

# The effectiveness of online learning using moodle in improving understanding of the equipment and completeness of electrical engineering drawings for vocational school students

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## ABSTRACT

This study aims to determine the effectiveness of-assisted online learning Moodle, the difference in effectiveness between-assisted online learning Moodle and WhatsApp Group, and a comparison of the effectiveness between-assisted online learning-assisted learning Moodle and WhatsApp Group in improving students' understanding of the equipment and completeness of electrical engineering drawings. This research is quantitative research with a quasi-experimental type using a design nonequivalent control group. The population in this study were all students of class X from SMK Negeri 2 Yogyakarta with competency in electrical power installation engineering expertise consisting of four classes. Classes X. TITL-1 and X. TITL-2 were determined as a random sample. Both classes were given instruments pre-test and post-test to measure students' understanding of the equipment and completeness of electrical engineering drawings. To test the effectiveness of online learning, the one sample t-test was used, the difference in effectiveness was used the paired sample t-test, and the comparison of effectiveness used the independent sample t-test. The results of this study indicate: (1)-assisted online learning is Moodle effective in improving students' understanding of equipment and electrical engineering drawings; (2) there is a difference in effectiveness between online learning assisted by Moodle and WhatsApp Group in improving students' understanding of the equipment and completeness of electrical engineering drawings; and (3)-assisted online learning is Moodle more effective than-assisted online learning WhatsApp Group in improving students' understanding of equipment and electrical engineering drawings.

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## 1. Introduction

Over the past three years there have been changes in educational activities around the world due to the co-19 pandemic. In Indonesia, including in the Province of DI Yogyakarta, very significant changes have occurred in teaching and learning activities. Learning that was originally done face-to-face now has to be done remotely. Likewise in the use of learning methods, educators are required to use online learning methods. Sugandi (2020) revealed that the use of online learning methods that are not in accordance with the characteristics of the material and students will affect the learning achievements of students. The use of online learning methods will be ineffective if the media used does not support learning features (for example using the WhatsApp Group), educators lack understanding of technology, and the conditions of the internet network in each region vary (Kholifah, Irwanto, Ramdani, & Nurtanto, 2020).

The online learning method WhatsApp Group has several drawbacks, one of which is limited features. WAG is intended for communication media or social media (Mpungose, 2020; Muhfizaturrahmah, Hermaniar, & Mubaraq, 2021). This can be seen from WAG which only provides short message, voice message, video message, and file sharing features. In contrast to Moodle (MDL), which is intended as a Learning Management System (LMS). This can be seen from the completeness of the learning features provided, starting from attendance features, learning materials, various forms of assessment, discussion forums and other learning features (Mpungose, 2020; Mustofa, Chodzirin, Sayekti, & Fauzan, 2019). In other words, WAG and MDL are indeed different in terms of completeness of features. However, the facts on the ground are that many educators use WAG as a tool or media in online learning.

Yogyakarta State Vocational School 2 is one of the educational institutions that is also implementing Distance Learning during the current pandemic. Based on the results of initial observations when carrying out Educational Practices at the school, the teaching and learning process in class still uses Blended Learning (face to face for practical subjects and online for theoretical subjects). For online learning, educators use WAG and MDL as learning media. The use of WAG itself is very popular with educators because of its convenience compared to MDL. According to educators, MDL is difficult to use and takes time to adjust. Even so, educators are still aware of the limitations of WAG and the completeness of MDL features as a learning medium in improving student learning achievement.

Electrical Engineering Drawing is one of the basic subjects in the Electrical Engineering Skills Competency Vocational School intended for class X students at SMK Negeri 2 Yogyakarta, this subject is given in the form of theory and practice. In general, the content of this subject is related to the concepts and rules of technical drawings; drawing lines based on shape and function of lines; technical drawing letter, number and etiquette symbols; electrical control circuit drawings; electronic circuit drawings; drawings layout electronic circuit PCB and the type software for drawing electrical and electronic control circuits (Directorate for Development of Vocational High Schools Number 330/D.D5/KEP/KR/2017). If you pay attention to the content of these lessons, the use of online media such as WAG which is widely used by educators is very ineffective. On the other hand, MDL with all its features, it can support the learning process of Electrical Engineering Drawing subjects with content that combines text, images, audio, and video online (Batubara, 2018).

