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THE COVID-19 PANDEMIC ERA: THE EFFECTIVENESS OF GOOGLE CLASSROOM MEDIA IN DISCRETE MATHEMATICS LEARNING IN TERMS OF STUDENT LEARNING OUTCOMES

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Abstrak. Salah satu media pembelajaran dalam jaringan yang sering digunakan dalam mengatasi berbagai permasalahan pembelajaran di masa pandemi Covid-19 adalah penggunaan media *google classroom*. Tujuan penelitian ini adalah untuk mengetahui keefektifan media *google classroom* dalam pembelajaran matematika diskrit ditinjau dari hasil belajar. Jenis penelitian yang dilakukan adalah penelitian eksperimen semu untuk melihat akibat dari suatu perlakuan dengan membandingkan hasil belajar dua kelompok kelas (*independent class*) atau dua kelompok waktu dengan kelas yang sama (*dependent class*). Desain penelitian yang digunakan adalah *one group pretest-posttest design*. Sampel dalam penelitian ini adalah seluruh mahasiswa semester IV kelas A yang mengambil mata kuliah matematika diskrit jenjang S1 Program Studi Pendidikan Matematika Fakultas Ilmu Pendidikan Universitas Timor yang berjumlah 40 mahasiswa. Data sampel diolah dengan analisis deskriptif dan uji beda rata-rata menggunakan uji t sampel berpasangan dan *N-Gain Score*. Hasil penelitian menunjukkan bahwa hasil belajar dengan menggunakan media *google classroom* cukup efektif berdasarkan hasil tes siswa. Hasil belajar siswa setelah pembelajaran dengan penerapan media *google classroom l*ebih tinggi dibandingkan hasil belajar siswa sebelum pembelajaran dengan penerapan media *google classroom*.

Kata Kunci: Keefektifan, *Google Classroom*, MatematikaDiskrit, Covid-19.

Abstract. One of the learning media in the network that is often used in addressing various learning problems during the Covid-19 pandemic is the use of google classroom media. The purpose of this study is to find out the effectiveness of google classroom media in discrete mathematics learning in terms of learning outcomes. The type of research conducted is quasi experiment research to see the consequences of a treatment by comparing the learning outcomes of two class groups (independent class) or two time groups with the same class (dependent class). The research design is applied using one group pretest-posttest design. The samples in this study were all the fourth semester class A students who took discrete mathematics courses at the S1 level of the Mathematics Education Study Program of the Faculty of Education, Timor University which consisted of 40 students. Sample data was processed with descriptive analysis and average difference test using paired sample t test and N-Gain Score. The research results showed that learning outcomes by using google classroom media is quite effective based the students' test results. The students' learning outcomes after learning by applying google classroom media were higher than students' learning outcomes before learning by applying google classroom media.

Keywords: Effectiveness, Google Classroom, Discrete mathematics, Covid-19.

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INTRODUCTION

Mathematics is one of the branches of science that has a meaningful role in human life and becomes the basis for other sciences. The growth of science, technology, and information is inseparable from the services of mathematics as a basic science. In addition, mathematics is also useful in solving problems in daily life. Considering the very meaning of the role of mathematics as a basic science in society, therefore, mathematics is learned since children learn at the official learning level is very basic in elementary school until they reach college.

The subject matter of mathematics for the college level is more difficult to learn because the topics presented are more abstract, such as discrete mathematics courses. Discrete Mathematics is one of the compulsory courses for the fourth semester class A students at the S1 level of Mathematics Education Study Program of the Faculty of Education, Timor University, which is given in the even semester. The subjects studied in discrete mathematics are part of the science of mathematics that must and importantly be known by students because they can train abstract thinking power, train logic thinking, and train problem solving analysis so that they are used to solving problems in the field of mathematics critically and rationally (Oktaviana & Susiaty, 2020). According to (Nopriana & Noto, 2017) discrete mathematics presents several subjects that seek students to have mathematical communication skills and critical thinking dispositions, including graph and tree subjects where students are required to be able to declare everyday events in mathematical symbols, read images, and mathematical symbols with written mathematical understanding and explain ideas, situations, and mathematical relationships with images.

