

# Implementation of the Problem Based Learning Model With E-Learning Media Through the Google Classroom Application in Introduction to Information Technology Courses

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**Abstract.** Good education can be realized by providing effective support in the teaching and learning process. One of the supports in the learning process is the use of models and media, including the Problem Based Learning model with E-learning media through the Classroom application. This study aims to determine the improvement of student learning outcomes of Class A semester 1 Uniba Madura and to find out how students respond after applying the Problem Based Learning model with E-learning media through the Classroom application. The method used in this research is Pre-Experimental Design type One Group Pretest-Posttest Design. The analysis of learning outcomes obtained shows that the t-count value in class A semester 1 is 2.097 and class B semester 1 is 2.100 with a t table of 2.056. This shows that after applying the Problem Based Learning learning model with E-learning media using Classroom, learning outcomes have increased. While the N-Gain value obtained results of 0.6 and 0.5 which indicate moderate criteria. This means that students' understanding of mathematical concepts increases. In addition, the results of the analysis of student responses showed scores in the range of 60%-80%. This states that student responses show good satisfaction with the given model.

**Keywords.** E-learning, Classroom, Problem Based Learning (PBL)

## 1 Introduction

The learning process is carried out so that someone has a cognitive, psychomotor, and affective understanding so that it will be better in the future is the goal of education. In law No. 20, 2003 concerning the national education system, Article 18 paragraph 3, Vocational High Schools will equip students to be ready to face the world of work in certain fields or certain jobs until they continue to the appropriate universities. The effect of education will give a person various kinds of knowledge and life skills. Skills can be personal, social, academic, and vocational skills. Vocational education teaches the development of interests, talents, skills, and habits that lead directly to the world of work. Creating students who have good personalities and have skills is the main goal of SMK. So students must be equipped with special skills to be ready to face the world of work, compete as workers, or as entrepreneurs. However, if the student's ability is still lacking and has not met the demands of the industry, then the student has not been accepted into the world of work and still needs retraining.

The existence of the coronavirus disease (covid-19) pandemic has made the implementation of education difficult. The policy during the pandemic by the Minister of Education and Culture said that the teaching and learning process was not carried out face-to-face in

the education unit but was carried out online or by dividing each class into several classroom meetings. Therefore, online learning or online learning on campus has begun to be applied. The application of online learning is also carried out in engineering mechanics subjects, although it is a little complicated in its implementation. Based on a preliminary study in class A of Uniba Madura, many obstacles arise such as obstacles to teaching and learning activities and how to motivate students so that students have an interest in learning engineering mechanics. The existence of these obstacles can cause students' understanding of mathematical concepts to decrease. Learning mathematical concepts takes quite a lot of time. Students can understand the concept of a material when students are faced with problems and the material can be studied repeatedly. Therefore, so that students can understand the subject matter and facilitate the learning process, it is necessary to have interesting learning tools. Efforts to make the teaching and learning process easy and fun are through E-learning.

E-learning is a system that supports the learning process in a network that utilizes technology and information (Suartama 2014). The characteristics of E-learning are not limited by space and time in communicating between teachers and students by utilizing technology services, using independent

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learning materials that can be accessed at any time, and educational administration can be viewed anytime on a computer (Kusmana 2011). Teachers or instructors can update teaching materials anytime and anywhere. But on the other hand, teachers must design E-learning methods well so that distance learning can run effectively and smoothly and remain conditional. With the help of this facility, the teaching and learning process does not depend on the teacher, because students can access material that is not limited by space and time. Access to complete materials and information makes it easier for students, lecturers, and those in need in learning activities (Riyanto 2016). However, teachers must also plan how the shortcomings of E-learning can be minimized. So E-learning is a form of system that can facilitate a teaching and learning process by utilizing online media. When you can't carry out learning in class, E-learning is very suitable to be implemented and easy to manage like Classroom.