Research related to the online learning method itself has been carried out by many researchers before, but it is more focused on the use of WAG. Meanwhile, the findings from Rachmat & Krisnadi (2020) show that the use of WAG is less effective in increasing student understanding. Likewise with the findings from Daheri et al. (2020) which states that online learning through WAG tends to be ineffective. On the other hand, research related to online learning methods using MDL at the high school level not much has been done. Previous research regarding the use of MDL in online learning also focused more on the tertiary level (Pancawati & Siswandi, 2020; Widodo & Hidayah, 2020; Yuliantini, Setiono, & Amaliyah, 2020).

Based on some of the research literature that has been discussed previously and the problems faced by SMK Negeri 2 Yogyakarta, there is incomplete information received by educators regarding the use of MDL as a medium in online learning. It is hoped that this research will provide a more comprehensive picture regarding the effectiveness of online learning methods in increasing students' understanding of equipment and completeness of electrical engineering drawings in Vocational High

Schools. It doesn't just stop there; this information can also become the foundation or basis for educators to be more active in studying and using MDL as an online learning medium in the future.

## 2. Method

### 2.1. Types of Research

This research is quantitative research of the quasi-experiment type considering that the learning achievement of students in this case is measured the level of understanding related to equipment and completeness of electrical engineering drawings that can be influenced by many factors. In addition, it is impossible to sample randomly or for reasons of practicality or ethical reasons. Likewise, the groups given treatment come from preconceived classes in daily learning at school.

### 2.2. Time and Place of Research

This research was conducted at SMK Negeri 2 Yogyakarta in class X students of the Electrical Installation Engineering Skills Competency in the odd semester of the 2021/2022.

### 2.3. Sample

The population in this study were all students of class X from SMK Negeri 2 Yogyakarta with competence in electrical installation engineering expertise consisting of four classes. X.TITL-1 and X.TITL-2 classes were determined as a random sample. Furthermore, from the two classes were randomly selected to determine the treatment given so that class X.TITL-1 was selected to apply the MDL assisted online learning method and class X.TITL-2 applied the WAG assisted online learning method.

### 2.4. Procedure

The experimental design used in this study was a nonequivalent control group. The choice of this design was adjusted to the objectives of the researcher who wanted to find out the effectiveness of online learning by utilizing MDL and its differences from WAG in increasing students' understanding of equipment and completeness of electrical engineering drawings. In addition, the selection of this design is to minimize threats to the internal and external validity of the research results. The research design that will be used can be seen in Table 1.

**Table 1.** Design of Nonequivalent Control Group

| Group          | Pre-Test       | Treatment | Post-Test      |
|----------------|----------------|-----------|----------------|
| Experiment (E) | O <sub>1</sub> | X         | O <sub>2</sub> |
| Control (K)    | O <sub>3</sub> | -         | O <sub>4</sub> |

Keterangan:

- E = Experimental Group (MDL)
- K = Control Group (WAG)
- X = Treatment
- O<sub>1</sub> = Preliminary test of experimental group
- O<sub>2</sub> = Pretest of control group
- O<sub>3</sub> = Posttest of experimental group
- O<sub>4</sub> = Posttest of control group

### 2.5. Data Collection Technique

Students' understanding of equipment and completeness of electrical engineering drawings were obtained through a multiple-choice test technique consisting of 20 questions. There are two instruments used to measure students' understanding of the equipment and completeness of electrical engineering drawings, namely the pre-test instrument and the post-test. Both instruments measure the same thing because they are based on the same instrument grid. instruments pre-test and post-test used in this study have been proven valid, have a high reliability coefficient, and have good grain characteristics.

The validity of the instruments used in this study was proven by content and constructs. Content verification is carried out through validation by three experts, namely experts in the fields of study, subjects, and education measurement. The results of the assessment of the three experts were then calculated using the Aiken validity index equation (Retnawati, 2016). The calculation results show that the Aiken coefficient of the pre-test 0.81 (very valid) and the post-test 0.82 (very valid). To prove the validity of the instrument constructively, exploratory factor analysis assisted by software JASP. The results of the analysis show that both the pre-test instruments post-test have items with a loading factor of more than 0.4 and measure one dominant factor. According to Hadi, Retnawati, Munadi, Apino, & Wulandari (2018) if the item has a loading factor of more than 0.4, it means that the item has significance or contribution in explaining what is to be measured. In other words, the instruments used in this study proved to be constructively valid for measuring students' understanding of equipment and completeness of electrical engineering drawings.