The learning model that has been applied to discrete mathematics learning by (Nopriana & Noto, 2017) is a student centered learning model. The student centered learning model allows students to have a tendency to: (1) Ask clearly and reasonedly; (2) Trying to understand well; (3) Using reliable sources; (4) Looking for various alternatives; (5) Still refer to the core of the problem; (6) Be open, dare to take positions; (7) Act quickly; (8) Looking at things thoroughly; (9) Utilizing critical people's way of thinking; (10) Be sensitive to other people's feelings. Meanwhile, (Rifanti & Pujiharsono, 2018) applies Self Directed Learning model in discrete mathematics learning. While (Subaidi & Lanya, 2019) applies cooperative learning model type STAD. This STAD model is a model that can activate students. The awarding of quizzes and the awarding of groups or individuals in learning become motivationfor students so that this is the characteristic or excellence of this learning model compared to other learning models. The Learning Model applied (Barr, 2019) flipped classroom using Edmodo media that aims to determine the improvement of the results of learning discrete mathematics courses. And (Aminah, 2018) applies a blended learning system model to Discrete Mathematics courses to improve student learning outcomes.

But the problem is, the education system is now faced with a situation that requires teachers to be able to master online learning media, especially in the era of the Covid-19 pandemic. The online education system is one of the solutions to overcome the difficulties in face-to-face learning with the social distancing rules given the problems of time, location, distance and cost that are major obstacles today (Kusuma & Hamidah, 2020). Online learning allows learning to be done without physical and distance encounters (Yudiawan, 2020). According to (Supriadi & Mustafa, 2019) online lectures are either online learning methods or conducted over the internet. The use of online learning according to (Oktavian & Aldya, 2020) will be very effective if it meets the essential components in learning, namely discursive, adaptive, interactive, and reflective with elements that will be very good if integrated with the learner environment so that it can meet the components of the digital learning ecosystem because it can accommodate the learning style, flexibility, and learning experience of learners so as to generate positive feelings.

One of the most used online learning media is Google Classroom media. Google Classroom media is one of the learning media that teachers use today. The use of Google Classroom media has become one of the media that covers the entire interests of teachers and students in learning. (S, 2017) defines Google Classroom as a technology that is provided and designed for schools and universities by prioritizing the use of information technology and online collaboration. Through the Google Classroom app it is assumed that learning objectives will be easier to realize and full of meaning (Sabran & Sabara, 2019). Google Classroom is used as a learning medium that includes text messages, images, and videos as a complete unity to help teachers and students in establishing interactions from all over the place (Syakur, 2020). (Supriadi & Mustafa, 2019) adds Google Classroom is designed to simplify creation, distribution, and assignment in a paperless way. In line with that, (Hamka & Vilmala, 2019) suggests that Google Classroom is an Internet-based service provided by Google as an e-learning system designed to help teachers create and share assignments with studentspaperlessly. Google Classroom also integrates with other google tools to help educators provide feedback and track student performance progress and make it easier to access anytime and anywhere (Joy et al., 2018).

Google Classroom is part of Google Apps for Education (GAFE) that contains many popular Google apps like Gmail, Google Calendar, and Google Drive, which are accessible to anyone. The app provides a central site for communicating with students, sending feedback and giving independent assignments to students (Ketut Sudarsana et al., 2019). Some of the key strengths of Google Classroom are time savings and easy-to-use and very simple organizing features. Google Classroom is like a virtual extension of a conventional classroom. Activities begin by creating classes and adding students. Then explore the features contained in the application such as sending information, starting discussions, distributing and collecting tasks (Shaharanee et al., 2016).

Google Classroom is now a place for discussions to solve problems, questions and something important that should be addressed to the people who are involved in it. This discussion through Google Classroom really helps its users to communicate in distance learning (Joy et al., 2018). But in the implementation of this media complained by some students because of the lack of interaction and teachers are more likely to give assignments so that students feel burdened by these tasks (Kusuma & Hamidah, 2020).

Shaharanee et al., (2016) suggests how to use Google Classroom media is that students can discuss with teachers for example by submitting the results of the completion of training questions according to the material if they want to know the right or wrong of the results of the problem resolution. Students can also ask questions related to the training questions. The issue you want to ask can be submitted in Google Classroom by first taking a picture of the results of the exercise solution. Submitted images are visible to all participants in Google Classroom. So that other students can try to solve or answer the problem before it is solved or answered by the teacher (Subandi et al., 2018).

