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THE EFFECT OF ONLINE LEARNING AND DIRECT FACE-TO-FACE TO MATHEMATICS LEARNING ACHIEVEMENT

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ABSTRACT

This study aimed to determine the effect of learning media on student achievement in mathematics. The learning media used include learning using Zoom Meeting, Google Classroom, and face-to-face in class. The research method used was an experiment with a quantitative approach. The samples were 30 Year 9 students divided into three different treatments in learning: learning using Zoom Meeting, learning using Google Classroom, and face-to-face learning in class. The instrument used was a description of the essay questions used to measure student achievement. Data were analyzed using one-way ANOVA and Tukey's - HSD test. The results showed a significant or different effect between the use of learning media on student achievement (F_{count} = 3.665 > F_{table} = 3.35) of α= 5%. Furthermore, further tests were carried out using the Tukey's - HSD test to examine which learning media had a different effect. Further test results showed that learning using Google Classroom with face-to-face learning in the class had a different effect on students' mathematics learning achievement. Meanwhile, student achievement between Zoom Meeting and face-to-face learning and Zoom meeting and Google Classroom was not significantly different. The average student learning achievement in face-to-face learning was greater than those using Google Classroom.

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INTRODUCTION

The use of online learning media is important when the Coronavirus Disease 2019, shortened to the Covid-19, outbreak spreads, this is due to the diversion of learning that makes teachers choose and try several online media to carry out learning. March 3, 2021, is the confirmation date of the first Covid-19 case in Indonesia (Nuraini, 2020). After the emergence of this case and the number continues to increase, on March 11, 2020, the World Health Organization (WHO) declared the Covid-19 outbreak a global pandemic (Putri, 2020). This virus is the most recently discovered caused by a coronavirus and can be transmitted, transmission can be easily transmitted through contact with sufferers (Mona, 2020). The spread of the Covid-19 virus causes learning activities that cannot be carried out in the classroom and must be transferred to distance learning in the online form. Distance learning requires media that can support learning; in this study, the media used in distance learning were Zoom Meeting and Google Classroom.

Mustakim (2020) researched the effectiveness of online learning. His research shows that online learning during the covid-19 pandemic with learning innovations carried out by teachers, namely online media, helps students in carrying out learning. In addition, a study from Kusuma and Hamidah (2020) researched the comparison of learning outcomes in Mathematics during the pandemic seen from the WhatsApp group platform and the Zoom webinar. His research shows that learning with Zoom Meetings is more effective than learning with WhatsApp groups in delivering material. Then Jusmiana, Herianto, and Awalia (2020) research the effect of audio-visual media on student learning outcomes. As a result, the use of audio-visual media can affect student learning outcomes. Furthermore, Dewi's (2020) research showed that anxiety during online learning affects mathematics achievement during the Covid-19 period.

Measurement of learning achievement is needed to determine whether distance learning media affects student achievement. Learning achievement is defined as a reflection of the results achieved by each student expressed in the form of letters, numbers, or symbols as an assessment of the results of learning activities within a certain period (Muslim, 2020). Low student motivation, conventional learning, and individual work become problems of learning achievement because sometimes students don't understand without any improvement. After all, this is involved in the assessment (Chen & Cheng, 2013; Rusmawati et al., 2013). In the research, Syafari and Montessori (2020) said that there was a significant effect between online learning and student achievement, which means that the better the online learning provided, the better the learning achievement of students. Then Noviana and

Solichin (2021) researched the effect of learning achievement based on WhatsApp and Zoom media. The result of the research is that there is a positive effect on students' learning achievement in the use of online learning media. Furthermore, research on learning achievement with the intervening variable of economic conditions was carried out by Nugroho et al. (2020); the result is 87.7%, directly or indirectly, economic conditions have a good effect on learning achievement during the pandemic.

Based on this background and previous research, estimates of different effects on student achievement in learning activities with distance media and classroom learning that are researched simultaneously need to be carried out, considering the importance of this for the implementation of learning. The learning in the research was online learning using two different online media: zoom meetings and google classroom, and face-to-face learning in class by complying with health protocols. All three learning were carried out with the same material at different times.