The reliability of the instruments in this study was estimated using the internal consistency method using the composite reliability formula. The composite reliability formula used is the  $\alpha$  coefficient from Cronbach (Mardapi, 2012). The coefficient  $\alpha$  in this study was calculated using the JASP software. According to Wells and Wollack (2003) that the test instrument used in class by teachers should have a minimum reliability coefficient of 0.7. Instruments pre-test and post-test used in this study were respectively 0.70 and 0.72, instruments the pre-test and post-test have good reliability.

The characteristics of the test items from the pre-test and post-test in this study were estimated using the classical rock theory test model of the software version 14.7.4. The item parameters generated from the classical test theory model are the level of difficulty and the differential power of the questions. The difficulty level of the questions ranges from 0 to 1, while the difference in power of the questions ranges from -1 to +1. The level of difficulty of a good item ranges from 0.3 to 0.8, less than 0.3 or more than 0.8, it is better if the item is revised or eliminated. Mardapi (2012) states the level of item difficulty in three categories, namely difficult ( $p < 0.3$ ), moderate ( $0.3 \leq p \leq 0.8$ ), and easy ( $p > 0.8$ ). In addition, Mardapi (2012) states that the differential power of questions can be accepted if the biserial point correlation value ( $pt\text{-}bsi$ )  $\geq 0.30$ . The results of the analysis using the software instrument pre-test all of them have good discriminating power and there are 19 items with a moderate level of difficulty and 1 item with a difficult level of difficulty instrument post-test all had good discriminating power and there were 16 items with a medium level of difficulty category and 4 items with an easy level of difficulty category. In other words, all of the items in both the pre-test and post-test used in this study had an acceptable level of difficulty and were able to distinguish between capable and incapable participants.

## 2.6. Data Analysis Techniques

Students' raw scores obtained from measurement activities before and after treatment use a scale of 0-20 which is then converted to a scale of 0-100. The scores obtained by students who have been converted are then compared with the Minimum Completeness Criteria (KKM) which has been set by the school at 70 to classify students into Complete and Incomplete categories. The criteria for completeness of students are presented in Table 2.

**Table 2.** Criteria Completeness of Understanding Equipment and Completeness of Electrical Engineering Drawings of Learners

| Interval  | Category   |
|-----------|------------|
| $\geq 70$ | Complete   |
| $< 70$    | Incomplete |

Student data related to the understanding of equipment and completeness of electrical engineering drawings obtained from pre-test and post-test instruments are then analyzed descriptively and inferentially. Descriptive analysis aims to describe the results of the learning process based on data measuring the understanding of equipment and the completeness of electrical engineering drawings obtained before and after being given treatment for each observed dependent variable. The data presented consists of averages, standard deviations, maximum values, and minimum values achieved by learners. Inferential analysis aims to statistically prove the proposed research hypothesis as well as answer the formulation of the established problem. Before carrying out the hypothesis test, an assumption test is first carried out consisting of a normality test and a homogeneity test.

### 2.6.1 Normality Test

The test aims to determine whether the data used is a sample of a normally distributed population or not. Therefore, in this study it will be tested whether the data from the pre-test and post-test of electrical engineering drawing learning achievements of students who are taught online using MDL and WAG are samples from a normally distributed population or not. The Kolmogorov-Smirnov test corrected the Dallal-Wilkinson-Lilliefor. For the calculation, it will utilize the help of the JASP application. The calculation results from the JASP application are then compared with the test criteria. As for the test criteria, if the significance value is greater than 0.05 ( $p > 0.05$ ) then the normality test is fulfilled, that is, there is no difference between the distribution of empirical data and the expected normal distribution.

$H_0$ : There is no difference between the distribution of pre-test and post-test scores in the experimental class and the control class with the expected normal distribution

$H_1$ : There is a difference between the distribution of pre-test and post-test scores in the experimental class and the control class with the expected normal distribution

#### 2.6.2 Test of Homogeneity Assumptions

Homogeneity test was carried out to find out whether the pre-test and post-test in the experimental class and control class have the same variance or not. To find out the homogeneity of the two groups' variance, a Levene's with the help of the JASP application. The hypothesis to test the homogeneity of the variance of the data group used is as follows:

$H_0$ : Pre-test and post-test scores in the experimental class and control class have the same variance

$H_1$ : Pre-test and post-test scores in the experimental class and control class have different or different variations

