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The Differences Of E-Learning Web Course Based On Mathematics Learning Achievement At Grade XI

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Abstract. Media Web Course is the use of the internet for educational purposes, where students and teachers are completely separate and no face-to-face is required. The objectives of this study are: (1) To find out whether there are differences in mathematics learning outcomes based on the e-learning learning method using the web course model (2) To determine whether there are differences in mathematics learning outcomes based on the level of student independence and (3) To determine whether there is an interaction between the e-learning learning method using the web course model and the level of student independence. The method used is an experimental research method. The research design used is a factorial design. The data analysis technique used is two-way analysis of variance. The results of this study are: (1) there is an influence between the use of web-based learning media on student learning outcomes obtained from the analysis of hypothesis testing (2) there is an influence between student learning independence and student learning outcomes (3) there is no interaction between student learning independence and learning outcomes using web media.

keywords: Learning Outcomes, Learning Independence, Web course

Perbedaan Pembelajaran E-Learning Web Course Berdasarkan Hasil Belajar Matematika Di Kelas XI

Abstrak: Media Web Course adalah penggunaan internet untuk keperluan pendidikan, yang mana peserta didik dan pengajar sepenuhnya terpisah dan tidak diperlukan adanya tatap muka. Tujuan penelitian ini adalah : (1) Untuk mengetahui apakah ada perbedaan hasil belajar matematika berdasarkan metode pembelajaran e-learning menggunakan model web course (2) Untuk mengetahui apakah ada perbedaan hasil belajar matematika berdasarkan tingkat kemandirian siswa dan (3) Untuk mengetahui apakah ada interaksi antara metode pembelajaran e-learning menggunakan model web course dengan tingkat kemandirian siswa. Metode yang digunakan adalah metode penelitian eksperimen. Desain penelitian yang digunakan adalah desain factorial. Teknik analisis data yang digunakan adalah analisis variansi dua jalur. Hasil penelitian ini adalah : (1) terdapat pengaruh antara penggunaan media pembelajaran berbasi web terhadap hasil belajar siswa yang diperoleh dari analisis pengujian hipotesis (2) terdapat pengaruh antara kemandirian belajar siswa dengan hasil belajar siswa (3) tidak terdapat interaksi antara kemandirian belajar siswa dengan hasil belajar menggunakan media web.

Kata Kunci : Hasil Pembelajaran, Kemandirian Belajar, Web

INTRODUCTION

At the beginning of 2020, a case emerged that attacked several countries, even all affected countries. This case is in the form of a virus that is known to have originated in China.

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The virus is known as COVID-19 (Corona Virus Desese-2019) which is a dangerous virus and easily transmitted to fellow humans. This virus has resulted in many fatalities because the way of transmission is very fast. This case ends differently in each country, because it follows the rules of each country. Various policies have been carried out by the government to break the chain of transmission of the COVID-19 virus, such as physical distancing, PSBB (Large-Scale Social Restrictions) and other policies. Policies made by the government have an impact on various fields and one of them is the field of education (Widiana, 2022).

This case resulted in learning that was originally done offline (outside the network) or often referred to as face-to-face now has to become online learning (in the network) or face-to-face learning (Heru, 2018). Offline learning system is learning using media, such as books, modules, printed teaching materials, and so on. During offline learning, all participants are in the same location or space, physically present, do not use network technology in communication. While the online learning system is learning that utilizes the internet network at the time of its implementation. The online learning system is a transformation of conventional education into digital form so that it has its own challenges and opportunities (Rismawati, 2021).

So that distance learning is one of the solutions in the field of education today. The COVID-19 outbreak has prompted testing of distance education that has almost never been conducted simultaneously before (Munawar et al., 2018). Conditions like this really pressure the teacher to make various innovative ways of learning so that it is not boring and can also be well received by students. The method that will be used in online learning must be well prepared. Thus, in the online learning process, parents play an important role in supervising and monitoring students while at home (Muthy & Pujiastuti, 2020). Parents must really supervise their children so that they continue to follow the learning even though it is through a distance (Winata et al., 2021).

