JURNAL PENDIDIKAN TEKNOLOGI INFORMASI DAN VOKASIONAL
http://jurnal.fkip.unila.ac.id/index.php/JPVTI
Vol.3, No.1, 2021, 41-54 | e-ISSN 2715-9647 | p-ISSN 2720-9091

COMPARISON OF MOBILE LEARNING BASED LEARNING MODELS WITH CONVENTIONAL IN IMPROVING STUDENTS' LEARNING OUTCOMES

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Received: June 13, 2021 *Accepted: June 23, 2021* *Published: June 30, 2021*

ABSTRACT

The current era of globalization, the use of technology, especially mobile android, in human life is very widespread and social. Along with the times, android information technology has developed rapidly and has been inherent in today's society. Not only used by the upper class but also the lower class has suggested. The purpose of this study was to determine the results of the comparison between the mobile learning model and the conventional learning model in improving student learning outcomes of electrical engineering vocational education FKIP UNTIRTA for the first semester of Calculus 1 in the academic year 2019/2020. This study used a quasi-experimental study, where the population consisted of two classes. For sampling, class A is the control class and class B is the experimental class. The two groups are equivalent to 57 students. The groups in this study were given different treatments. The control group used the video method in learning while the experimental group used mobile learning. Then each group was given a pre-test and post-test as well as a questionnaire to see student responses after learning using mobile learning. The results of this study indicate that the comparison between students using video learning and mobile learning. In the control class the normalized gain value is 0.64 and for the experimental class is 0.82 and for the student response results, the value is 87.32% and is included in the very interested category. So learning using mobile learning is better than using video in delivering lecture material 1.

Keywords: *Model, learning, mobile learning, learning outcomes, calculus*

INTRODUCTION

the world of higher education is a formal institution that functions to print students into intelligent and educated human beings. Efforts to improve the quality of teaching and learning processes and student learning outcomes, at every level of education need to be realized in order to obtain the quality of Indonesian human resources that can support national development. Teaching and learning activities are the main activities in the educational process on campus, therefore the success of achieving educational goals is highly dependent on the quality of the

implementation of the teaching and learning process (Brian Selvi Feliciano Septianova, 2017). Education is very important in the life of the nation and state. So education is a vehicle to improve and develop the quality of human resources (HR). The government has implemented a national education system that has been regulated in Law No. RI. 20 of 2003 states that: National education functions to develop capabilities and shape the character and civilization of a dignified nation in order to educate the nation's life (Siswoyo, et al, 2012). The main target of national education is the creation of equity in obtaining education for all Indonesian citizens in remote areas of the country to improve the quality of human resources (Fendi Lestiawan & Arif Bintoro Johan, 2018).

In the teaching and learning process, there is interaction between lecturers and students through reciprocal communication that takes place in an effective situation to achieve the desired learning objectives. According to the directives of the Minister of Education and Culture No. 22 of 2016, the learning process in educational units should be held interactively, inspiring, fun, challenging, motivating students to participate actively, and providing sufficient space for initiative, creativity, and independence in accordance with talents, interests, and physical and psychological development learners. Through an interactive, inspiring and fun learning process, students are expected to gain meaningful learning in order to develop their potential. However, the facts show that not all learning processes take place in accordance with the standard direction of the process. One of them is learning for the calculus 1 course in the Electrical Engineering Vocational Education study program, FKIP UNTIRTA, which is one of the basic courses and is required to pass a minimum grade of B because this course is the basis of subsequent courses.

At this time learning is needed, namely innovative and creative learning, one of which is developing learning media in the classroom. Learning media must increase student motivation. Therefore, it stimulates students to remember what they have learned, in addition to providing new learning stimuli. Good media also activates students in providing feedback, feedback, and encouraging students to do the right practices. Conventional learning media is a medium that is often used in the learning process (Arsyad, 2007; Hamalik, 1986). Trianto (2010) states that the media as a component of learning strategies is a container from which the message obtained or its distribution wants to be transmitted to the target or recipient of the message. This media is often used by lecturers in teaching because the preparation is the easiest, but it tends to make students bored because there is only one-way interaction, namely from lecturers to students, an example of conventional media is the blackboard. The use of inappropriate teaching media will result in a less than optimal impact on student learning outcomes, an ineffective learning process is a factor causing the low learning outcomes obtained (Nopa Mustopa, 2017).

