The Impact of Application on Calculus 1 Teaching Materials by Using Google Classroom Media to Increase Students' Motivation

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Abstract. This study aims to describe the impact of using Google classroom media on student learning motivation in the Calculus 1 course. The type of research was used descriptive with One Shot Case Study design. The subjects in this study were students of Semester II who were taking the Calculus 1 course in the Mathematics Study Program of the Faculty of Mathematics and Natural Sciences, UNP which were 33 students. The instruments used in this study were a motivation questionnaire sheet and a student learning outcome test. The data analysis used was descriptive analysis by using the difference test. The results showed that students’ motivation after the implementation of lectures using Google classroom media was better than before using Google classroom. This is indicated by the motivation score obtained was 62.26 or 51.62% in moderate. Furthermore, the average score of student learning outcome of Calculus 1 after using Google classroom media is 81.63 with sufficient criteria.

1. Introduction

Calculus I is a compulsory subject offered at the Department of Mathematics and Natural Sciences, UNP. The topics of discussion in this course include: functions, limits and continuous, integrals as anti-derivatives, of course integrals, basic theorems of calculus, application of integrals, transcendental function, integration techniques and unnatural integrals. Based on the experience of teaching Calculus I and the results of discussions with several lecturers of Calculus I, the lecturer said that students had difficulty understanding Calculus I because the lecturer explained the material to the students directly. Students pay attention and note the lecturer's explanation, then solve the questions assigned by the lecturer. The obstacle that is generally faced by lecturers is that the lecturer has difficulty helping students who have problems in mastering the previous material. In this case, lecturers are often trapped in the density of the material to be taught while the time available is limited. If students do not completely master the material about limits and continuity, as well as derivatives, then students will also have difficulty understanding the integral concept. A similar opinion was stated [1] that many students have difficulty learning calculus. Part of the difficulty stems from incomplete learning, lack of problem-solving skills, and lack of motivation to learn.

If you pay close attention, learning designed to follow a paradigm shift from a teacher centred learning orientation to student centred learning about knowledge, learning and learning. According to
the Directorate General of Higher Education \cite{2} the old paradigm views knowledge as something that has already been made, which just needs to be transferred to other people/students with the term transfer of knowledge. The new paradigm, knowledge is a result of construction or formation from people who learn. So that learning is a process of seeking and shaping/constructing knowledge, so it is active, and has a specific method. Knowledge is not received passively. Knowledge is formed or discovered actively by students.

Student centred learning, along with the Covid 19 pandemic, has changed learning patterns that require lecturers and educational developers to provide learning materials and teach students directly through remote digital tools \cite{3}. So that the lecturers make changes, for example changing the learning model that has been taking place face-to-face into learning that is done online \cite{4}. Lecturers need to design activities or learning activities in online learning to facilitate students to achieve learning goals or competencies. With this growing technological era, online learning is directed to be able to make better use of technology. One of the uses of technology today is e-Learning using the web to access it. It does not deny that because many students now have smart phones, it is easier to access them from wherever they are and anytime. The use of e-learning that is commonly developed today is to use the Learning Management System.

In addition, students are also given additional material in order to understand more broadly the material that may not be able to be conveyed directly when face to face in class. E-learning is an alternative media for providing test questions and media improvisations that do not always use printed media. However, in its implementation, Google classroom media can be used in the learning Google classroom media can be used to help Lecturers create interesting learning so that it can foster student learning motivation \cite{5}. One way that can be used to carry out the learning process online is by using Google Classroom. This is supported by the results of research conducted \cite{6} using the Google Classroom application. Therefore, using Google Classroom actually makes it easier for teachers to manage learning and convey information accurately and accurately to students \cite{7}.

Through the Google Classroom application, it is assumed that learning objectives will be easier to realize and full of meaning. Therefore, the use of Google Classroom actually makes it easier for teachers to manage learning and convey information accurately and accurately to students \cite{7}. Through blended learning, students feel comfortable and active in constructing their knowledge. Teachers can take advantage of various features found in Google Classroom such as assignments, grading, communication, time-cost, archive courses, mobile applications, and privacy. This research is also expected to provide a solution to the method that has been applied in class, namely the conventional method where lecturers dominate learning activities either by lecture method or assignment method. The implementation of learning with Google Classroom makes it easier to evaluate the implementation of the teaching and learning process both in class and outside the classroom.

Google Classroom is an application that allows the creation of classrooms in cyberspace. In addition, the Google classroom can be a means of distributing assignments, submitting assignments and even assessing submitted assignments \cite{8}. Thus, this application can help facilitate Lecturers and Students in carrying out the learning process more deeply. Besides, the lecturer can assign assignments and directly give grades to students. Delivery of learning with e-learning is learning using internet technology to improve the learning environment with a wide range of rich content. E-learning is the use of learning media using the internet, to send a series of solutions that can increase knowledge and skills.

