

Effectiveness of Using Video Project and Google Classroom in Mathematics Learning of Numerical Methods Course

Rosidah^{1*}, Fadhil Zil Ikram²

^{1*}Universitas Negeri Makassar

²Universitas Sulawesi Barat

^{1*}rosidah@unm.ac.id

Abstract – This quantitative research is a pre-experimental study using a one-shot case study design to test the effectiveness of video projects and Google Classroom in learning mathematics numerical methods. Researchers conducted the study at one of the universities in Sulawesi, and the class selected as the research sample was one of the classes containing 28 students who programmed the Numerical Methods course. The results showed that the mean of students' learning outcomes was 92.71, with a standard deviation 7.88. the percentage of students who scored above 65 was 100%. Based on the percentage of students who scored above 65 and the analysis results using the one-sample Wilcoxon signed rank test, using Video Project and Google Classroom in learning mathematics in the Numerical Methods course is effective.

Keywords: *video project, Google Classroom, mathematics, effectiveness*

I. INTRODUCTION

Mathematics is one of the sciences that can be applied in various sectors of life. Mathematics can also help us develop our critical and systematic thinking. Mathematics can support students to build skills needed in everyday life, including in their future professional pursuits [1]. Therefore, mathematics learning is one of the areas that needs attention.

Both mathematics teachers and lecturers face various challenges in teaching and learning. They must continue to adjust to the evolving standards and expectations in mathematics learning today [2]. This change has become even more pronounced as the COVID-19 pandemic sweeps across the globe, and education is one of the sectors affected. Teachers and lecturers must adapt to online activities, including teaching [3, 4].

Online learning, which is starting to be widely used nowadays, has many merits. This learning can be completed or accessed anytime and anywhere. Online learning provides wider access to students to participate in learning or use learning content [5, 6].

Online learning can be done using various applications such as Zoom, Google Meet, Google Classroom, or even social media such as WhatsApp and Instagram. This platform facilitates teachers or lecturers to deliver materials or provide learning materials and media in various forms, such as video, audio, or text. Access to the learning materials can be done anytime and anywhere.

While online learning has many benefits, there are concerns regarding mathematics learning today. Many students in Indonesia viewed mathematics as a highly complex subject, and they revealed that learning mathematics is often dull due to the lack of teacher innovation in providing quality and enjoyable learning [7]. At the university level, we conducted an initial survey at a university in Sulawesi and found that there are still numerous students with low mathematics learning outcomes. It is

indicated by quiz, mid, and final scores that are still below average. Further investigation showed that there were many students who, after attending lectures, did not study again or even forgot the material that had been taught. Many do not even find out anything about the material to be taught.

One solution that can be offered is the use of learning videos. Learning videos that contain a lot of interactive content can make it easier for students to understand the mathematics concepts taught. Students need learning videos to keep them focused on the learning material and help them understand the material quickly [8]. The use of this learning video has been proven to have a positive impact on students. According to research by [9], learning videos could increase mathematics learning outcomes. There was also research by [10] that using learning videos effectively improved students' mathematical learning achievement. Therefore, this mathematics learning video can solve students' low mathematics learning outcomes in the initial survey.

Learning videos have been shown to impact students in several studies positively. However, in this study, the researcher intends to further encourage students' learning independence by modifying learning using video projects. The video referred to in this study is prepared by students in groups to be discussed outside and inside the classroom. Students will be assigned to search and read various references on the Internet related to the material to be taught. They will then be directed to make a learning video based on the material they have understood through their reading. This video project can encourage students to be more independent and increase their learning frequency. In the end, this can improve students' mathematics learning outcomes.

Maximum utilization of video projects requires a support application to make learning run successfully. The application should contain features that can facilitate the submission of assignments or projects and provide a place for discussion and learning. One application that can be used is Google Classroom (GC). This application is one of the free

alternative applications in the form of a learning management system that can facilitate the online teaching and learning process [11, 12]. Another strength of this application is that students can easily access and follow the learning process, including the content provided, anytime and anywhere [4] without the fear of formatted device memory or damage that requires students to delete or reset their devices. This application allows lecturers to manage classes and teach material quickly and accurately [13].

Research on video projects and Google Classroom use is still infrequent in Indonesia. The research search results show that most researchers investigate using self-prepared learning videos or those that already exist on the Internet, such as those conducted by [10] and [9]. Based on the stated background, the researcher considers it essential to examine the effectiveness of video projects and Google Classroom in mathematics learning at the university level.

II. METHOD

This quantitative research is a pre-experimental study that used a one-shot case study design where one class would be given treatment, and then the researcher would analyze the results of the post-test in that class. This research was conducted at a university in Sulawesi, Indonesia. The research was conducted from January 2023 to May 2023. The population of this study was all mathematics education students of the mathematics education class of 2021, and the class selected as the sample was one class that programmed the numerical methods course where there were 28 students.

The instrument used in this study was a test of students' mathematics learning outcomes on numerical methods material. The test used contains 25 multiple-choice questions. The test is given through Google Form to make the results easier to obtain and immediately analyze.

The effectiveness criteria in this study are divided into two. First, the percentage of students who scored above the standard (i.e., 65) is at least 85% [4]. Second, the mean student test score is over 65 [4].

The analysis used in this study utilized descriptive statistics and inferential statistics. The researcher used descriptive statistics to calculate the mean value and standard deviation of the student's mathematics learning outcomes on numerical methods material. Regarding inferential statistics, the researcher tested the hypothesis that had been formulated based on the criteria and background stated. Researchers in the study used a one-sample t-test. The researcher used SPSS (Statistical Product and Service Solutions) 20 to conduct descriptive and inferential statistical analyses.