Classroom is a microblogging media platform that provides an online learning management system. Classroom is an application that allows teachers to share learning materials, give quizzes, and communicate with students. The application of Classroom in E-learning learning is intended for teachers, students, and also parents who can be accessed via the internet or android-based applications. Teachers can take advantage of Edmodo's facilities such as creating groups, creating assignments, making quizzes, providing materials, creating forums, to providing direct scores for student assignments that have been collected. The features provided in Classroom are very diverse such as Assignment, Quiz, Gradebook, Groups, Library, Progress, and so on so that it is comfortable to use by students and teachers, including parents (Enriquez 2014). Judging from the many benefits and features in it, Edmodo is the right choice. This google classroom can make it easier for students and teachers to connect with each other inside and outside school (Class, 2018: 16). Although Edmodo is not the answer for every online class but Classroom makes learning more fun for students.

The learning process carried out by applying E-learning has various challenges and weaknesses. One of them is limited internet access, reduced interaction between teachers and students, tends to be training rather than educational, participants feel isolated, and reduced understanding of the material. Teachers have challenges how to increase students' interest in learning and how to create fun learning so that in the end students' mathematical concepts also increase. To improve these two things requires continuous learning and practice. The practice of understanding concepts in a learning process can be realized by confronting students with everyday problems. The problem-based learning model or Problem Based Learning (PBL) is considered suitable and can be applied.

According to Eggen (2012) the Problem Based Learning (PBL) model or problem-based learning model is a model used to develop thinking skills, problem solving, and self-regulation by using authentic problems as the focus of learning. The learning process carried out through group collaboration will be better than the

individual model (Adistana 2016). The purpose of the PBL learning model is to develop critical thinking patterns to solve problems and master the learning materials. With the PBL model students can conduct analysis, try out, make references and draw conclusions by carrying out investigations into the problems at hand (Shofiyah, Noly and Wulandari 2018). This PBL Learning Model is considered effective because students can search for solutions and solve problems on their own so that students' understanding of mathematical concepts can increase. The application of this model can change students' thinking patterns based on cognitive levels from low to higher. As explained by Rahayu, Imami and Adistana (2019) that the highest level in the cognitive domain after the learning process is that students are able to solve problems.

The PBL learning model is carried out using E-learning media. The syntax used in the PBL model in E-learning-based learning is (Afrianto 2020): 1) Gathering participants into online classes, 2) Forming small groups, 3) Preparing problems or issues, 4) Giving questions to groups that have been formed and groups The teacher must look for references, 5) Conduct discussions in online classes to build collaboration between groups, 6) The teacher monitors and guides the online discussion, 7) Collects assignments on the links provided, 8) Face-to-face presentations and discusses the results, 9) Conducts joint reflection and evaluation. By applying Edmodo media and PBL learning models, the teaching and learning process can be carried out effectively and the understanding of mathematical concepts increases so that student learning outcomes also increase.

This study uses the subject of Engineering Mechanics. Mechanical mechanics is a science that studies the behavior of structures due to the influence of forces on a stationary object or a moving object. Things that are discussed in studying structural behavior are force balance, stability, elasticity, etc. (Murfihenni 2013). The structure can be planned and its strength known if we already know each force and deflection that occurs. This study uses the basic competencies of the Mechanical Mechanics subject, namely Analyzing the forces of the rods in simple frame construction and calculating the forces of the rods on simple frame constructions.

## 2 Research Methodology

The method used in this research is Pre-Experimental Design research using the One Group Pretest-Posttest Design type. The design method consists of a sample that will be tested twice, namely the initial test or pretest and posttest final test. The following is an overview of the research design (Sugiyono 2013):

**Table 1.** Research Method.

Pretest	Treatment to sample	Posttest
O1	X	O2

- O1 Value before being treated (pretest)
- X PBL learning model with E-learning media through the Classroom application
- O2 Test value after being treated (posttest)

In this research method, cognitive ability tests will be given twice before and after the treatment is carried out. Pretest or Pretest will be given to the experimental class called O1 to determine the students' prior knowledge. After that, the researcher will give treatment to the experimental class in the form of applying the PBL learning model with E-learning media through the Classroom application called X. Then the experimental class will be given a final test or posttest called O2. The posttest was given to obtain the results of students' understanding of the rod style material delivered by the lecturer using the PBL learning model with E-learning media through the Classroom application.