The class design that applies Google classroom is actually environmentally friendly. This is because students do not use paper in collecting tasks. This is in line with Herman's opinion in \cite{8} who explained that Google classrooms are designed to help lecturers create and collect paperless assignments, including time-saving features such as the ability to automatically make copies of Google documents for each student. Classrooms can also create drive folders for each assignment and each Student, to keep things organized. The following is the appearance of Google classroom in Calculus 1 course.
The importance of implementation in e-learning based learning with Google classroom, this research aims to identify the effectiveness of Google classroom based learning, namely: a. Knowing the effect of implementing Google Classroom on online lectures in Calculus 1; b. Knowing students’ motivational responses to Calculus 1 lectures using Google Classroom which is applied to the teaching and learning process. According to [9], online learning is often required to be more motivated because the learning environment usually depends on motivation and related characteristics of curiosity and self-regulation to involve the learning process. In fact, technology itself is seen by some as an inherent motivation because it provides a number of qualities that are recognized as important in fostering intrinsic motivation, namely challenge, curiosity, novelty and fantasy [10][11]. Important factors for successful learning are included in the online learning environment, so it is necessary to reconsider learning motivation in learning environments that use technology [12], for this reason it is important for researchers in the world of education to examine in depth how student motivation in learning using Google classroom. According to [13], changes in behaviour can be in the form of increased knowledge, acquired skills or dexterity, and changing attitudes of someone who has learned. Motivation which comes from the word motive has the meaning of impulse, desire, need and will [4]. There are three characteristics in motivation [14], namely: effort, willpower and direction or purpose. This is reinforced by the results of research conducted [15] saying that in the midst of the Covid-19 pandemic that has hit the world, it is not a reason for students to stay motivated in learning even though the implementation has several obstacles. Students where they have to divert their learning media by using online lecture support applications so as to increase motivation and interest and take the attention of students to focus on following the material presented, so it is expected that learning outcomes will also increase. The following is a display of the motivation questionnaire in google classroom in the Calculus 1 course in Figure 2 below:
2. Method
This type of research is descriptive research. This research is used to describe the effect of Google classroom learning on student learning motivation. The research design used is One Shot Case Study, in which the subject is given a certain treatment followed by observation at the time of applying the treatment and measuring the consequences of the treatment. The treatment referred to in this research is lectures using Google classroom media in the experimental class and seeing the effect on student learning motivation. This research was conducted in the January-June 2020 semester for 33 students of the Department of Mathematics and Natural Sciences, UNP, but at the time of the research, only 31 students were active studying from the first meeting to the end of the study. The instruments used in this study were in the form of a Calculus 1 learning outcome test, and a student learning motivation questionnaire using the Likert scale[16] The two research instruments were first validated and then used in the implementation of the research. Data collection techniques in this study consisted of documentation, learning outcomes tests and learning motivation questionnaires. Calculus 1 the data analysis used was descriptive analysis with a quantitative approach which resulted in the effectiveness
of quantitative data from the research questionnaire instrument \cite{17}. Analysis of data descriptions in this study is intended to describe and interpret student motivation using Google Classroom as a learning medium in the Calculus 1 course using criteria as in Table 1.

| Category     | Formula               |
|--------------|-----------------------|
| Very low     | $X \leq \mu - 1.8\sigma$ |
| Low          | $\mu - 1.8\sigma < X \leq \mu - 0.6\sigma$ |
| Moderate     | $\mu - 0.6\sigma < X \leq \mu - 0.6\sigma$ |
| High         | $\mu - 0.6\sigma < X \leq \mu - 1.8\sigma$ |
| Very high    | $\mu - 1.8\sigma < X$ |

**Information:**
- $X$: Total Score
- $\sigma$: Standard Deviation
- $\mu$: Mean

Meanwhile, to see the use of Google classroom media for students majoring in Mathematics who are taking Calculus 1 lectures, statistical testing is used with the t test, after first being tested for normality and homogeneity of the variance.

3. Results and Discussion

Descriptive analysis in this study, the researcher created a class at https://classroom.google.com entitled Calculus 1, as seen in the following display.

*Figure 3. Display of Google Classroom Usage Calculus Courses 1*
Based on the results of the assessment of the learning outcomes test in Calculus 1, it was found that the score of student learning outcomes after the application of Google classroom learning media was quite varied. The description of student learning outcomes test statistics can be seen in table 2 below:

Table 2. Descriptive Statistics

|        | N  | Mean | Std. Deviation | Max | Min |
|--------|----|------|----------------|-----|-----|
| Exp Class | 31 | 81.63 | 7.29          | 90  | 73  |
| Control Class | 31 | 67.74 | 10.52         | 88  | 48  |

From the table, the requirements analysis test, namely the normality test and the homogeneity test. By using the Shapiro-Wilk test, the following data were obtained

