

# **Case Based Learning Methods In Mechanical Earth Moving Courses In Improving Learning Outcomes Of Students Of Building Engineering Education**

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## **Abstract**

This research aims to determine student learning outcomes in the Mechanical Earth Moving course using the application of case based learning methods in building engineering education classes. This research uses a Classroom action research design) carried out on students majoring in Building Engineering Education, Faculty of Engineering for the Mechanical Earth Moving course. This research design was adapted to the implementation of research in cycle 1 and cycle II in building engineering education classes. This research data comes from students, namely in the form of test results carried out by lecturers on students, while student activities are observed by lecturers during the lecture process. This data is verified and processed to obtain information on student success levels from student learning outcomes. The research results show that The learning outcomes using the case based learning method in cycle I were 35% or there were 9 students who completed classical learning, while in cycle II the percentage of student learning completion was 90%. Thus, the application of cased based learning methods can improve student learning outcomes in the Mechanical Earth Removal course in Building Engineering Education.

**Keywords:** Methods Case Based Learning, Learning Outcome, Classroom Action Research

## **Abstrak**

Penelitian ini bertujuan untuk mengetahui hasil belajar mahasiswa pada mata kuliah Mekanikal Pemindahan Bumi dengan penerapan metode case based learning pada kelas pendidikan teknik bangunan. Penelitian ini menggunakan desain Penelitian Tindakan Kelas (Classroom Action Research) yang dilakukan pada mahasiswa jurusan Pendidikan Teknik Bangunan Fakultas Teknik untuk mata kuliah Mekanikal Pemindahan Bumi. Desain penelitian ini disesuaikan dengan pelaksanaan penelitian pada siklus 1 dan siklus II pada kelas pendidikan teknik bangunan. Data penelitian ini berasal dari mahasiswa yaitu berupa hasil tes yang dilakukan dosen terhadap mahasiswa, sedangkan aktivitas mahasiswa diamati dosen selama proses perkuliahan. Data tersebut diverifikasi dan diolah untuk memperoleh informasi tingkat keberhasilan siswa dari hasil belajar siswa. Hasil penelitian menunjukkan bahwa Hasil belajar dengan menggunakan metode case based learning pada siklus I sebesar 35% atau siswa yang tuntas belajar klasikal sebanyak 9 orang, sedangkan pada siklus II persentase ketuntasan belajar siswa sebesar 90%. Dengan demikian penerapan metode cased based learning dapat meningkatkan hasil belajar mahasiswa pada mata kuliah Mechanical Earth Removal pada Pendidikan Teknik Bangunan.

**Kata kunci:** Metode Case Based Learning, Hasil Belajar, Penelitian Tindakan Kelas

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Received 5 October 2023, Accepted 8 October 2023, Published 11 October 2023

## **INTRODUCTION**

The era of globalization is an era of competition between nations in the world. Source excellence A nation's human resources (HR) greatly determine this competition. In this way, the Indonesian nation is required to improve the quality of human resources so that they are not left behind by other nations, especially for universities which create large job opportunities in order to create superior, competent human resources such as support for study programs or majors. Therefore, the role of departments in higher education institutions must be able to absorb learning curricula that

are adapted to graduate strategies according to expectations for student graduation for superior and competent human resources, one of which is building engineering education.

Building Engineering Education is one of the study programs at the Faculty of Engineering, Manado State University which seeks to educate students to have reliable qualities to face globalization. To improve the quality of human resources, mastery of course material is absolutely necessary by making efforts for lecturers to be more serious and smart in choosing learning methods that are in accordance with the achievement of knowledge absorption in the world of work. The Mechanical Soil Transfer course is one of the courses that has a level of knowledge from basic to developing skills through problems in the building world by knowing the level of soil movement based on geographical location and land contour. This course is classified as an exact course, so the teachers really have to have a special strategy so that their students can absorb the material well. The Mechanical Earth Moving course discusses fluid properties, hypostatic pressure, kinematics and flow dynamics, Euler and Bernaulli equations, impulse-momentum equations, flow through holes and measuring thresholds in pipes (laminar, turbulent, simple and complex), dimensional analysis , open channel flow. The implementation of this knowledge is used to plan irrigation in a certain area or to regulate drainage.

The need for learning methods that are adapted to the material taught in the Mechanical Earthmoving course is useful for developing knowledge and skills in seriously overcoming problems in the building sector. You need to know that student-centered learning is a learning strategy that positions students as active, independent, adult learners and able to learn "outside the classroom" (Kustijono, 2011; Mustofa et al., 2019). It is hoped that the change in the paradigm of the learning process from lecturer-centered to student-centered learning can encourage students to be actively involved in building knowledge, attitudes and behavior (Ardian & Munadi, 2015; Johanes, 2018). Therefore, one method that is suitable for courses that can be applied in mechanical ground transmission courses which discuss fluid properties is to use the cased based learning method.