The location of the research was carried out at Uniba Madura, which was carried out in the odd semester of 2021/2022. The population of this study were students of class A and B of the Informatics study program. The following research procedures are presented in the flow chart.

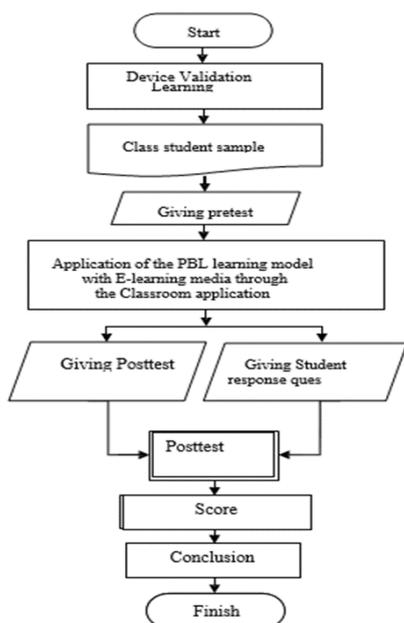


Fig. 1. Research Design Flow Chart.

Before this research is carried out, the learning tools will first be validated. expert lecturers are expert validators who will validate learning tools. The results of the assessment of the validation of each device were analyzed in the form of a percentage. The results of the percentage assessment are used as the following criteria (Ridwan 2012):

Table 2. Rating Scale Rating Categories

Average Score (%)	Percentage Result Criteria
0-20	Very less
21-40	Not enough
41-60	Enough
61-80	Valid
81-100	Very valid

The syllabus has been validated by expert validators to get eligibility with a percentage of 81.95% which means that this result is in a very valid criterion because the value is in the 81%-100% interval. Calculation of RPS validation results from expert validators obtained eligibility with a percentage of 80.36% which means that this result is in a very valid criterion because the value is in the 81%-100% interval. The calculation of the feasibility of Classroom media shows a percentage of 81.25%, which means that this result is in the valid criteria or suitable for use because the value is in the 81%-100% interval. The calculation of the feasibility of the student response questionnaire shows a percentage of 77.09%, which means that this result is in a very valid criterion to be used because the value is in the 61%-80% interval. The results of the validation that have been carried out are presented in the following table

Table 3. Results of Validation by Experts

Aspect Assessment	Percentage (%)	Criteria
Syllabus	81.9	Very valid
Rpp	80.3	Very valid
Media classroom	77.0	Valid
Student response question	81.2	Very valid

Before calculating and determining the t-test, the data must be tested for normality and homogeneity. The way to find out whether the sample being tested is normal or not, the normality test is used. The normality test is carried out before calculating and determining the paired t test because to calculate the paired t test it is necessary to know that the data we get are normally distributed. In this test, the chi squared formula is used to be able to analyze data that is normally distributed or not (Sugiyono 2016). In addition to the normality test, it is also necessary to know whether the data obtained is homogeneous before calculating the t test. This homogeneity test can be known by using the chi square test formula (Sugiyono 2016). After getting the results of normal and homogeneous data, then the paired t-test can be done. The way to find out whether or not there is a significant difference between the pretest and posttest scores is a paired t-test. After knowing the value of t, the next step is to draw conclusions. From the calculation of the paired t-test that has been carried out, it can be concluded that H0 is rejected if the value of ttable is less than tcount and H0 is accepted if the value of ttable is greater than tcount (Sugiyono 2016). After the paired t-test was performed, then the data were analyzed using N-gain. The purpose of the formulation of the N-gain analysis is to investigate the improvement of mathematical concepts of students who have been given treatment. The N-gain value obtained is classified based on its interpretation. The criteria for the normalized N-gain value are if the value obtained is more than or equal to 0.7 including high, if it is more than 0.3 and <g> is less than 0.7 then it is moderate, and if <g> is less than 0.3 is low.