Education is an effort to prepare the younger generation to welcome and face developments in the global era (Nurrita, 2018). The teaching method is a way or path that must be passed in teaching(Slameto, 2003). This means that it is a method used to implement plans that have been prepared in real activities so that the goals that have been prepared are achieved optimally. Efficient learning methods are currently needed to be applied to the learning process, so that students who carry out the learning process can achieve the desired goals and are also not bored in learning. In other words, the strategy is "a plan of operation achieving something" while the method is "a way in achieving something"(Sanjaya, 2007). E-learning (Electronic Learning) as any teaching and learning that uses electronic circuits (LAN, WAN, or internet) to deliver learning content, interaction, or guidance (Kumar, 2022). Learning independence is very important in the student learning process, problems that can occur from low learning independence that have an impact on declining student achievement or learning outcomes, lack of student responsibility and dependence on others in making decisions and in doing school assignments. Media is a component of learning resources or physical vehicles that contain instructional materials in the learning environment that can stimulate students to learn. Learning media are everything that can be used to channel

messages (learning materials), so that they can stimulate students' attention, interests, thoughts and feelings in learning activities to achieve certain learning goals (Sumarwati et al., 2020).

The biggest problem in learning today is the lack of active students during the learning process, resulting in decreased and not optimal learning outcomes. Learning outcomes are a process to determine student learning scores through assessment and measurement activities in the form of learning outcomes tests (Mudjiono, 2006). Learning outcomes can be seen from changes in student behavior, which can be observed and measured in the form of changes in knowledge, attitudes and skills. Mathematics learning carried out at SMK N 3 Wonoari while online is by creating a whatsapp group, google class room, and then doing the tasks given through the google class room in the form of a google form. Then for the delivery of material never use video conferencing because of several obstacles that occur. The obstacle is the lack of adequate facilities owned by students, causing the delivery of material only by providing a pdf or tutorial on youtube(Zainudin, 2021). The independence of students' learning during the pandemic has greatly decreased because learning so far has been less interesting or seems difficult to understand, so students often delay the assignments that have been given. Therefore, it is necessary to find a solution so that students can still receive learning well, also when learning is not boring and students remain active (Wu et al., 2018).

Through this research, a Learning Media in the form of a Web Course will be tried where students are provided with a Web containing material, practice questions, assignments and others so that it is hoped that students will find it easier to learn. For this reason, researchers want to examine how the influence of the e-learning web course learning method on mathematics learning outcomes in terms of the independence of students in class XI Industrial Electronic SMK N 3 Wonosari.

METHOD

This type of research is experimental research. According to (Sugiyono, 2012) experimental research methods are defined as research methods used to find the effect of certain treatments on others under controlled conditions. In general, this study aims to compare mathematics learning outcomes between those using conventional learning models and web-course models with the control variable being student learning independence. The researcher used a factorial design (Factoral Experimental Design). Factorial design is an application of regression equations, namely a technique to model the relationship between response variables and one or more independent variables. Data collection techniques in this study are questionnaire techniques and test techniques. The population is a generalization area consisting of objects or subjects that have certain quantities and characteristics determined by the researcher to be studied and then draw conclusions. In this study the population was students of SMK N 3 Wonosari class XI majoring in Industrial Electronics as many as 108 students. The sample is part of the number and characteristics possessed by the population.

The sample in this study was part of the overall class XI students majoring in Industrial Electronics at SMK N 3 Wonosari for the 2021/2022 academic year, 1 class with even attendance of 17 students as the experimental class and 17 students odd absence as the control class. Sampling technique is a sampling technique. Sampling in this study was using simple random sampling. The simple random sampling technique is the simplest sampling procedure that is carried out fairly, meaning that each unit is an equal opportunity to be selected. From the results of sampling obtained class XI EI 3 a total of 34 students. The experimental class is 17 students and the control class is 17 students. The instrument of this research is a test instrument for mathematics learning outcomes and a questionnaire instrument for student learning independence. The test of the question instrument uses the validity test, the level of difficulty of the questions, the discriminating power and reliability, while for the anget instrument test uses the validity test and the reliability test.

The data analysis technique used in this study is the difference test and prerequisite analysis test. The difference test in this study is to use the t-test formula to test the significance of the differences between the two averages derived from the two distributions (Nikmatur, 2017). The form of the formula used is as follows:

$$t = \frac{x_1 - x_2}{\sqrt{S^2\left(\frac{1}{n_1}\right)+\left(\frac{1}{n_2}\right)}}$$

Where $s^2 = \frac{(n_1-1)S_1^2+(n_2-1)S_2^2}{n_1+n_2-2}$

t = value of t count

x_1= the average score of the experimental class taught using the model Lecture

x_2 = the average score of the experimental class taught using the model *web course*

n_1= the number of students taught by the lecture model

n_2 = = the number of students taught by model *web course*

s_1^2 = the standard deviation of students taught by the lecture model

s_2^2= = the standard deviation of students taught by model *web course*

Thus, if the value of t count < t table at a significant level with degrees of freedom (dk) = n_1 + n_2 − 2, then there is a significant difference

The analysis prerequisite test consists of the following:

1. Normality Test

Normality test aims to determine whether the dependent variable, independent, or both are normally distributed, close to normal

Normality testing is carried out using the Kolmogorov Smirnov method, with the following formula:

$$D = maks|f\ o\ (x) - s(x)|$$

Where

D = kolmogorov smirnov value count

$f\ o\ (x)$ = theoretical cumulative frequency

(x) = cumulative frequency of observation

2. Homogeneity Test

Homogeneity test is used as a reference material to determine statistical test decisions.