Table 3. Normality test

| Tests of Normality | Kolmogorov-Smirnova | Shapiro-Wilk |
|-------------------|---------------------|--------------|
| Type              | Statistics | df | Sig. | Statistics | Df | Sig. |
| Score             | Control      | .101 | 31 | .200 * | .963 | 31 | .354 |
|                 | Experiment  | .140 | 31 | .127 | .953 | 31 | .183 |

* This is a lower bound of the true significance.

a. Lilliefors Significance Correction

From the table above, the significance value (p) in the Shapiro-Wilk test is 0.354 and 0.183 (p > 0.05), so based on the Shapiro-Wilk normality test the data were normally distributed. Furthermore, the variance homogeneity test was carried out with Levene Statistic, obtained as Table 4 below

Table 4. Homogeneity Test

| Test of Homogeneity of Variances | Levene Statistics | df1 | df2 | Sig. |
|----------------------------------|-------------------|-----|-----|------|
| Score                            | Based on Mean     | 2,170 | 1 | 60 | .146 |
|                                  | Based on Median   | 1,934 | 1 | 60 | .169 |
|                                  | Based on Median and with | 1,934 | 1 | 49,083 | .171 |
| adjusted df                      | Based on the trimmed mean | 2,131 | 1 | 60 | .150 |

From the table above is obtained that the homogeneity significance of 0.146 (≥ 0.05) indicates that the Control and Experiment groups are homogeneous, with a Levene Statistic value of 2.170. Because the data of the experimental class and control class were normal and homogeneous, to determine whether there was a difference in learning outcomes between the experimental class and the control class, the t test was carried out, as shown in Table 5 below:

Table 5. Hypothesis testing

Based on Table 5 above, the Sig. (2-tailed): The probability value / p value of the test

| Independent Samples Test | t-test for Equality of Means | 95% Confidence Interval of the Difference | Lower | Upper |
|--------------------------|-----------------------------|----------------------------------------|-------|-------|
|                          | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference |                     |       |
| Score                    |   |      |   |    |              |               |                         |                     |       |
| Equal variances assumed  | 2,170 | .146 | -4.875 | 60 | .000 | -11.47419 | 2.35369 | -16.18227 | -6.76612 |
| Equal variances not assumed | -4.875 | 53.325 | .000 | -11.47419 | 2.35369 | -16.19442 | -6.75397 |
Independent Samples Test: Result = 0.000. Meaning: there is a difference between the value of the Control and Experiment Class. Based on the hypothesis testing in table 5, according to the decision making criteria for hypothesis testing, it can be concluded that there are differences in learning outcomes of Calculus 1 students who are taught by applying Google classroom learning media to students majoring in Mathematics.

Furthermore, the results of student responses after distributing a motivational questionnaire through the http://bit.ly/kuesionergoogleclassroomlink showed that the percentage value of student responses to the motivation questionnaire was 51.62% or in the medium category. Categorization is done to place individuals into groups whose positions are tiered according to a continuum on each variable. If based on a normal curve, researchers usually divide the subject category into 4 categorizations by considering the standard deviation distribution function in the normal curve. In this study, the categorization levels that will be used are 4, namely the very low, low, high and very high levels. The results of the motivation score categorization are as follows:

| Category    | Score Range | Number of Subjects | Percentage (%) |
|-------------|-------------|--------------------|----------------|
| Very low    | M ≤ 50.78   | -                  | -              |
| Low         | 50.78 < M ≤ 58.43 | 6              | 19.35%         |
| Moderate    | 58.43 < M ≤ 66.09 | 16              | 51.62%         |
| High        | 66.09 < M ≤ 73.74 | 9               | 29.03%         |
| Very high   | M 73.74 ≥   | -                  | -              |
| Amount      | 31          | 100%               |                |

Based on the table above, it shows that there are four categories of subjects in the learning motivation variable, namely very low, low, high and very high. A total of 6 students from a total of 31 subjects or equivalent to 19.35% are in the low category. Then 16 students from a total of 31 subjects or equivalent to 51.62% are in the medium category. Furthermore, 9 students equivalent to 29.03% are in the high category. High learning motivation can be seen from the persistence of students in dealing with assignments given by the lecturer, having a resilient nature in facing any difficulties and also showing a very high interest in learning. The level of student motivation to learn greatly determines the quality of behaviour in doing the assigned task.

4. Conclusion
The impact of using Google classroom media on student learning achievement in the Calculus 1 course was differences in learning outcomes of Calculus 1 students who are taught by applying Google classroom learning media to students majoring in Mathematics. The average score of student learning outcome of Calculus 1 after using Google classroom media is 81.63 with sufficient criteria. The students’ motivation criteria by the implementation of lectures using Google classroom media was 51.62 % in moderate. Furthermore, the average of the motivation score obtained was 62.26. This indicated that the learning motivation of students of the mathematics program was sufficient. This study is expected to be an evaluation of various parties in organizing Google classroom in higher education, especially those involving motivation in it. This research is also expected to be a study material for other researchers in analyzing and developing student learning motivation in Google classroom during emergencies in higher education.

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