METHOD

This research was conducted in January 2021. In this study, the population is Year 9 students of the junior high schools in Tangerang in Mathematics with the topic of Curved 3-D Shapes. Thirty students were chosen randomly as samples in this study and divided into three treatments: 10 students participating in learning using Zoom Meeting media, ten students participating in learning with Google Classroom, and ten students participating in face-to-face learning in class. This relatively small number of samples adjusted to the situation during the COVID-19 pandemic, where no one was allowed to assemble and maintain the health protocols. Holland and Wainer in Alwi (2012) argued that a tightly controlled experimental study with 8-10 subjects in each sample is sufficient to obtain accurate results. This type of research is experimental research with a quantitative approach. Students were given treatment for the use of learning media within a certain period, which later, their learning achievement was measured at the end of the meeting.

Table 1. Research Design

Method \ Repeat	1	2	3	4	Total Y_i
A-1	Y_{11}	Y_{12}	Y_{13}	Y_{14}	Y_1
A-2	Y_{21}	Y_{22}	Y_{23}	Y_{24}	Y_2
A-3	Y_{31}	Y_{32}	Y_{33}	Y_{34}	Y_3
Total Score					Y

Source: ***Pengantar Statistika***, third edition by Walpole (2018)

Information:

A-1	:	The learning method uses Zoom Meeting learning media.
A-2	:	The learning method uses Google Classroom learning media.
A-3	:	Direct face-to-face learning method.
Repeat1st to 4th	:	Treatment sample.
Y_{11} s.d Y_{14}	:	Learning achievement of students using Zoom Meeting learning media.
Y_{21} s.d Y_{24}	:	Learning achievement of students using Google Classroom learning media.
Y_{31} s.d Y_{34}	:	Learning achievement of students with face to face directly.

The data collection method in this study was a written test consisting of a description of the essay question. Before the questions are used for instruments, the questions are tested for validity and reliability first.

In this study, the item's validity was used as the validity of the instrument to be used. Item validity focuses on each item to be validated, which aims to determine the consistency level of each item used (Matondang, 2009). The validity of this item is appropriate to determine the level of consistency of the instrument in measuring student achievement. The formula used is as follows.

$$r_{xy} = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{\{N\sum X^2 - (\sum X)^2\}\{N\sum Y^2 - (\sum Y)^2\}}} \quad (1)$$

Information:

r_{xy} = Validity

N = Number of data

X = Number of Score of each item

Y = The total number of scores each data

The results of the validity test are presented in Table 2.

Table 2. Validity Test

Question	r_{count}	r_{table} 5% (n = 30)	Interpretation
1	0.5381	0,361	Valid
2	0.535	0,361	Valid
3	0.625	0,361	Valid
4	0.381	0,361	Valid
5	0.481	0,361	Valid
6	0.885	0,361	Valid

7	0.684	0,361	Valid
8	0.737	0,361	Valid

(Source: Primary Data, Year: 2021)

Table 2 shows that the questions used as research instruments are valid and can be used as instruments in research. Questions that have been declared valid can be tested for reliability with the following alpha formula.

$$r_{11} = \left(\frac{n}{n-1}\right)\left(1 - \frac{\sum \sigma_i^2}{\sigma_i^2}\right) \quad (2)$$

Information:

r_{11} = reliability

n = Total of questions

σ = Varian

The results of the reliability test are $r_{11} = 0.724$. The instrument reliability test is declared high if r_{11} equals or greater than 0.70 (Rukajat, 2018). Then the instrument tested for reliability has been met, or the instrument has been reliable.