To test the effectiveness of online learning, the one sample t-test is used, differences in effectiveness are used by the paired sample t-test, and for comparisons of effectiveness, the independent sample t-test. The testing hypothesis is as follows:

##### 2.6.2.1 Hypothesis of Testing the Effectiveness of MDL-Assisted Online Learning

$H_0$ :  $\mu_{Moodle} < 70$  MDL-assisted online learning is not effective in improving students' understanding of equipment and completeness of electrical engineering drawings

$H_1$ :  $\mu_{Moodle} \geq 70$  MDL-assisted online learning is effective in improving the understanding of equipment and completeness of electrical engineering drawings of students

##### 2.6.2.2 Hypothesis of Testing Differences in the Effectiveness of MDL WAG-Assisted Online Learning

$H_0$ :  $\mu_{Moodle} < 70$  There is no average difference between MDL and WAG-assisted online learning in improving students' understanding of equipment and completeness of electrical engineering drawings.

$H_1$ :  $\mu_{Moodle} \geq 70$  There is an average difference between MDL and WAG-assisted online learning in improving the understanding of equipment and completeness of electrical engineering drawings of students

##### 2.6.2.3 Comparative Testing Hypothesis of the Effectiveness of MDL WAG-Assisted Online Learning

$H_0$ :  $\mu_{Moodle} = \mu_{WA}$  MDL-assisted online learning is no more effective than WAG-assisted online learning in improving students' understanding of equipment and completeness of electrical engineering drawings.

$H_1$ :  $\mu_{Moodle} \neq \mu_{WA}$  MDL-assisted online learning is more effective than WAG-assisted online learning in improving students' understanding of equipment and completeness of electrical engineering drawings

Decision criteria for rejecting the null hypothesis ( $H_0$ ) for the three hypotheses is the same, that is, if the significance value is less than the specified alpha value ( $p < 0,05$ ).

### 3. Results and Discussion

#### 3.1. Result

##### 3.1.1 Results of Descriptive Data Analysis

Online learning methods are said to be effective in increasing students' understanding of equipment and completeness of electrical engineering drawings if the overall average score of students is at least 70. Data on test results for understanding equipment and completeness of students' electrical engineering drawings at pre- test and post-test for the experimental group and control group classes are presented in Table 3.

**Table 3.** Data on Pre-Test and Post-Test Student

| Description | MDL Group |        | WAG Group |        |
|-------------|-----------|--------|-----------|--------|
|             | Pre       | Post   | Pre       | Post   |
| Average     | 50.78     | 79.53  | 53.67     | 66.91  |
| SD          | 19.96     | 15.20  | 18,02     | 17,53  |
| Min         | 10        | 50     | 25        | 35     |
| Max         | 80        | 100    | 80        | 95     |
| KKM (%)     | 21.87%    | 78.12% | 26.47%    | 55.88% |

Based on Table 3, it was obtained that the average score of the pre-test of student learning achievement in the MDL assisted learning class, namely 50. 78, which increased by 28.75 to 79.53 in the post-test average score pre-test of students' learning achievement in the WAG assisted learning class was 53.67, which increased by 13.24 to 66.91 in the post-test. In addition, based on the achievement of learning completeness of students in the MDL assisted learning class the completeness achievement of 21.87% (7 students) who achieved KKM in the pre-test increased to 78.12% (25 students) who achieved KKM in the post-test. Meanwhile, in the WAG assisted learning class, a complete achievement of 26.47% (9 students) achieved the KKM in the pre-test increased to 55.88% (19 students) who achieved the KKM in the post-test. These results indicate that the MDL-assisted online learning method is more effective in increasing students' understanding of equipment and completeness of electrical engineering drawings compared to the WAG-assisted online learning method.

##### 3.1.2 Results of Inferential Data Analysis

###### 3.1.2.1 Assumptions of Normality and Homogeneity

The results of the normality test using the Kolmogorov-Smirnov test with the Dallal-Wilkinson-Lilliefors correction are presented in Table 4.

