar Basak, S., Wotto, M., & Bélanger, P. (2018). E-learning, M-learning and D-learning: Conceptual definition and comparative analysis. *E-Learning and Digital Media*, *15*(4), 191–216. https://doi.org/10.1177/2042753018785180

Kusmana, A. (2011). E-Learning Dalam Pembelajaran. *Lentera Pendidikan: Jurnal Ilmu Tarbiyah Dan Keguruan*, *14*(1), 35–51. https://doi.org/10.24252/lp.2011v14n1a3

Lembong, J., & Tatali, Y. (2023). Improving Learning Outcomes of Electrical Lighting Installation with Project-Based Learning at SMKN 3 Tondano. *JURNAL EDUNITRO Jurnal Pendidikan Teknik Elektro*, *3*(1), 1–8. https://doi.org/10.53682/edunitro.v3i1.5351

Mamahit, C. E. J. (2019). ANALYSIS TO THE INFLUENCE OF TIME MANAGEMENT AND TEACHING MOTIVATION ON LECTURER'S PERFORMANCE. *Jurnal MANAJERIAL*, *18*(1). https://doi.org/10.17509/manajerial.v18i1.11002

Mamahit, C. J. (2021). Blended Model of Distance Learning: Does It Effective? *Jurnal Pendidikan Teknologi Kejuruan*, *3*(4), 176–186. https://doi.org/10.24036/jptk.v3i4.15223

Mardapi, D., Hadi, S., & Retnawati, H. (2015). MENENTUKAN KRITERIA KETUNTASAN MINIMAL BERBASIS PESERTA DIDIK. *Jurnal Penelitian Dan Evaluasi Pendidikan*, *19*(1), 38–45. https://doi.org/10.21831/pep.v19i1.4553

Mohammad Saleh, A., Mandagi, G., & Kaligis, G. (2023). The Effect of Workshop Facilities on Practice Learning Outcomes of Students of SMKN 1 Tomohon. *JURNAL EDUNITRO Jurnal Pendidikan Teknik Elektro*, *3*(1), 63–70. https://doi.org/10.53682/edunitro.v3i1.5779

Mokalu, A., Mamahit, C., & Sanger, R. (2021). Peningkatan Hasil Belajar dengan Pembelajaran Demonstrasi di Kelas X Jurusan TITL SMKN 2 Manado. *JURNAL EDUNITRO: Jurnal Pendidikan Teknik Elektro*, *1*(2), 19–26. https://doi.org/10.53682/edunitro.v1i2.1045

Nasution, M. K. (2017). Penggunaan metode pembelajaran dalam peningkatan hasil belajar siswa. *STUDIA DIDAKTIKA: Jurnal Ilmiah Bidang Pendidikan*, *11*(1), 9–16.

Pradiatiningtyas, D., & Suparwanto. (2017). E-Learning Sebagai Media Pembelajaran Berbasis Web Pada Smk N 4 Purworejo. *Ijsn*, *7*(2), 1–8. https://doi.org/http://dx.doi.org/10.55181/ijns.v7i2.1499

Rizaldi, Riyan, D., Makhrus, M., & Doyan, A. (2019). Analisis tingkat kemampuan berpikir kritis dengan model perubahan konseptual ditinjau dari gaya belajar siswa. *Jurnal Pendidikan Fisika Dan Teknologi*, *5*(1), 74–81.

Saptono, Y. J. (2016). Motivasi dan Keberhasilan Belajar Siswa. *Jurnal Pendidikan Agama Kristen*, *1*(1), 189–212.

Sugiyono. (2014). Metode Penelitian Pendidikan pendekatan Kuantitatif, Kualitatif dan R&D. In *METODE PENELITIAN ILMIAH*.

Sugiyono. (2015). *Statistik untuk Penelitian*. Alfabeta.

Usman, U., Badiun, B., & Sangi, N. (2022). The Influence of Interest and Creativity on Learning Achievement Students of SMKN 1 Tongkuno. *JURNAL EDUNITRO Jurnal Pendidikan Teknik Elektro*, *2*(2), 81–88. https://doi.org/10.53682/edunitro.v2i2.4067

Wahyudi, I., & Neviyarni, N. (2021). Analisis Terhadap Perhatian Dan Belajar Perseptual Dalam Aktivitas Belajar Siswa. *Edukatif : Jurnal Ilmu Pendidikan*, *3*(1), 124–134. https://doi.org/10.31004/edukatif.v3i1.231