Testing with Levene's test can be done with the following formula:

$$W = \frac{(n-k)\sum_{i=1}^{k} n_1(\bar{Z}_i - \bar{Z})^2}{(k-1)\sum_{i=1}^{k}\sum_{j=1}^{k} n_1\left(\bar{Z}_{ij} - \bar{Z}_i\right)^2}$$

n = number of student

k = number of class

Z_{ij} = $|Y_{ij} - Y_t|$

Y_i = average of group i

$\bar{Z}_i$= average group of Zi

$\bar{Z}$ = average all Z_{ij}

Hypothesis testing

Tests in this study used two-way analysis of variance (Two Way Anova) at a significant level $\alpha = 0{,}05$

Analysis of variance is widely used in studies that involve comparative testing, namely testing the dependent variable by comparing it to the observed independent sample groups (Arigiyati & Istiqomah, 2019)

The steps for two-way ANOVA testing are as follows:

Sumber Variasi	Jumlah Kuadrat (JK)	Db	Mk	F_o	P
Antar A	$JK_A = \frac{\sum(\sum XA)^2}{nA} - \frac{(\sum XT)^2}{N}$	$A - 1\ (2)$	$\frac{JKA}{dbA}$	$\frac{MKA}{MKd}$	
Antar B	$JK_B = \frac{\sum(\sum XB)^2}{nA} - \frac{(\sum XT)^2}{N}$	$B - 1\ (2)$	$\frac{JKB}{dbB}$	$\frac{MKB}{MKd}$	
Antara AB (Interaksi)	$JK_{AB} = \frac{\sum(\sum XAB)^2}{nA} - \frac{(\sum XT)^2}{N} - JK_A - JK_B$	$db_A \times d_bB(4)$	$\frac{JKAB}{dbAB}$	$\frac{MKAB}{MKd}$	
Dalam (d)	$JK_d = JK_T - JK_A - JK_B$	$db_T - db_A - db_B - db_{AB}$	$\frac{JKd}{dbd}$		
Total (t)	$JK_T = \sum {X_T}^2 - \frac{(\sum XT)2}{N}$	$N - 1(49)$			

4. Post-Anova Test

Scheffe test is carried out through the F-Fosher Snedecor sampling probability distribution.

With the following formula:

$$F_{i-j} = \frac{\left(\overline{X}_i - \overline{X}_J\right)^2}{RKG\left(\frac{1}{n_i} - \frac{1}{n_j}\right)}$$

RESULT DAN DISCUSSION

This research is an experimental study conducted on class XI SMK students from several schools in Gunungkidul in the even semester of the 2021/2022 academic year. Based on the results of the balance, it was found that the initial abilities of students in the control class and the experimental class were in a balanced state.

The following are the output results of hypothesis testing with SPSS 22.0 for windows:

Table 1. Two Path Anova Test Output

Item Name	Mean	F_{hitung}	*Sig*
Learning Model	802,222	8,706	0,006
independence	842,208	9,140	0,001
independence* class	75,762	0,822	0,450

From the results of the hypothesis test output with two-way ANOVA, it can be seen in the test of Between-Subjects Effects that the Learning Model is 0.006 , then 0.006 < 0.05, H_0 is rejected. So it can be concluded that there is an influence between the web course learning model and the learning outcomes of class XI EI 3 students at SMK N 3 Wonosari, then Independence with a significance value of 0.001, then 0.001 < 0.05, H_0 is rejected. So it can be concluded that there is an influence between student learning independence and student learning outcomes in class XI EI 3 SMK N 3 Wonosari. The significance value of the Learning Model is 0.006 , then 0.006 < 0.05, H_0 is rejected. So it can be concluded that there is an influence between the web course learning model and the learning outcomes of class XI EI 3 students of SMK N 3 Wonosari, the significance value of Independence and Learning Model is 0.450, then 0.450 > 0.05, H_0 is accepted. So it can be concluded that there is no interaction between students' learning independence and the web course learning model for class XI EI 3 students at SMK N 3 Wonosari.