**Table 4.** Normality Test

| Kolmog-Smirnov Test | MDL Group |        | WAG Group |        |
|---------------------|-----------|--------|-----------|--------|
|                     | Pre       | Post   | Pre       | Post   |
| StatistiC           | 0.14      | 0.12   | 0.14      | 66.91  |
| p-value             | 0.11      | 0.18   | 0.06      | 0.16   |
| Information         | Normal    | Normal | Normal    | Normal |

Based on Table 4, information is obtained that the pre-test and post-test of learning achievement in the Electrical Engineering Drawing subject in the MDL assisted class has a significance value that is greater than the alpha value of 0.05 ( $p\text{-value} > 0.05$ ). The same information was also obtained on the pre-test and post-test the learning achievement of the Electrical Engineering Drawing subject in the WAG-assisted conventional class where the resulting significance value was greater than the alpha value of 0.05 ( $p\text{-value} > 0.05$ ). Thus, it can be concluded that the null hypothesis is accepted and there is no reason to accept the alternative hypothesis. That is, there is no difference between the distribution of pre-test and post-test in the experimental class (MDL) and control class (WAG) with the expected normal distribution. The homogeneity test results using the Levene are presented in Table 5.

**Table 5.** Homogeneity Test Results

| Condition | F-Test | p-value | Information |
|-----------|--------|---------|-------------|
| Pre-Test  | 0.04   | 0.83    | Homogeneous |
| Post-Test | 0.77   | 0.38    | Homogeneous |

Based on Table 5, information is obtained that the homogeneity test of the pre-test and post-test on the learning achievement of the Electrical Engineering Drawing subject in the MDL assisted class has a significance value that is greater than the alpha value of 0.05 ( $p\text{-value} > 0.05$ ). The same information was also obtained on the pre-test and post-test the learning achievement of the Electrical Engineering Drawing subject in the WAG-assisted conventional class where the resulting significance value was greater than the alpha value of 0.05 ( $p\text{-value} > 0.05$ ). Thus, it can be concluded that the null hypothesis is accepted and there is no reason to accept the alternative hypothesis. scores pre-test and post-test in the experimental class (MDL) and control class (WAG) have the same variance (homogeneous).

### 3.1.2.2 Effectiveness of MDL Assisted Online Learning

To test the effectiveness of MDL assisted online learning methods in improving students' understanding of the equipment and completeness of electrical engineering drawings, the One-Sample T-Test. The learning achievement data of students used in the test is post-test compared to the KKM value that has been set, namely 70. The results of the One-Sample T-Test assisted classes Moodle are presented in Table 6.

**Table 6.** Learning Effectiveness Test Results Online assisted MDL

| One-Sample T-Test | MDL Group |
|-------------------|-----------|
| t                 | 3.55      |
| p-value           | 0.001     |
| Information       | Effective |

Based on Table 6, information is obtained that the resulting significance value is smaller or less than an alpha 0.05 ( $p\text{-value} < 0.05$ ). This indicates that the null is rejected. Thus, it can be concluded that online learning by utilizing MDL is effective in increasing students' understanding of equipment and completeness of electrical engineering drawings.

### 3.1.2.3 Differences in Effectiveness between MDL and WAG Assisted Online Learning

To test differences in effectiveness between MDL assisted online learning methods and WAG in improving students' understanding of equipment and completeness of electrical engineering drawings, the Independent-Sample T-Test was. The learning achievement data of students used in testing are pre-test and post-test. The results of the effectiveness difference test between the MDL-assisted experimental class and the WAG-assisted (conventional) control class are presented in Table 7.

**Table 7.** Results of the Effectiveness Difference Test between MDL and WAG Assisted Online Learning

| Independent-Sample T-Test | Pre-Test      | Post-Test            |
|---------------------------|---------------|----------------------|
| t                         | -0.62         | 3.12                 |
| p-value                   | 0.73          | 0.001                |
| Information               | No Difference | There's a Difference |

Based on Table 7 it is obtained that the results of the effectiveness test of the pre-test on student achievement in the electrical engineering drawing subject between the MDL and WAG assisted classes have a value greater significance than the alpha 0.05 ( $p\text{-value} > 0.05$ ). This shows that there is no difference in effectiveness between MDL and WAG assisted classes in increasing students' understanding of equipment and completeness of electrical engineering drawings before being given treatment. data effectiveness post-test where the resulting significance value was smaller or less than the alpha 0.05 ( $p\text{-value} < 0.05$ ). This indicates that the null is rejected. Thus, it can be concluded that after being given the treatment it was found that there was an average difference between MDL and WAG assisted online learning in increasing students' understanding of equipment and completeness of electrical engineering drawings.