One of the learning problems that is a priority to find a solution for is the quality of education, especially the quality of learning. From various existing conditions and potentials, efforts that can be made regarding improving the quality of education are by developing learning technology that is oriented to the interests of students and facilitates the need for cognitive, effective, and psychomotor development (Depdiknas, 2005). Seeing the phenomena that occur, which in general students already know and use technology in a familiar way, can be used as an advantage for educators or lecturers by utilizing these technological developments to improve the quality of the learning process. Until now, there have been many application programs to help the learning process as a medium of learning information which is the result of the development of information and communication technology (ICT), including interactive multimedia and *mobile learning*. One

of the most serious problems in the field of education today is the low quality of education in various types and levels of education, especially higher education. The low quality of education is one of the factors that hinders the provision of human resources who have the expertise and skills to meet the demands of national development in various fields of expertise (Irwanto, 2019).

The success of the world of education cannot be separated from the use of learning methods. The learning method*(instruction method)*is an accumulation of the concepts of teaching*(teaching)*and the concept of learning*(learning).*Both are a combination in a learning system that involves students, objectives, materials, facilities, procedures, tools or media used. The importance of the learning method is very dependent on the modern and conventional application. Some research results in the use of successful learning methods in realizing educational goals are modern and conventional learning (Erni Ratna Dewi, 2018). Students are human beings who have uniqueness and diversity, therefore lecturers are expected to change the paradigm in their learning. Along with the development of the era began the development of student-centered learning. Students are also required to actively seek and find material together with the lecturer. So it is necessary to choose a learning model that can develop student activity. The learning model needs to be understood by the lecturer in order to be able to carry out learning effectively in improving the desired learning outcomes. In its application, the learning model must be carried out according to the needs of students because each learning model has different goals, principles, and main stresses.

According to Joyce & Weil in Rusman (2012) learning models themselves are usually arranged based on various principles or theories of knowledge. Experts develop learning models based on learning principles, psychological, sociological, systems analysis, or other supporting theories. Joyce & Weil argues that the learning model is a plan or pattern that can be used to shape the curriculum, design learning materials, and guide learning in the classroom or otherwise. Learning models can be used as patterns of choice, meaning that teachers may choose appropriate and efficient learning models to achieve their learning goals (Esminarto, Sukowati, Nur Suryowati, Khoirul Anam, 2016).

According to Gagne (2015) there are six modern and conventional learning methods namely tutorials, lectures, resistance, discussions, laboratory activities, public works, these methods need to be accumulated with proportional and urgent methods that are modern and conventional oriented. It also includes modern and conventional learning methods, namely developing learning activities in the laboratory which are usually learning while practicing to understand the interactions of students and lecturers on observations, experiments and proofs of various hypotheses from events or facts that can prove the observed hypotheses. This is important so that students and lecturers jointly conduct studies and analyzes of theoretical justification according to practice. Likewise, modern and conventional learning methods usually provide homework in the form of instruction to read books, exercises to handle cases or project assignments for various learning deepening activities. Molenda (2014) states that modern and conventional learning methods are very orientative and prospective for students and lecturers to create efficient and effective learning in realizing the quality of learning in the world of higher education. This view is an important construction for observing learning methods that have been applied in several universities.

Learning is a relatively permanent change in behavior resulting from past experience or from purposeful or planned learning. Eveline & Nara (2015) state that learning is a complex process in

which it contains aspects of developing knowledge, developing memory and awareness, developing meaning enrichment, interpretation and reality, as well as developing scientific behavior and obsession. On this basis, problem-based learning models were born, cooperative learning models, exploratory learning models, thinking skills improvement learning models, suggestopedia learning models,approaches to communicative *language teaching* (CLT), realistic mathematics learning models, PAKEM learning models (Active, Creative, Effective and Fun). These models are used from various applications of learning methods.

From this learning theory, information processing theory or commonly known as cognitive theory from Gagne (2015) is created, namely human knowledge explains various processes of information received, stored and retrieved to become learning materials and produce learning outcomes. Based on this theory, a learning method was born as a motivation in humans to achieve success in learning that is clarity, urgency, deepening and development. The learning method is an operational step of the chosen learning strategy to achieve the learning objectives. Learning theory according to Molenda (2014) is that learning methods or techniques are efficient, effective and of high quality in producing learning outcomes. The learning method according to Reigeluch (2015) is learning a process that is easy to know, apply and theorize in helping to achieve learning outcomes.