In relation to learning outcomes, online learning such as Google Classroom media is still a polemic among stakeholders and the community (Ernawati et al., 2021). This is because online learning is still considered no better than conventional hands-on learning, especially in mathematics learning (Fatkhurrozi et al., 2021). This is because in learning mathematics one must think in order for him to be able to understand the mathematical concepts studied and beable to use those concepts appropriately when he has to look for answers to various mathematical problems (Widada, 2015), while the thought process cannot be obtained from distance learning (Khusniyah & Hakim, 2019). Furthermore (Fadlurreja et al., 2020) said that the ability to understand the mathematical concepts of learners needs to be developed because it is in accordance with the demands of the curriculum in universities and is one of the objectives of each material delivered by educators, because educators are

guidance students to achieve the expected concept.

Based on the above problems, research was conducted to test the effectiveness of discrete mathematics learning through google classroom media reviewed from the results of students studying mathematics education program, Faculty of Education, Timor University.

METHOD

The type of research conducted is quasi experiment research to see the consequences of a treatment by comparing the learning outcomes of two class groups (independent class) or two time groups with the same class (Sugiyono, 2010). This study used two time groups, namely experiment group I (students have not utilized google classroom media before mid test) and experiment group II (students learnt to use google classroom after mid test). Therefore, students' in experiment group I were as same as students' in experiment group II, with different study time groups, before mid test (before applying google classroom) and after mid test (learning by applying google classroom media). The research design used by using one group pretest-postest design (Simarmata, 2020).

The population in this study was the fourth semester class A students who took discrete mathematics courses at the S1 Level of Mathematics Education Study Program, Faculty of Education, Timor University, which consisted of 40 students. This evidence based on the consideration of this class had a relatively similar average learning outcomes (based on the test results). Considering the population less than 100, all members of the population become samples (Arikunto, 2006).

Data on student learning outcomes obtained from the results of the mid test namely for group I and from the results of the Final test namely for group II. Then, data was processed using SPSS software (Simarmata, 2020) with the following steps:

a. Calculate average, median, maximum value, minimum value and standard deviation (descriptive analysis of sample data)
b. Test the normality of sample data
c. Average difference test (using t-dependent test or paired sample t test)
   Test criteria that is if the p-value (Sig value in spss output) < 0.05 (real level), then there are differences in student learning outcomes using before using Google Classroom and after using Google Classroom. Whereas if the p-value (Sig) ≥ 0.05, then there is no difference in student learning outcomes before using Google Classroom and after using Google Classroom.
d. Calculating N-Gain Score
   If in the test paired sample t test obtained there are differences in student learning outcomes before using Google Classroom and after using Google Classroom, then continued by calculating the score Gain (test N-gain) that is to know the effectiveness of the use of Google Classroom media in discrete math learning. The formula used is:

$$N - Gain = \frac{Skor\ Postest - Skor\ Pretest}{Skor\ Ideal - Skor\ Pretest}$$ (Hake, 1999)

   Description: The ideal score is the maximum (highest) score that can be obtained.

According to Hake in (Yensy, 2020) the categorization of the acquisition of N-gain score is determined based on the value of N-gain in the form of percentages as follows:

Table 1. Category Interpretation of N-Gain Effectiveness

Persentase (%)	Interpretation
< 40, 00	Ineffective
40,00 - 55,99	Less Effective
56,00 - 75,00	Quite Effective
> 75,00	Effective

RESULT AND DISCUSSION

1. Descriptive Analysis of Learning Outcomes Data

The following are the results of descriptive analysis of student learning outcomes that take discrete mathematics courses in the mathematics education program of the Faculty of Education, Timor University:

Table 2. Description of Student Learning Outcomes

Descriptive Analysis	Mid Test (Class Before Using Google Classroom)	Final Test (Class After using Google Classroom)
Minimum Value	45,00	70,00
Maximum Value	75,00	95,00
Standard Deviation	8.18	6,30
Average	53.50	83,63
Median	52,50	85,00
Skewness	0,73	0,25

Based on table 2, it appears that the average student learning outcomes from mid test to final test have increased or in other words the average test scores of students after being given learning using Google Classroom have increased from before using Google Classroom, which is 30.13. Furthermore, a median value that is almost equal to the average indicates that the value of student learning outcomes tends to be or relatively located in the middle of the data. Skewness values that are close to zero in both mid test and final test values indicate that descriptively the data of student learning outcomes has a normal distribution.