### 3.1.2.4 Comparison of Effectiveness between MDL and WAG Assisted Online Learning

To follow up on the test results of differences in effectiveness between MDL assisted online learning methods and WAG in improving students' understanding of equipment and completeness of electrical engineering drawings, the Independent-Sample Test. The data used in the test is the reduced data between the post-test and pre-test of the students (gain scores). The results of the effectiveness comparison test between the MDL-assisted experimental class and the WAG-assisted control class are presented in Table 8.

**Table 8.** Results Comparison Test of Effectiveness between MDL Assisted Online Learning and WAG

| Independent-Sample T-Test | Pre-Post Test (Gain Score) |
|---------------------------|----------------------------|
| t                         | 3.04                       |
| p-value                   | 0.002                      |
| Information               | MDL is More Effective      |

Based on Table 8, information is obtained that the results of the effectiveness test from the score gain achievement student learning in electrical engineering drawing subjects between MDL and WAG assisted classes has a significance value that is smaller or less than an alpha 0.05 ( $p\text{-value} < 0.05$ ), this indicates that the null is rejected. Thus, it can be concluded that MDL-assisted online learning is more effective than WAG-assisted online learning in increasing the understanding of tools and equipment. n electrical engineering drawings of students.

### 3.2. Discussion

Effective learning is learning that is active, interactive, creative, effective, and fun. In other words, effective learning is learning that can involve students in the learning process. One of several ways that can be used so that students can be actively involved in learning is to use a variety of learning media. Based on this, this study applied online learning using Moodle and conventional online learning using WhatsApp Groups on Electrical Engineering Drawing material for class X Electricity Installation Engineering Skills Competency at SMK Negeri 2 Yogyakarta. The basis for the comparison of the two media is the widespread use of WhatsApp Groups as an alternative learning media during the pandemic compared to Moodle (Mpungose, 2020). The use of WhatsApp Groups is more due to familiarity, while Moodle by some teachers and students is a new thing that still needs adjustments. The effectiveness aspect still tends to be ignored by teachers and students (Gon & Rawekar, 2017).

The data from this study have high internal validity. This was shown by the treatment that was only carried out twice in meetings to avoid boredom and fatigue experienced by students, especially during the pandemic, students received many assignments from the teacher. The number of students who were sampled in the control and experimental classes was not lost instruments pre-test and post-test used in this study also have good quality because they have been proven to be valid in terms of content and constructs and have good reliability instrument pre-test used in this initial test has items with a moderate level of difficulty and good discriminating power. The results of statistical testing of the pre-test of both classes using the independent sample t-test showed that the p-value was greater than the alpha value of 0.05, which was 0.73. In addition, the results of testing the homogeneity of variance between the control and experimental groups showed that the p-value was greater than alpha 0.05, which was 0.83. In other words, threats from maturity, sample loss, quality of measurement instruments, and subject selection errors can be minimized. In addition, the data from this study also had high external validity because the samples in the study were selected randomly, the subjects in the control and experimental groups were different, and the two groups were given the same material and method of presentation (in the form of videos and handout materials in pdf format).

Online learning by utilizing Moodle has a positive impact on students' understanding of the application of equipment and completeness of electrical engineering drawings. This can be seen from the results of the descriptive statistical analysis which showed that there was an increase in the percentage of KKM completeness of students by 56.25% between before (only 21.87% of students completed KKM) and after being taught by using Moodle (increased to 78.12% students complete KKM). The results of the descriptive statistical analysis were also strengthened by the results of inferential statistical analysis using the One Sample T-Test which showed that online learning using Moodle is effective in understanding students in the application of equipment and completeness of

electrical engineering drawings. The results of the research support the results of Faridah & Santi's research (2021) which states that the use of moodle in learning food knowledge is very practical and very effective in increasing the understanding of students in vocational high schools. In addition, the results of this study also support the results of research by Setyobudi & Harimurti (2017) which states that the use Moodle as a tool in teaching and learning activities is very feasible to use because it has a positive influence on the learning achievement of students in vocational high schools, especially in skills programs. Computer and Network Engineering.