Wortham's (2013) view suggests that modern and conventional learning will give birth to tactical, technical and practical learning methods in the form of expository methods, demonstration methods, panel discussion and debate methods, role playing methods and simulation methods. This modern and conventional method is directed to be an effective, efficient and quality method in learning the world of higher education. Learning is a system or learning process for learners that is planned, implemented and evaluated systematically so that learners can achieve learning objectives effectively and efficiently (Komalasari, 2013). The use of interesting learning media will increase students' motivation and interest in learning which in turn makes students succeed in understanding the material provided (Setyadi & Qohar, 2017).

The use of *mobile learning* as a learning medium can help students learn the material easily. The development of *mobile learning* is shown to be able to be operated on a *smartphone*. The application of information and communication technology in learning has become a must, because the application of information and communication technology is one indicator of success in learning (Esterika Giovanni Pangalo, 2020). Facilities that provide general electronic information to learners and content *educational*that helps achieve knowledge without blaming location and time (Arifpurnamayana, 2012). *Mobile learning* is part of *e-Learning* which is more directed at utilizing the sophistication of mobile phones. *Mobile learning* provides subject matter that can be accessed anywhere and anytime with an attractive appearance (Fatmawati, 2015). According to Teguh Arifianto (2012) states that Android is a mobile device on an operating system for cellular phones based on Linux. So Android is a collection of mobile devices that includes an operating system, middleware and main mobile applications (Hermawan, 2011, Safaat, 2011). The use of mobile learning will increase student learning motivation and student attention in learning activities. In addition, compared to traditional teaching and learning systems, *mobile learning* allows for more opportunities for direct collaboration and informal interaction among students (Fatmawati, 2015). *Mobile learning* (*M-learning*) is a learning media that utilizes an information and communication technology (Setiawati, Kartika, & Purwanto, 2012).

Strategy according to Kemp (1995) is a learning activity that must be carried out by lecturers and students so that learning objectives can be achieved effectively and efficiently. In line with Kemp's opinion, Dick & Carey (1985) also stated that a learning strategy is a set of learning materials and procedures that are used together to produce student learning outcomes. Efforts to implement learning plans that have been compiled in real activities so that the objectives that have been prepared can be achieved optimally, it is necessary to use a method to realize the strategies that have been set. Thus, one learning strategy can occur using several methods (Syah, Muhibbin, 2010).

Approach can be interpreted as our starting point or point of view on the learning process. There are two approaches in learning, namely teacher-centered *approaches and student-centered approaches-centered approaches*, lecturer reduce strategies direct *instruction*, learning *deductive* or learning *expository*. Meanwhile, the student-centered learning approach reduces learning strategies *inquiry* and *discovery* inductive learning. Each learning model has advantages and disadvantages, to overcome the weaknesses of a learning model, it depends on how the lecturer implements the learning model in a more effective and efficient form of packaging. The temporary trial results show that learning with a learning model that activates students can be applied in lectures as an alternative learning with advantages such as: it can increase the acquisition of learning outcomes; can motivate students; students are more active and creative; The relationship between lecturers and students is quite familiar so that students are more daring to ask questions (Abdullah, 2017).

Various studies have shown that the use of *mobile learning* can train students' critical thinking skills. The development of *mobile learning* as a learning medium has been carried out by several researchers, including (Purbasari, Kahfi, & Yunus, 2013) and (Kusuma, 2016) who developed *mobile learning* -based *android*. Learning outcomes are the maximum results achieved by a person after carrying out a given learning activity based on certain measurements (Ilyas, 2008). According to Rifai, et al (2009) learning outcomes are changes in behavior obtained by students after experiencing learning activities. According to Reigeluth quoted by Keller in Rusmono (2012) learning outcomes are all consequences that can occur and can be used as indicators of the value of using a method under different conditions. Learning outcomes are the results achieved by a person as a process that has been carried out, namely the existence (input or input) and producing (output or output) (Ngalim Purwanto, 2013). Based on some of the opinions described above, it can be concluded that learning outcomes are the results of achievement by individuals and groups obtained from the ability to think, act after going through a learning process that includes cognitive, affective and psychomotor aspects to support life skills and learning outcomes are not It just disappears, unless there is a new learning process or there is damage/abnormality in the brain that interferes with memory function (Fendi Lestiawan & Arif Bintoro Johan, 2018).