Based on the presentation of the data and the results of data analysis, this section will discuss the results of hypothesis testing as a basis for making conclusions. The discussion is as follows:

1. First Hypothesis

The calculation of the Two Way Anova test shows that the significance value is less than with α where 0,006 < 0,05 that H_0 rejected or H_0 accepted. This means that there is an influence of the web course learning model on student learning outcomes.

Based on the results of the hypothesis testing above, the hypothesis testing is proven correct, so the researcher concludes that the web course learning model improves learning outcomes more than the lecture learning model. This is because the web course learning model has several advantages compared to lecture or conventional learning, web course learning can be accessed by students anytime, anywhere so there is no time limit for students to learn. Students are easier to access the material and also more flexible to learn. The score taking used is using the Live Work Sheet which makes it very easy for students and teachers, because they will immediately see how the score is getting after they work on the question.

The effect of learning using a web-based learning model is also the same as previous research, namely by using a web learning model, student learning outcomes are better than the previously applied learning model. Because basically the web learning model makes it easier for students to learn without any time and place restrictions.

2. Second Hypothesis

In the calculation of the Two Way Anova test, it shows that the significance value is smaller than with a value of 0.001 < 0.05 so that $\boldsymbol{H_0}$ rejected or $\boldsymbol{H_0}$ accepted**.**. This means that there is an influence of student learning independence on student learning outcomes.

Based on the results of hypothesis testing above, the hypothesis testing is proven correct, so the researchers conclude that the level of student independence affects student learning outcomes. This happens because many students have moderate and low levels of learning independence so that it affects the learning outcomes of mathematics. If students have a high level of learning independence, their mathematics learning outcomes will also be high. In previous studies that the level of student learning independence using the web learning model was higher than students with the previous learning model, this is also the same as the results of this study. Where the level of independence of students who use the web learning model has higher mathematics learning outcomes than the level of independence of students who do not use the web learning model. So previous studies with the results of this study are in line because the results have the same effect on students' mathematics learning outcomes.

3. Third Hypothesis

In the calculation of the Two Way Anova test, it shows that the significance value is smaller than with a value of 0.450 <0.05 so that $\boldsymbol{H_0}$ accepted or $\boldsymbol{H_0}$ rejected**.** This means that there is no interaction between student learning independence and the learning model used.

Based on the results of testing the hypothesis above, the hypothesis testing is not proven, so the researcher concludes that there is no interaction between student learning independence and the applied learning model. In this study, there was no interaction between learning independence and the applied learning model, if you look at the results it is proven that the learning model and independence affect learning outcomes, so it cannot be stated that the main factor is independence, while the supporting factor is the learning model. It can also be interpreted that the interaction of the level of independence with the learning model does not have a significant joint influence on students' mathematics learning outcomes . The increase in student learning outcomes is caused by differences in learning models. This has also been proven in previous research by Arifin & Herman (2018).

Students who are given learning treatment using the web course method have higher learning outcomes compared to students who are given learning treatment using the lecture method. The level of independence between students who were given learning treatment with the web course method and the lecture method was also different. This is because during the learning process using the web course method students are more flexible to learn without any time limit and can also repeat what material is given without having to ask the teacher, and make students more independent in the learning process. The use of the web course learning method is also very influential on learning outcomes. Hypothesis testing using the

two-way ANOVA test (Two Way Anova) is used to determine the truth of the proposed hypothesis, based on the normality test and homogeneity test, then the data on the value of learning outcomes and student motivation can be arranged in a table presenting the two-way ANOVA calculation (Two Way Anova). Provided that if the significance value or probability value is < 0.05 then H_0 is rejected and if the significance value or probability value is .05 then H_0 is accepted.

CONCLUSION

Based on the formulation of the problem, hypothesis and research results, it can be concluded that there is a positive and significant influence on the research entitled "The Effect of E-Learning Web Course Learning Methods on Mathematics Learning Outcomes in terms of the Independence of Class XI Students of Industrial Electronics Department at SMK Negeri 3 Wonosari " Based on the data that has been collected and the tests that have been carried out using the two-way analysis of variance method, the following conclusions can be drawn: 1). There is a positive and significant effect between conventional learning and learning using a web course based on the results of testing research hypotheses. This means that learning using a web course improves students' mathematics learning outcomes than before. This is evidenced by the value of the t-test results which show that t_{count} $15{,}445$ > t_{table} $0{,}3388$. So it can be stated that the hypothesis is accepted based on the assumptions of the previous hypothesis. 2). There is a positive and significant influence between student learning independence and conventional learning by learning using a web course based on the results of testing the research hypothesis. This means that student independence is higher when using the web course learning model than the conventional learning model. 3). There is no interaction between learning independence and the learning model used based on the results of the research hypothesis test. This means that any learning model used does not have an interaction with student learning independence.

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