Online learning by utilizing the WhatsApp Group also has a positive impact on students' understanding of the application of equipment and completeness of electrical engineering drawings. This can be seen from the results of the descriptive statistical analysis which showed that there was an increase in the percentage of students' KKM completeness by 29.41% between before (only 26.47% of students completed KKM) and after being taught using the WhatsApp Group (increased to 55.88% of students complete KKM). However, the impact is very small or can be said to be ineffective in increasing students' understanding in the application of equipment and completeness of electrical engineering drawings. This is reinforced by the results of the descriptive statistical analysis showing that the average pre-test (53.67) and post-test (66.91) of students is less than the specified KKM score (KKM = 70). Arwidiyarti & Hikmi (2020) stated that the use of WhatsApp Groups in online learning at vocational high schools for more than one semester is very ineffective. According to Gon & Rawekar (2017), this condition is caused by the difficulty of teachers in recording students who have or have not done assignments and schools cannot evaluate teaching and learning activities both in terms of conformity with schedules, teaching materials, and lesson plans, the number of students present, the number students who work on assignments, and the resulting grades because they are not integrated.

If you compare the results of online learning using WhatsApp Groups with online learning using Moodle, a difference in effectiveness is found between the two after being given treatment. The results of this study are in accordance with the results of previous research conducted by Melda (2021) that there are differences in effectiveness between vocational high school students majoring in accounting who are taught using Moodle and WhatsApp Groups. The difference between the two can be seen from the average post-test scores achieved by students. Students who were taught using Moodle had a post-test score that was greater than the specified KKM score ( $79.53 > 70$ ), while students who were taught using the WhatsApp Group average score post-test less than the KKM score. set ( $66.91 < 70$ ). This is also reinforced by the results of inferential statistical tests using the Independent Sample T-Test which shows that there is a difference in effectiveness between the two ( $p\text{-value} = 0.003 < 0.05$ ) this difference in effectiveness is the different designation of the two media, Moodle is intended for learning media, while the WhatsApp Group is intended for social media (Mpungose, 2020). This can be seen from the differences in the features of the two, in Moodle the presence features, learning materials, various forms of assessment, discussion forums and other learning features are already available, while in the WhatsApp Group only features short messages, voice messages, and file sharing are still very far away. to say complete as a learning media.

Online learning by utilizing Moodle is more effective than online learning by utilizing WhatsApp Groups in terms of student achievement in applying equipment and completeness of electrical engineering drawings. This is reinforced by the results of inferential statistical analysis using the Independent Sample T-Test using Gain Score (an increase in score from pre-test to post-test) of students taught using Moodle and WhatsApp Group ( $p\text{-value} = 0.002 < 0.05$ ). The results of this study are in line with the results of Melda's research (2021) which states that online learning using Moodle is more effective in increasing the understanding of vocational school students compared to online learning using the WhatsApp Group. The results of this study also strengthen the results of research conducted by Gon & Rawekar (2017) which states that online learning using WhatsApp Groups is not effective in increasing students' understanding, even more disadvantages than advantages. The disadvantages of online learning using WhatsApp Groups include so many messages from students that it makes students' thinking constructions chaotic, and eyestrain experienced.

#### 4. Conclusion

Based on the results of data analysis and discussion, it can be concluded as follows: (1) Moodle-assisted online learning is effective in improving the understanding of equipment and completeness

of students' electrical engineering drawings; (2) there are differences in effectiveness between Moodle-assisted online learning and WhatsApp Group in improving students' understanding of equipment and completeness of electrical engineering drawings; and (3) Moodle-assisted online learning is more effective than WhatsApp Group-assisted online learning in improving students' understanding of electrical engineering equipment and drawings.

Based on the results of the research, discussion, conclusions, and findings obtained during the research implementation process, the researchers provide suggestions aimed at schools, teachers and further researchers. This suggestion aims to make further research that is like this research (quasi-experimental) run better. The suggestions are as follows: (1) schools should provide adequate facilities and infrastructure to support the implementation of the online learning process. The facilities and infrastructure in question are the provision of a Learning Management System (LMS); (2) schools should hold training regarding the use moodle as a solution for online learning; (3) for future researchers who want to apply online learning using Moodle, it can be done not only for aspects of understanding or learning achievement, but other aspects such as critical thinking skills, self-efficacy, have the potential to be improved.