In the world of higher education, reflective learning (*reflective learning*) has been developed by many education experts, so that quite a lot of variations of reflective learning have come to us. One of the reflective learning models is the one formulated by *The International Center for Jesuit Education* (ICEGATE), namely the Ignatian Pedagogy Paradigm (Sirajuddin, 2009). Learning outcomes can be easily explained by understanding the two words that make it up, namely "results" and "learning". The word yield refers to the product or gain as a result of a process that causes a change in the input of a system. Learning refers to a process marked by the interaction between

the components of learning. Learning outcomes are the basis for determining the level of student success in the learning process (Taman Firdaus, 2012).

Learning outcomes according to Asep Jihad & Haris (2008) are the attainment of a form of behavioral change that tends to persist from the cognitive, affective and psychomotor domains of the learning process carried out within a certain time. Meanwhile, Taman Firdaus (2012) states that learning outcomes are something that is obtained, mastered, or owned by students after going through a learning process. In line with this, Nana Sujana (2012) also defines learning outcomes as abilities possessed by students after they receive their learning experiences. In a learning process, learning outcomes are often used as binoculars to be able to see improvements in one's learning, therefore educators must be able to measure student mastery of the material concepts that have been given by looking at student learning outcomes. Learning outcomes are often used to determine how far someone has mastered the material being taught (Purwanto, 2009). According to Bloom, learning outcomes include cognitive, affective and psychomotor abilities (Agus Suprijono, 2009). Learning outcomes are learning achievements that students have after participating in learning activities to find out to what extent they understand and understand the material. Learning outcomes are all effects that can be used as indicators of the value of using learning strategies (Rohani, 2010; Slameto, 2008; Hamalik, 2008; Mulyasa, 2008; Sudjana, 2010; Suprijono, 2009; Purwanto, 2010).

Giving pressure on material mastery due to changes in students' self after learning is given by Soedijarto who defines learning outcomes as the level of mastery achieved by students in following the teaching and learning process in accordance with the educational goals set (Purwanto, 2009). After paying attention to the various theoretical studies above, it can be concluded that learning outcomes are a basis in determining the level of student success which is marked by changes in students' self-control of a number of materials provided in the teaching and learning process which include cognitive, affective and psychomotor aspects. The learning models themselves are usually arranged based on various principles or theories of knowledge. Experts develop learning models based on various principles or theories of knowledge.

Experts develop learning models based on learning principles, psychological, sociological, systems analysis, or other supporting theories. Joyce & Weil studied models based on learning theory which were grouped into four learning models. The model is a general pattern of learning behavior to achieve the expected learning objectives. Joyce & Weil argues that the learning model is a plan or pattern that can be used to form a curriculum (long-term learning plan), design learning materials, and guide learning in the classroom or otherwise. Learning models can be used as patterns of choice, meaning that teachers choose appropriate and efficient learning models to achieve their educational goals (Putri Khoerunnisa & Syifa Masyhuril Aqwal, 2020). Student learning outcomes are influenced by two main factors, namely internal factors and external factors. Internal factors that come from within students include psychological and physical factors. While external factors are factors that come from outside the students themselves. One of the factors from outside the student is the model used by the lecturer in delivering the material. The application of appropriate learning models will affect the success of students in understanding the subject matter, achieving science process skills and improving learning outcomes (Primarina, 2012).

Based on the background that has been stated above, the authors are interested in researching the problem entitled the comparison of conventional and mobile learning-based learning models

in improving student learning outcomes in the Calculus 1 course in the electrical engineering vocational education study program, FKIP University of Sultan Agen Tirtayasa Serang Banten. And the purpose of writing this article is (1) to find out the comparison of conventional learning based on video learning and android-based learning in improving student learning outcomes in the calculus 1 course in semester 1 in the PVTE study program, FKIP UNTIRTA. (2) to determine student responses to the use of android-based learning.