After being given treatment in the experimental class which was tested using the classroom media and the

PBL learning model, students filled out a response questionnaire to the learning that had been carried out. To find out the level of student satisfaction, the analysis was carried out on the results of the student response questionnaire. The Likert scale is used to analyze the calculation of student responses and the percentage results of the assessment of student response questionnaires are used as criteria based on the Rating Scale (Ridwan 2012). The following are criteria based on the Rating Scale (Ridwan 2012):

**Table 4.** Rating Scale Rating Categories

Percentage (%)	Criteria
0-20	Strongly disagree
21-40	Don't agree
41-60	Doubtful
61-80	Agree
81-100	Strongly agree

The criteria in the percentage will be used to measure the level of student satisfaction after being given treatment. If the results of the analysis show a high level of satisfaction, then the model and media applied in the experimental class are good for continuous use.

### 3 Research Results and Discussion

The data of pretest and posttest values were tested for normality before the paired t-test was conducted to determine whether there was an increase in student scores. The hypothesis of the normality test is in the form of H0 which states that the sample tested is normally distributed and H1 states that the sample tested is not normally distributed (Sugiyono 2016). The decision on the results of the distribution of data is done by comparing the values obtained with a significance of 0.05. This study requires H0 to be accepted, then the calculated X2 value must be less than X2 table. This states that the sample from the population is normally distributed. Here is the result table normality test that has been analysed.

**Table 5.** Results of Normality Test Analysis

Class	Test	X <sup>2</sup> count	X <sup>2</sup> table	Conclusion
A	Pretest	8.0	11.1	H <sub>0</sub> received
	Posttest	6.3	11.1	H <sub>0</sub> received
B	Pretest	5.5	11.1	H <sub>0</sub> received
	Posttest	5.7	11.1	H <sub>0</sub> received

Based on Table 5, it shows that all the pretest and posttest groups of class A and class B who have received treatment, namely by implementing PBL using E-learning media through the Classroom application, the X2 table value is greater than the calculated X2. In this case it can be said that H0 is accepted. Therefore, the test data from the two experimental classes were normally distributed.

In addition to the normality of a data, the requirement to perform a paired t-test is that the data is homogeneous. The way to find out if the data will be

analyzed is homogeneous or not, it is done by using the homogeneity test (Sugiyono et al 2016). The hypothesis of the homogeneity test in the form of H0 states that the sample variance is homogeneous and H1 states that the sample variance is not homogeneous. In this case what is desired is that H0 is acceptable, then the calculated X2 value must be less than X2 table which means the sample variance is homogeneous. The following is a table of data results that have been analyzed:

**Table 6.** Homogeneity Test Results

Test	X <sup>2</sup> count	X <sup>2</sup> table	Conclusion
Pretest	1300	3841	H <sub>0</sub> received
Posttest	0.700	3841	H <sub>0</sub> received

Based on Table 6, the calculated X2 value for the pretest is 1,300 while the X2 value for the table which is 3,841. This shows that the X2 count is less than the table X2, meaning that in the pretest the variance of the sample is homogeneous. In the posttest, it can be seen that the calculated X2 value is 0.700, while the X2 table can be seen with a value of 3.841. From the X2 calculations that have been carried out, it can be concluded that X2 count is less than X2 table, which means the sample variance is homogeneous. In accordance with the requirements, after knowing that the pretest and posttest were normally distributed and the sample variance between groups was homogeneous, then a paired t-test was carried out (Sugiyono 2016). This test was conducted to investigate the difference in the average sample before being given treatment and after being given treatment (pretest and posttest values) with a hypothesis in the form of H0: 1 = 2 which stated that there was no significant difference between pretest and posttest and H1: 1 ≠ 2 which stated there is a significant difference between the pretest and posttest. H0 is accepted if tcount is less than ttable. The results of the paired t-test can be seen in table 7. Below