### Reference

- Arwidiyarti, D., & Hikmi, H. C. (2020). Constructing moodle-based online learning for vocational. *Jurnal PILAR Nusa Mandiri*, 16(2), 1–8. <https://doi.org/10.33480/pilar.v16i2.1481>
- Batubara, H. H. (2018). *Pembelajaran Berbasis Web dengan Moodle Versi 3.4*. Deepublish.
- Daheri, M., Juliana, J., Deriwanto, D., & Amda, A. D. (2020). Efektifitas whatsapp sebagai media belajar daring. *Jurnal Basicedu*, 4(4), 775–783.
- Faridah, A., & Santi, T. D. (2021). Praktikalitas dan efektivitas pengembangan mobile learning berbasis moodle pada mata pelajaran pengetahuan bahan makanan di sekolah menengah kejuruan. *Edukatif: Jurnal Ilmu Pendidikan*, 3(5), 2194–2199. <https://doi.org/10.24905/cakrawala.v15i1.1800>
- Gon, S., & Rawekar, A. (2017). Effectivity of e-learning through whatsapp as a teaching Learning tool. *MVP Journal of Medical Sciences*, 4(June), 19–25. <https://doi.org/10.18311/mvpjms/2017/v4i1/8454>
- Hadi, S., Retnawati, H., Munadi, S., Apino, E., & Wulandari, N. F. (2018). The difficulties of high school students in solving higher-order thinking skills problems. *Problems of Education in the 21st Century*, 76(4), 520.
- Kholifah, N., Irwanto, I., Ramdani, S. D., & Nurtanto, M. (2020). Vocational skills learning model strategies during covid-19. *Journal of Physics: Conference Series*, 1700(1), 12092. IOP Publishing.
- Mardapi, D. (2012). Pengukuran penilaian dan evaluasi pendidikan. In *Yogyakarta: Nuha Medika* (Vol. 45).
- Melda, A. D. (2021). Efektivitas media pembelajaran moodle terhadap hasil belajar akuntansi dasar di SMKN 1 Muara Pawan. *Jurnal Pendidikan Dan Pembelajaran Khatulistiwa*, 10(9).
- Mpungose, C. B. (2020). Is Moodle or WhatsApp the preferred e-learning platform at a South African university? First-year students' experiences. *Education and Information Technologies*, 25(2), 927–941. <https://doi.org/10.1007/s10639-019-10005-5>
- Muhfizaturrahmah, M., Hermaniar, Y., & Mubaraq, Y. F. (2021). Boosting students' excitement during long online course using combination of online course platforms and social media based assignments. *Jurnal Edukasi Elektro*, 5(1).
- Mustofa, M. I., Chodzirin, M., Sayekti, L., & Fauzan, R. (2019). Formulasi Model Perkuliahan Daring Sebagai Upaya Menekan Disparitas Kualitas Perguruan Tinggi. *Walisongo Journal of Information Technology*, 1(2), 151–160.

- Pancawati, R., & Siswandi, G. (2020). The development of online tutorial moodle to increase the effectiveness of lectures during pandemic covid-19. *BALANGA: Jurnal Pendidikan Teknologi Dan Kejuruan*, 8(2), 75–80.
- Retnawati, H. (2016). Validitas reliabilitas dan karakteristik butir. In *Yogyakarta: Parama Publishing*.
- Setyobudi, R. K., & Harimurti, R. (2017). Pengaruh penerapan media pembelajaran moodle terhadap hasil belajar siswa pada bidang kejuruan tkj di smkn 3 buduran. *It-Edu*, 2(01), 198–202.
- Sugandi, A. I., Bernard, M., & Linda, L. (2020). Efektivitas pembelajaran daring berbasis masalah berbantuan geogebra terhadap kemampuan penalaran matematis di era covid-19. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 9(4), 993. <https://doi.org/10.24127/ajpm.v9i4.3133>
- Wells, C. S., & Wollack, J. a. (2003). An instructor's guide to understanding test reliability. *Testing and Evaluation Services*, 2–5.
- Widodo, G. S., & Hidayah, L. (2020). Pengembangan E-Learning Mata Kuliah Profesi Keguruan Berbasis Moodle Untuk Model Blended Learning Di Universitas Islam Malang. *Jurnal Bidang Pendidikan Dasar*, 4(2), 114–123.
- Yuliantini, N., Setiono, P., & Amaliyah, Y. (2020). Analisis Pemahaman Konsep Pembelajaran Tematik Integratif Menggunakan Sistem Pembelajaran Daring Berbasis E-Learning Moodle pada Mahasiswa Pendidikan Guru Sekolah Dasar Universitas Bengkulu. *JURNAL ILMIAH WAHANA PENDIDIKAN*, 6(3), 241–248.