METHOD

This research is an experimental research with a quasi-experimental type (*Quasi-Experimental Research*). Sugiyono (2019) stated that *Quasi-Experimental Research* is also known as quasi-experimental. This method is used because the research conducted has a control group but cannot function fully to control external variables that affect the implementation of the experiment. The experimental class uses android-based learning media while the control class uses learning videos. So in this study, it consists of two variables, namely the independent variable (*independent*) where this variable affects or is the cause of changes in the emergence of the dependent variable. This variable in this research is learning by using mobile learning. and dependent variables. The dependent variable (*dependent*) is a variable that is affected or is the result of the independent variable. The dependent variable in this study is student learning outcomes.

Quasi-experimental is also called quasi-experimental or not original. In the field of education the tight control as designed in a true experiment, is sometimes very difficult to fulfill. Therefore, an experimental design is needed that is in accordance with the real conditions as shown in Table 1 below.

Tabel 1. Desain penelitian

Kelompok	***Pre-test***	**Perlakuan (variabel bebas)**	***Post-test* (variabel terikat)**
Eksperimen	Y_1	X_1	Y_2
Kontrol	Y_3	X_2	Y_4

The experimental class and the control class which were used as subjects in this study were chosen by *purposive sampling*, where the researchers carried out based on certain considerations and the lecturers of the same subject, namely the calculus 1 course, so that they had the same learning characteristics. The experimental class in this study carried out learning activities using mobile learning while the control class carried out video learning activities. The two classes have different treatments, so in this study the class that uses mobile learning is called the experimental class and the one that uses video is called the control class. Basically, these two classes were given a pretest before being given treatment and a posttest after being given the same treatment.

The subjects of this study were odd semester students of the 2019/2020 academic year at the Electrical Engineering Vocational Education Study Program, Faculty of Teacher Training and Education at the undergraduate level, at one of the State universities (PTN) in the city of Serang-

Banten. The research subjects were 57 students consisting of class A (*Control*28 students in) and 29 students in class B (*Experimental*).

This research was conducted at the electrical engineering vocational education study program, FKIP Sultan Ageng Tirtayasa University, Serang Banten, which is located at Jalan Raya Ciwaru No. 25, Serang City, Banten, Indonesia. This research was conducted in October – December 2019. In this study, the researcher used quasi-experimental (quasi) research.

The instruments used are *pretest, posttest,* and student questionnaires. The material discussed in this study is the basic concept of the matrix. Before the test is used in the research class, it is first tested in the first class that studies this material in other classes. The questions tested were 45 questions and 38 questions were valid. This is used to measure the ability of PVTE FKIP students, UNTIRTA, so that from the results of this trial it can be seen whether the questions are suitable for use or not.

The hypothesis used in this study is a comparison based learning *mobile learning* with conventional in improving learning outcomes of students in the subject of calculus 1 in courses vocational education in electrical engineering, Guidance and Counseling, Untirta namely:

1. There are differences in learning outcome of students in the subject of calculus 1 using tutorial video.
2. There are differences in the improvement of student learning outcomes in calculus 1 courses using *mobile learning*.

The data analysis technique was carried out to find out whether there was an increase in student learning outcomes with learning using *mobile learning* better than using the learning video model. The results of the initial ability test (*pretest*) and final ability (*posttest*). All students in both research classes (experimental class and control class). The data processing includes normality test, homogeneity test and hypothesis testing. In addition, this study also uses a questionnaire, where this questionnaire is used to determine the extent to which students are interested in using the learning model *mobile learning*.

RESULTS AND DISCUSSION

Universities as higher education institutions in the teaching and learning process are known as lectures. In the lecture process, the lecturer plays a role in conveying and explaining the material, so that it can be understood and mastered by students. However, it should be realized that the ability of each student is different. This can be seen from their ability to solve problems. From the results of solving these problems, it can be seen whether the students were able to solve the problems correctly or they made mistakes in solving the problems.