**Table 7.** Paired T-test Results

Class	t <sub>count</sub>	t <sub>table</sub>	Conclusion
At	-2097	±2056	H <sub>0</sub> reject
B	-2100	±2042	H <sub>0</sub> reject

Seen from table 7, the value of tcount A is 2.097 with ttable is 2.056. From the results of the analysis states that H0 is rejected because tcount is greater than ttable. This shows that between the test scores that were carried out before the treatment and the test after the treatment was given, there was a significant difference. Seen in table 7 that the ttable value is 2,042 and the tcount value in class B is 2,100. From the results of the analysis, it is stated that tcount is more than ttable, which means that H0 is rejected and H1 is accepted. So it can be concluded that there is a significant difference between the pretest and posttest scores.

N-Gain Test. After the paired t-test is carried out, then analyze the N-gain value in the experimental class. The N-gain value is used to determine the increase in students' mathematical concepts in each class after being given treatment, namely PBL learning with E-learning media through the Classroom application. The

following is the result of calculating the N-gain value for each class, which can be seen in table 8.

**Table 8.** The calculation results N-Gain

Class	<g>	Interpretation
At	0.6	Currently
B	0.5	Currently

From the calculation of the N-gain value, it can be seen that the N-gain value of A is 0.6 so that it enters into the moderate interpretation criteria. So it can be concluded that in class B there is an increase in students' mathematical concepts. The N-gain value in class A obtained a value of 0.5 which is also included in the moderate interpretation criteria. So in class A it can be concluded that students experience an increase in mathematical concepts.

Analysis of Student Response Questionnaire Results. The results of the student response questionnaire that has been filled out after being given learning in the form of the application of the PBL model with E-learning media through the classroom application can be analyzed to determine the level of student satisfaction. The samples that filled out the response questionnaires were students from classes A and B. These students filled out the response questionnaires according to how they felt. The learning process was carried out using the PBL model with E-learning media through the Classroom application. The percentage results can be seen in table 9

From Table 9 it can be seen that the student response questionnaires get a percentage of 60%-100% on questions 1-9. This shows that the question number 1 to 9 is in the good category. As for question number 10, it is in the range of 41%-60% so that it can be declared in the sufficient category.

Based on the analysis obtained in this study, it was stated that the results of the paired t-test showed that there was a significant difference between the test scores given to the experimental class before and after being given treatment. The results obtained show a negative value, then the results of the students' final test scores (posttest) are higher than the pretest scores in accordance with the statement from Sugiyono (2016). These results indicate that after applying the PBL learning model with E-learning media through the Edmodo application in class A and B, students experience an increase in learning outcomes. In addition, the results of the N-gain calculation show moderate criteria, which means that students experience an increase in mathematical concepts in learning. In the analysis of the research that has been carried out, it can be concluded that with the learning process that applies the PBL model with E-learning media through the Classroom application, the students of class A and B experience an increase in learning outcomes through increasing students' mathematical concepts.

Learning carried out through collaboration between study groups will be better and result in increased student understanding and increased learning outcomes. This is in line with the explanation by Adistana (2016) where learning with group collaboration will be better when compared to the competitive model. There is a

good impact for students that is obtained after the implementation of the PBL learning model with E-learning media through the Classroom application. The use of Edmodo media also makes students experience an increase in learning outcomes, because students can quickly access the required material. This is supported by the statement by Holland & Muilenburg (2011) which states that teachers can share subject matter, quizzes, and others in Edmodo so that students can access learning materials with unlimited time. This increased learning outcome is also supported by Jannah (2018) where after applying Edmodo media it can provide a positive learning experience so that learning outcomes increase.