Furthermore, data management in this study used descriptive statistical analysis and inferential statistical analysis. One-way ANOVA was used in the inferential statistical analysis test method in this study. ANOVA stands for Analysis Of Variance. ANOVA aims to determine the effect on the treatment and the interaction between variables (Hermawan, 2017). ANOVA can test the average difference of three populations so that ANOVA is said to be an extension of the t-test (Setiawan, 2019). In one-way ANOVA, there are two variations, namely between group means called treatment effect and within groups called error. The difference between the two variations, among others, is that the treatment effect is the different diversity between groups, while the error is the different diversity in each member of a group. The requirements for conducting the ANOVA test include samples from independent groups, the data for each group is normally distributed, and the variance between groups must be homogeneous. Then using the ANOVA test, the steps include grouping samples based on certain categories, calculating the variability of all samples, calculating the degree of freedom, calculating the variance between groups and within groups, looking for the value of F_{count}, finding the value of F_{table}, and compare F_{count} with F_{table}. Before carrying out the analysis test, a prerequisite test was carried out, namely the normality test using Shapiro-Wilk and homogeneity test using the Levene test, then to test the data obtained, one-way ANOVA data analysis was carried out with the hypothesis:

H_0 : Learning media does not affect mathematics learning achievement

H_1 : At least one learning media that affect mathematics learning achievement

To calculate the one-way ANOVA analysis test, here is a summary of the calculations in one-way ANOVA in Table .

Table 3. One-way ANOVA summary

Source	Degrees of Freedom (DF)	Sum of Square (SS)	Means of Square (MS)
Treatment / Between-group	$K-1$	$\left(\sum \frac{T^2}{n}\right) - \frac{G^2}{N}$	$\frac{SS_{total}}{DF_{treatment}}$
Error / Within-group	Total – Treatment	SS_{total} - $SS_{treatment}$	$\frac{SS_{error}}{DF_{error}}$
Total	N – 1	$\sum x^2 - \frac{G^2}{N}$	-

(Source : e-book Statistic Ninth edition by Witte and Witte (2009))

Where:

K: Total of treatments

T: Total group

n: Sample group

G: Total grand

N: Sum of all sample

The next calculation is to calculate F_{count}/ F_{ratio} with the following formula.

$$\frac{MS_{treatment}}{MS_{error}} \quad (3)$$

Then calculate F_{table} with 5% significance level. The last stage in this ANOVA analysis is drawing conclusions, if $F_{count} > F_{table}$, then the decision is to reject H_0, or it can be said that there are at least one learning media that affects student learning achievement, on the contrary, if $F_{count} < F_{table}$ then the decision is failed to reject H_0 or it can be said to -Three learning media have the same or no effect on learning achievement. Next is a further test of the results of the ANOVA calculation, which aims to determine the real significant difference. In the decision to reject Ho, the further test to be used is the Tukey's – HSD test. The purpose of the Tukey-HSD test is to find out further the difference in effect because using the Tukey-HSD test it can show a significant difference in effect. Tukey-HSD test formula is :

HSD = $q\sqrt{\frac{MS.Eror}{n}}$ Where $q = k\ ; df.error$ on Tukey's – HSD table or q table (4)

RESULT AND DISCUSSION

From the research results obtained by giving three different treatments to 30 students as a sample within a certain period, descriptive statistical analysis and inferential statistical analysis were carried out. Mathematics learning achievement by giving three different treatments, the results of descriptive statistics are displayed in Table 4.

Table 3. Descriptive Statistics of Learning Achievement Based on Learning Media

Media	n	Mean	Standard Deviation	Minimum	Maximum
Zoom Meeting	10	81	6.683	72	93
Google Classroom	10	73.3	8.97	61	91
Face to face in Class	10	82.7	8.957	72	98
Total	30	79	9.002	61	98

(Source: Primary Data, Year: 2021)

Table 3 shows that learning using the Zoom Meeting has a mean of 81, a standard deviation of 6683, a minimum value of 72, and a maximum value of 93. Learning using Google Classroom has a mean of 73.3, a standard deviation of 8.97, a minimum value of 61, and a maximum of 91. In comparison, Face-to-face learning directly in the classroom has a mean of 82.7, a standard deviation of 8,957, a minimum value of 72, and a maximum value of 98. Furthermore, overall from the three different treatments, the average is 79, the standard deviation is 9.002, the minimum value is 61, and the maximum value is 98. The value of student learning achievement obtained can be seen in Table 5.