Calculus 1 is one of the compulsory subjects in the Electrical Engineering Vocational Education Study Program. As a condition for taking advanced courses, namely Calculus 2, students are required to take Calculus 1 courses first. Calculus I is a compulsory subject in the electrical engineering vocational education program, which means that it is mandatory for all undergraduate students from the PVTE FKIP UNTIRTA study program. Calculus 1 is needed by science (even all disciplines) to increase the predictive power of that science and is something imperative because it is a means to further enhance deductive reasoning. In addition, calculus 1 is also famous for its material which is very hierarchical in nature and produces an efficient language that is very much needed by Technical Education. In terms of the ability to quantitatively analyze

problems related to learning in engineering, calculus modeling at a simple level by applying an understanding of various concepts and principles in engineering is an absolute must because without calculus (mathematics) knowledge will stop at the qualitative stage.

Calculus (Latin: calculus, meaning "little stone", to calculate) is a branch of mathematics that includes limits, derivatives, integrals, and infinite series. Calculus is the science of change, just as geometry is the science of shapes and algebra is the science of working to solve equations and their applications. Calculus has wide applications in the fields of science, economics, and engineering; and can solve various problems that cannot be solved by elementary algebra. Calculus has two main branches, differential calculus and integral calculus, which are related to each other through the basic theorems of calculus. Calculus lessons are the gateway to other higher mathematics courses, which specialize in the study of functions and limits, which is generally called mathematical analysis (Wikipedia.org). The results of the study showed that in the implementation of learning using *mobile learning* and using video learning the level of student learning outcomes of the electrical engineering vocational education study program, Faculty of Teacher Training and Education, Sultan Ageng Tirtayasa University, Serang-Banten. In learning before and after being given treatment, it is necessary to process data and analyze data on *pretest* scores and scores *posttest*.

Calculus 1 is a basic subject that is important for students to master because it is widely used to study other subjects, therefore this course is a prerequisite for taking the following courses. Calculus 1 is a Science and Skills Course (MKK) with a load of 2 credits. The material is in the form of real number systems, matrices, inequalities, inequalities and absolute values, functions of one variable, types of functions, operations on functions, composition functions, inverse functions, implicit functions, trigonometric functions, cyclometric functions, function graphs, function limits. , continuity of function, limit function theorem, continuous function, calculate limit of function, derivative of function and its theorems, understanding of function derivative geometry, continuity and differentiability, chain rule, implicit differentiation, differential and derivative, application of derivative function, drawing function graph, usage derivatives on some problems, and the mean value theorem.

The increase in student learning outcomes after using *mobile learning* can be seen based on *the gain value*, namely the difference between the scores *pretest* and *posttest*. The recapitulation ofdata *pretest* and *posttest* can be seen in Table 2.

Table 2. Improving student learning outcomes in the experimental class and control class

Values for the	Experimental	ClassControl Class
Pretest	85.67	82.31
Posttest	88.32	83.24
Gain Score	2.65	0.93

From the research data above, it can be analyzed against the pretest scores. with the aim of measuring the initial abilities of PVTE FKIP UNTIRTA students and the final abilities of these students. The presentation of the data is presented on descriptive statistics with pretest scores for

the experimental class and the control class. The following are the results of the normality test calculation.

Table 3. Normality test

Class	χ^2 count	χ^2 table	Conclusion
Experiments	5867	7815	Normal
Control	4305	7815	Normal

From the above data obtained from the data that the class that uses mobile learning or classroom use instructional videos in the learning process is obtained that χ^2 count on χ^2 tables at the level of significant 5% or 95% confidence interval, the obtained results stating that that χ^2 count $<\chi^2$ tables,it can be concluded that the control class and experimental class normal distribution.
To test the homogeneity of the experimental class and control class, the following results can be obtained.

Table 4. test

F_{count}	$F_{0.95}$	$F_{0.99}$	Conclusion
0.432	1.341	2.62	HomogeneityHomogeneous

From the data above it can be seen that the calculated F and F table are at a significant level of 0.05 with a 95% confidence interval and a significance of 0.01 or a 99% confidence interval, then theF is obtained calculated < F table, it can be concluded that the control class and the experimental class are homogeneous samples.

After testing the normality and homogeneity of the data, the next step is to test the hypothesis with the help of the SPSS version 21.0 program with statistics. If you have larger than that used by researchers at the confidence level of 95% and y = 27, so it was found that H_0 is rejected and H_1 accepted. Then the hypothesis testing can be done by looking at the t distribution table, with the t price obtained and then consulting with the t table. The results of hypothesis testing conducted on the control class and the experimental class are as follows.