Other research also states that by applying the PBL model, students are able to investigate authentic problems provided by the teacher after the PBL learning model is applied, conduct trials with their respective groups so that students succeed in solving problems and drawing conclusions (Shofiyah, Noly and Wulandari 2018) . If the student succeeds in solving the problem, then the student has reached a high level in the cognitive domain such as the explanation from Rahayu, Imami Arum Tri and Adistana (2019). The PBL learning model can help students develop understanding of mathematical concepts and critical thinking patterns so that if there are problems students can solve them themselves. Students are guided by conceptual questions in the form of problem solving. With the demands of students must be able to collect various information and conclude the results. This has an effect on increasing students' mathematical thinking concepts.

Feasibility of Models and Media Based on Student Response Questionnaires Based on the analysis obtained from student response questionnaires, the PBL learning model with E-learning media through the Classroom application that is applied makes students quite happy in learning the Buffer Point Balance material. The results of the questionnaire responses to student attitudes are in good or satisfied criteria.

Students feel enthusiastic about learning online through classroom media, students' enthusiasm is also high when discussing solving problems in the classroom. In addition, the PBL learning model with E-learning media through the classroom application that is applied makes students' interest and curiosity higher. The successful application of the PBL learning model with classroom-based E-learning media also makes it easier for students to solve existing problems so that students' understanding increases. The proof of this is that the results of the student response questionnaire in understanding and solving problems are in good or satisfied criteria. This statement is supported by Priyasudana (2016) who explains that the PBL learning model is important and feasible to apply because the goal is that students can solve everyday problems so that students are accustomed to real situations.

The existence of E-learning media assistance that is applied in the learning process is very impactful, especially when learning cannot be done in class. Technology that is developing very widely requires us to be more sophisticated and more responsive, especially in the world of education. By utilizing E-

learning media through this classroom application, all activities can be carried out and facilitate the learning process. However, the use of classroom media still has limitations. Limitations in this study are the presence of students who do not have adequate mobile phones, limited internet access at home, and difficulty controlling students during learning. This is what makes this research has limitations.

Based on the description of student learning outcomes and feasibility according to student responses, learning by applying the PBL model with E-learning media through this classroom application can help make the learning process run well. During the distance learning process, classroom is used to facilitate learning activities. Meanwhile, so that students can have a good understanding of mathematical concepts and students continue to learn, the PBL model is used. Therefore, the PBL model applied in E-learning media through this classroom application can help realize an effective

learning process and develop students' understanding in learning

## 4 Conclusions

From the results of research and discussions that have been carried out in this study, it can be seen that students' understanding of mathematical concepts after the PBL learning model is applied with E-learning media through the classroom application can improve better. This is known by the student learning outcomes that increase from low to higher. In addition, after implementing the PBL learning model with E-learning media through the classroom application, student responses showed good satisfaction. From the results of student responses that show a good level of satisfaction and improve student learning outcomes, the PBL learning model and classroom media are feasible to be applied in the distance learning process.

Question	Percentage	Criteria
I am not happy in studying the material with the applied model	73%	Well
Through the media that has been applied, it is easier for me to learn the introduction of information technology	62%	Well
The presentation of the problem presented by the teacher was able to attract	65%	Well
The presentation of the problem presented by the teacher is able to arouse curiosity	72%	Well
The process of teaching and learning activities that are applied makes it easier for me to digging information	68.5%	Well
I find it difficult to understand the concept of point balance learning material Buhul by using the applied learning model	6%	Well
I can participate and play a more active role in the classroom media applied	67.5%	Well
Learning introductory information technology using a learning model that is applied to the classroom media attracts my interest in learning	65.5%	Well
The use of the applied learning model can help me in solving existing problems	66%	Well
I prefer to learn with the classroom media that is applied	59.5%	Enough

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