Table 4. Student Learning Achievement

Value Range	Frequency	Percentage	Information
0-54	0	0%	Very Poor
55-64	1	3%	Poor
65-79	16	53%	Moderate
80-89	9	30%	Good
90-100	4	13%	Very Good
Total	30	100%	-

(Source: Primary Data, Year: 2021)

Table 4 shows mathematics learning achievement of students was in five categories: one student was poor (3%), 16 students were moderate (53%), nine students were good (30%), and four students were very good (13%).

Student achievement based on the learning media used can be classified as follows: the learning using Zoom Meeting is categorized as moderate (five students or 50%), good (four students or 40%), and very good (one student or 10%). The learning using Google Classroom can be classified as very very poor (one student or 10%), moderate (seven students or 70%), good (one student or 10%), and very good category (one student or10%).

Furthermore, direct learning in the classroom is categorized as moderate (four students or 40%), good (four students or 40%), and the very good (two students or 20%).

Inferential analysis with hypothesis testing using one-way ANOVA. Previously, the prerequisite tests were carried out, namely the normality test and homogeneity test. This normality test determines whether the data is normally distributed on the data obtained in the study. The normality test using the Shapiro-Wilk was chosen because, according to Oktaviani and Notobroto (2014), for the number of samples 10 to 70 samples using Shapiro-Wilk tends to a high level of consistency. The results of the calculation of the normality test with each number of students are 10, including the value of learning statistics using zoom meetings is 0.957, the value of learning statistics using google classroom is 0.956, and the statistical value of direct learning in the classroom is 0.924. The value of Shapiro-Wilk table at the level of significance 5% and n = 10 is 0.842. It can be concluded that the statistical value of Zoom Meeting, Google Classroom, and face-to-face in class is greater than the table value, with a significance level of 5%, meaning that classes with three different treatments are normally distributed.

Then calculate the homogeneity test value as a prerequisite test. The homogeneity test aims to determine whether the data is homogeneous or not by using the Levene's test at $df_1 = 2$ and $df_2 = 27$. The calculation results show that the statistical value was 0.556, smaller than the F_{table} value of 3.354, with a significance level of 5%. Thus, it can be said that the data obtained homogeneously or data have the same variance.

After the normality test and homogeneity test were carried out as prerequisite tests to meet the requirements. After meeting the requirements, the next step was to test the hypothesis using one way ANOVA with a significance level of 5%, the results of the one-way ANOVA test are described in Table 6.

Table 5. One-Way ANOVA Test

Source	DF	SS	MS	F_{count}	F_{table}
Treatment	2	501.8	250.9	3.665	3.35
Error	27	1848.2	68.452		
Total	29	2350			

(Source: Primary Data, Year: 2021)

Table 5 reveals that the results of the calculation of the hypothesis test using one-way ANOVA obtained the F_{count} value of 3.665 and F_{table} 3.35. The ANOVA calculation concludes that if F_{count} is greater than F_{table}, the decision is to reject H_0. So it can be concluded that there is a different effect between student learning achievement and learning media,

namely by using Zoom Meeting, Google Classroom, and face-to-face in class in Mathematics. As for seeing the differences and which media are different between the three media, it is necessary to carry out further tests of one-way ANOVA, one of which is by using the Tukey's – HSD test. The calculation results from Tukey's - HSD test are presented in Table 7.