Before the t-test, researchers conducted a prerequisite test to determine whether the data obtained followed a normal distribution. The test used is Shapiro's Wilk Test. H_0 in this study indicates that there is no significant difference between the distribution of the data obtained and the normal distribution, while H_1 indicates that the data obtained has a significant difference from the normal distribution. The test's criterion is if $p > 0.05$, the data obtained follows the normal distribution. However, if $p \leq 0.05$, the data does not follow a normal distribution. If the

data is normally distributed, then the researcher uses the one-sample t-test; if not, the one-sample Wilcoxon signed rank test.

The statistical hypothesis of this study refers to the second effectiveness requirement, where the mean student test score is more than 65. The statistical hypothesis is as follows.

$$H_0 = \mu_p \leq 65 \text{ vs } H_1 = \mu_p > 65$$

μ_p is the mean score parameter of the students' mathematics test results. The null hypothesis (H_0) indicates that the score of the class is less than or equal to 65, while the alternative hypothesis H_1 indicates that the score of the class is above 65. Regarding decision-making based on test results, if the $t > 0$ and $\frac{sig}{2} > 0.05$ (due to a one-sided test), then H_0 is rejected. Meanwhile, if the value of $t > 0$ or $\frac{sig}{2} > 0.05$ then H_0 is accepted.

If the data is not normally distributed, then decision-making using the one-sample Wilcoxon signed rank test uses two criteria: looking at the decision in the Decision Table and the average value of the student's mathematics learning outcomes.

III. RESULTS AND DISCUSSION

The results of descriptive statistical analysis can be seen in Table 1 below.

Table 1 Results of Descriptive Statistical Analysis

Highest Score	Lowest Score	Mean	Standard Deviation
100	76	92.71	7.88

Table 1 shows that students' mathematics learning outcomes have a mean of 92.71 and a standard deviation 7.88. Descriptively, this mean is more than 65. As for the first effectiveness criterion, we can conclude that the first criterion is fulfilled. This is because the lowest score of the students' test score is 76, while the standard of the first effectiveness criterion set is that the score must be more than 65. It means 100% of the students' scores were over 65. In conclusion, this shows that the first criterion of learning effectiveness has been met.

Furthermore, researchers conducted the Shapiro-Wilk test to determine whether the data obtained followed a normal distribution. The results can be seen in Table 2 below.

Table 2 Results of the Shapiro-Wilk Test

Statistic	df	Sig.
0.828	28	0.000...

Table 2 shows that the value of Sig., which is less than 0.05, means that H_0 is rejected. It means that the data obtained is not normally distributed. Therefore, researchers used the One-Sample Wilcoxon Signed Rank Test. The results of the test can be seen in Figure 1 below.

Hypothesis Test Summary			
	Null Hypothesis	Test	Sig. Decision
1	The median of VP_dan_GC equal 65.00.	One-Sample Wilcoxon Signed Rank Test	.000 Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Figure 1. Results of One-Sample Wilcoxon Signed Rank Test

Figure 1 shows that the test conducted decided to reject H_0 . This means there is a significant difference between the student learning outcome test score and the minimum score of 65 set previously. Since descriptively, the mean student learning outcome is more than 65, and there is a significant difference, it can be said that the mean student learning outcome is significantly more than 65.

The percentage of students who scored more than 65 on the mathematics learning test reached 100%, and the one-sample Wilcoxon Signed Rank Test results showed that the mean was significantly greater than 65. Both indicate that all the previously established effectiveness criteria have been met. Therefore, it can be said that the Video Project assisted by Google Classroom is effective in learning mathematics in the numerical methods course.

The results of research related to the application of a combination of video projects and Google Classroom in learning mathematics are supported by a study conducted by [9], which suggests that the use of learning videos can increase students' motivation to learn mathematics and mathematics learning outcomes. There is also research by [10], which reports that learning videos effectively improve students' mathematical learning achievement. A study by [14] also reported a similar thing where the use of learning video media in online learning was effective in undergraduate mathematics courses.

Regarding Google Classroom itself, [15] reported that the use of GC is effective in learning mathematics at the lecture level. There is also research by [12] which shows that Google Classroom is effectively used to improve students' mathematics learning outcomes. Research by [16] suggests the same thing where the quality of mathematics learning through the use of the GC platform in terms of student responses and mathematics learning outcomes is classified as good. The results of research by [17] suggest that the use of GC applications can improve students' mathematics learning outcomes.

The effectiveness of the combination of using videos and Google Classroom in learning mathematics is also reported by several studies. Research by [18] suggested that the use of learning videos supported by virtual classes in Google Classroom can improve students' mathematical thinking skills.

IV. CONCLUSION AND SUGGESTION

Based on the results obtained, the use of Video Project and Google Classroom is effective in learning mathematics in the Elementary Algebra course. Both effectiveness criteria have been met where the percentage of students who score more than 65 reaches 100% and the mean

score of student test results is also more than 65, which is 92.71 with a standard deviation of 7.88.

For other researchers interested in the same topic, there are alternative studies that test the effectiveness of certain learning models with the utilization of media such as videos and online platforms such as Google Classroom. In addition, further investigation on the topic can also consider the level of effectiveness at different levels of education such as high school, undergraduate, postgraduate, and doctoral. Finally, teachers can use the results of our research as a reference in implementing mathematics learning.

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