Table 5. Hypothesis testing

Class	$t_{arithmetic}$	t_{table}	Conclusion
Control - experiment	3,289	2,052	H_0 rejected H_1 accepted

From the data above, it can be consulted at a significant level of 0.05 or 95% confidence interval and v = 27, it is obtained that count > table which means H0 is rejected and H1 is accepted. So it can be concluded that the results of the t-test is that mobile learning in improving student learning outcomes is considered better than learning using the video learning model.

Based on the descriptive results and hypothesis testing above, it can be concluded that both classes experienced an increase in learning outcomes for the calculus 1 course in the electrical engineering vocational education study program, FKIP Sultan Ageng Tirtayasa University, Serang-Banten. After calculating the two tests, the average gain was normalized for both the experimental class and the control class. So students who take lessons with mobile learning have

a better understanding of the increase compared to classes that use video learning. This means that learning using mobile learning can improve student learning outcomes in the electrical engineering vocational education study program, FKIP, UNTIRTA. The comparison of the improvement in student learning outcomes of PVTE, FKIP, UNTIRTA for the control class scores with the experimental class, can be seen in the image below.

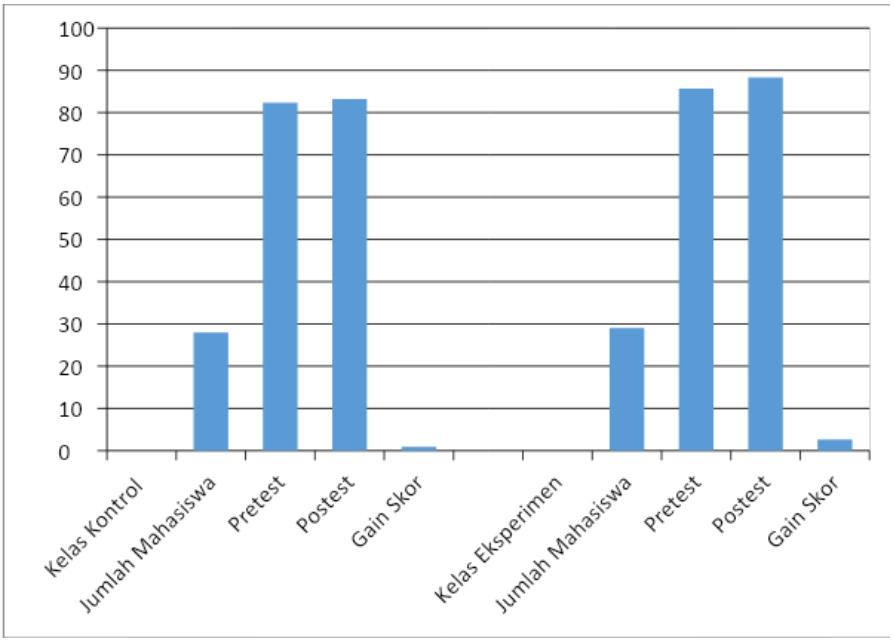

Figure 1. Comparison of the improvement in student learning outcomes for the control class scores with the experimental class

After the initial and final tests were carried out, students in the experimental class were given a questionnaire to determine the extent of student interest in using mobile learning. The instrument used in this study used a Likert scale with the following scoring.

Table 6. Student Response Criteria

No	Percentage Interval Percentage	Criteria
1	84.01 % - 100 %	Very Interested
2	68.01 % - 84.00 %	Interested
3	52.01 % - 68.00 %	Moderately Interested
4	36.01 % - 52.00 %	Less Interested
5	20.00 % - 36.00 %	Not Interested

After distributing a questionnaire containing 38 statements related to learning using the learning model *mobile learning* to 29 students in the experimental class. Then the results obtained an average value of 89% and the score of 89% is included in the category of very interested. Thus,

students who take calculus 1 courses are more interested in using the mobile learning model than the video learning model.

CONCLUSION

Based on the results of the analysis and discussion that has been carried out, it can be concluded as follows:

Learning using mobile learning is better than learning using video, in the calculus 1 course in the electrical engineering vocational education study program, FKIP UNTIRTA. Student responses after taking lessons using mobile learning for calculus 1 courses, are very interested in the average score of 89% and can improve calculus 1 learning outcomes for electrical engineering vocational education students, FKIP UNTIRTA.

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