Furthermore, the data of student learning results tested normally using chi square test with the help of SPSS software, obtained the results of the data of both sample groups (mid test and final test data) has a normal distribution (sig value = 0.215) so that it is continued by conducting different tests using t-paired test.

2. T-paired test results

Based on SPSS output, the average difference test result using t-paired test obtained sig or p-value = 0.0001, which means that there is a significant difference in the learning outcomes of students who take discrete mathematics courses before being given learning with google classroom media and after being given learning with google classroom media.

Furthermore, based on the N-gain score obtained a percentage N-gain of 64.13%. This shows that discrete mathematical learning using Google Classroom media is quite effective. In keeping with the opinions expressed by (Noah et al., 2020) Google Classroom media is one effective way to increase students' active involvement in the online learning environment. Similarly, (Utami, 2019) said that learning using Google Classroom media makes students interested and happy to learn and easy to use by students because it is faster to access important materials, assignments, and announcements that can be accessed through PC andsmartphones owned by students. Furthermore (Ghofur, 2018) suggests that Google Classroom media has a large and unlimited discussion space where educators can create collaborative classes in interactive relationships with other students. Thus, Google Classroom media can be used as an alternative medium of discrete mathematics learning in lieu of face-to-face lectures in the era of the covid 19 pandemic is still rampant, but despite the effectiveness of learning with Google Classroom media, when learning takes place still has some disadvantages while also having some advantages.

Based on the findings in the field by providing questionnaires to students, the following

are obtained the strengths and the weaknesses during learning by using Google Classroom. The strengths of applying Google Classroom are: 1) Questions from students are directly responded to during learning so that it is more effective and easy to understand by students, 2) Students are more active in solving training questions, 3) Materials provided by lecturers in the form of power point slides, videos or in the form of notes can be opened directly in Google Classroom, 4) Students can discuss with other students if there are unresolved questions and have not been answered by the lecturer, 5) Students immediately know the value of the assignment/quiz given, 6) Students are very easy to see announcements from lecturers,7) Materials and discussion materials can be directly saved to students' Google Drive so they can repeat and read the material.

Meanwhile the weaknesses of Google Classroom are: 1) Students are in different locations with different signal strengths, so not a few complain about the difficulty of the signal to be able to join during the learning process, 2) This resulted in students missing the material because they were not on time to participate in the learning activities. When Google Drive is full, the file or document you want to send to your teacher becomes error and unsent.During the lecture activities of Mathematics Dsikrit courses took place using Google Classroom media, students were quite active in asking and discussing with lecturers about unconstood material and questions that have not been completed. Student activity is also seen from the presence of students who attend on time when the lecture begins. This is in accordance with what is stated by (Ghofur, 2018) that online media such as Google Classroom media can attract the interest and motivation of learners to learn to discuss with their friends and teachers about the subject matter discussed. Similarly, it was expressed by (Utami, 2019) that the learning method in the current era of globalization, the use of technology is needed for the development of media and multimedia of mathematics learning, especially during the Covid-19 pandemic where the implementation of mathematical learning activities is quite difficult for students and teachers because of the social distancing rules. The results of this study illustrate that online learning can help students learn independently in such a way that it can improve their mathematical abilities. Such as the use of youtube media, Google Meet, and Whatsapp Group can improve mathematical problem solving skills (Fatkhurrozi et al., 2021), (Yensy, 2020), (Batubara & Batubara, 2020), (Oktavian & Aldya, 2020), (Abidin, 2020).

Based on the description above, the discrete mathematics lectures in the Mathematics Education Study Program of the Faculty of Education, Timor University using Google Classroom media are quite effective when viewed from student learning outcomes. Student learning outcomes after college using Google Classroom media are higher than student learning outcomes before lectures using Google Classroom media. Because there are still some weaknesses during the lecture, students should also be supported by using other online media in addition to Google Classroom media as an alternative learning method, especially during the covid 19 pandemic.

CONCLUSION

Discrete Mathematics Courses in Mathematics Education Program, Faculty of Education, Timor University by applying Google Classroom media is quite effective based on the students' learning outcomes. The students' learning outcomes after learning by applying Google Classroom media were higher than students' learning outcomes before learning by applying Google Classroom media.

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