Table 6. Tukey's – HSD Test

	$\bar{X}_{A-1} = 81$	$\bar{X}_{A-2} = 73.3$	$\bar{X}_{A-3} = 82.7$
$\bar{X}_{A-1} = 81$	-	...	1.7
$\bar{X}_{A-2} = 73.3$	7.7	-	9.4*
$\bar{X}_{A-3} = 82.7$	...	...	-

(Source: Primary Data, Year: 2021)

The results of the calculation using the HSD formula obtained a value of 9,183, then calculate the average, which is then listed in Table 6 above, $\bar{X}_{A-1}$ is the average treatment at Zoom Meeting, $\bar{X}_{A-2}$ is the average treatment in Google Classroom, and $\bar{X}_{A-3}$ is the average face-to-face treatment in class. Then, the difference between treatments was calculated and obtained $\bar{X}_{A-1}$ with $\bar{X}_{A-2}$ of 7.7, $\bar{X}_{A-1}$ with $\bar{X}_{A-3}$ of 1.7, and $\bar{X}_{A-2}$ with $\bar{X}_{A-3}$of 9.4. Tukey's HSD test concludes if the difference between treatments is greater than the HSD value and is marked with an asterisk, namely between treatment in Google Classroom and face-to-face in class. From Tukey's – HSD test, it can be concluded that the use of Google Classroom with face-to-face in class has a significantly different effect on student learning achievement.

Students' achievements using Google Classroom are different from the achievements of students who are face-to-face in class. This is because by using Google Classroom, there is no direct interaction between researchers and students, so that educators cannot see students' expressions whether they understand the material or not. The interactions that exist are only limited to conversations through the comments column. This is following the results of previous research conducted by Naserly (2020) that the difficulty for researchers using Google Classroom is the loss of interaction between students. In addition, research from Argaswari (2020) states that the interaction function in Google Classroom needs to be developed. The use of Google Classroom is effective if used in blended learning. Furthermore, the achievements of students who use Zoom Meetings are not significantly different from those of face-to-face students in class. Zoom Meetings are not much different from face-to-face meetings in class. What distinguishes it is only face-to-face Zoom Meetings conducted online or remotely where researchers can interact directly with students. Still, there are several complaints experienced by students, one of which is an unstable

internet connection and wasteful quota. This is also following the results of research conducted by Mustakim (2020), which states that one of the drawbacks of using Zoom Meeting is an uncertain signal when you want to join a class at Zoom Meeting.

One of the effects on learning achievement is interest in learning. Sirait's (2016) research found that interest in learning affects learning achievement where comfortable and pleasant conditions make positive learning interest for students. These factors are also very influential during distance learning. Researchers must be active in building interest in learning for students who study remotely at home, which are usually constrained by different home conditions, especially in Mathematics. Students need to concentrate more when participating in learning because of the formulas that must be considered and follow the steps of working on the existing questions.

The role of parents and the environment is very important in supporting learning achievement. Suppose at home parents act as supervisors when their children study, and the environment supports children's interest in learning. In that case, a good environment will positively impact students' interest in learning and will have a good effect on student achievement. According to Samad (2020), establishing good cooperation between parents and the school is needed to improve student learning achievement. Schools, especially teachers, really need a parent figure in their children's learning process as well as students who will always need parents in their learning activities. Therefore, no matter how busy parents are with their work, they must still supervise their children, especially in learning.

CONCLUSION

Today's learning continues to develop in line with the development of technology, where the teaching and learning process is required to adapt existing technology, which continues to develop to assist the course of education. Learning by using Zoom Meetings and face-to-face in class has a good different effect on student achievement in Mathematics, where direct interaction learning can be more easily understood by students, and two-way learning helps students understand learning and assist teachers in assessing the extent to which students understand. The use of other media, namely Google Classroom, provides an online learning room in which it is equipped to help students in learning, the drawback is that students are less active and sometimes shy to ask, which makes two-way learning limited. Still, the advantage is that students find it easy because they only need a little quota compared to Zoom Meeting. The quota subsidized by the government to help the online learning process during the pandemic is very helpful for students and makes students

enthusiastic about learning. The use of online media can be used as a new science in technology because technology is currently developing rapidly. However, face-to-face learning remains more attractive to students. The limitation of this research is that the sample is relatively small because it was carried out during the Covid-19 pandemic where it is not allowed to gather and comply with health protocols. Next researchers can further research with more samples with various other online media that can be used for learning engaging both students and teachers.

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