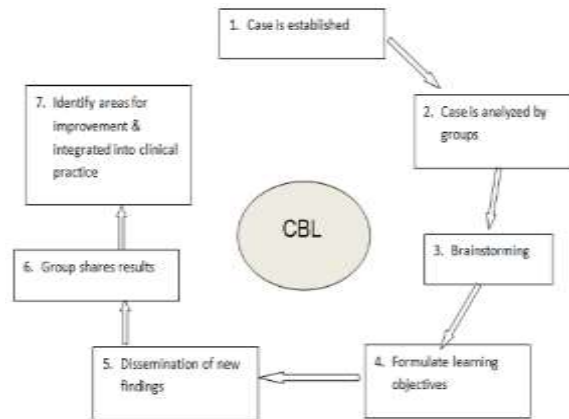
Universities, in this case the Ministry of Education and Culture, have given a mandate, so that educators put more pressure on the learning process to focus more on student center learning. Of course, this goal is made so that the absorption of knowledge gained will result in increased experience and curiosity in learning. Therefore, the teacher's strategy is to choose the right learning method that is adapted to the main learning material, in this case there is more support for the application of Case-Based Learning (Trinova, 2013). Case-Based Learning includes interactive conditions, student exploration of realistic and specific situations. Case-Based Learning involves interactive conditions, student exploration of realistic and specific situations. When students face problems that the teacher gives, it is necessary to respond to the students by taking them seriously and trying to analyze the existence of a problem based on opinions or arguments. Of course, students are directed to look for references to strengthen the problem at hand, then solve it with definite evidentiary answers after observation and analysis (Dayu et al., 2022).

Furthermore, the case based learning method provides the opportunity to ask questions about things that are still unclear or not understood. Then, cases are given that arise in CBL learning containing problems related to the environment, conditions, situations or images of the student's future. Cases are stories with a message that students can analyze and consider solutions to the story (Syarafina et al., 2017). CBL involves students in learning by using realistic narratives, these narratives provide opportunities for students to integrate many sources of information in an authentic context (Yadav et al., 2011). CBL provides students with a realistic problem scenario, a case, that can be studied retrospectively by examining how the case was solved or interactively trying to solve the case. Finally, to make it easier for students to understand, they are given example questions complete with explanations regarding the solution of the questions (Dayu et al., 2022). At the end of the meeting, students were given practice questions to do at home.

The advantage of using the case based learning method is that students can apply theory to real contexts, think critically about complex situations and can choose actions to take, develop self-knowledge, compare and provide their own perspective with other people's perspectives (Syarafina et al., 2017). Apart from that, CBL also bridges the gap between theory and practice (Anam, 2015). So that students do not only know the theory without being able to apply their knowledge to certain conditions, or students cannot only practice without understanding the underlying knowledge (Nababan, 2022). This is what needs to be achieved in a course that is able to absorb quality learning that is meaningful and in accordance with the competencies expected by both students and the study program. Many factors influence the quality of graduates from a tertiary institution, but the lecturer (teaching star) factor plays a very important role in supporting the effectiveness of learning process activities as one of the aspects that determines the quality of graduates. This is because lecturers deal directly with students in presenting lecture material in the form of theory and practicum.

The steps for the Case Based Learning (CBL) learning method are; (1) The teacher divides students into small groups consisting of 5 students. (2) The teacher provides each group with factual cases related to the material being taught. (3) Each group is given time to discuss with their group about news articles or short stories related to the petroleum learning material provided by the teacher. In this discussion process the teacher gives several written questions to each group to guide the discussion process. (4) Questions and answers and discussions to compare the responses of each group. In this way students will be more involved and participate actively in the learning process compared to teacher (Trianto, 2011). Furthermore, as for the characteristics or Characteristics of case-based learning include: 1) focusing on the direction of decision making as a case that can be described in terms of conditions or situations that need to be overcome but not regardless of the results achieved; 2) in the learning process students play an active role in analyzing problems based on the conditions and situations described; 3) carry out group collaboration through discussion of the problems or cases faced by taking written points to develop and find alternative solutions; 4) the case being solved must have strong support from various reference sources or references as evidence of important information

that can be solved; 5) questions that have been solved need to have conclusions or important notes to be brought to the question and answer session in class (Dewi & Hamid, 2015; Kulak & Newton, 2014; Sen, 2017). Furthermore, the case based learning process can be seen in Figure 1 below.



**Figure 1.** the CBL Process

It is important to know that there are 7 case based learning process stages that must be carried out at a minimum in the learning process, including the following (1) collaborate with small groups in discussing cases given by teachers; (2) it is only then that problems that are already known require the preparation of a reference grid for teaching resources to investigate further; (3) after that, search for reference sources and carry out an analysis of what was studied or discussed; (4). After the information has been obtained, it is necessary to make special notes to summarize the problem into one whole and become the answer to the solution that has been solved; (5) These results will later be explained or presented to the teacher in the classroom learning process, of course the teacher's hope is that from the questions given by students they will be able to answer these challenging problems; (6) the hypothesis or alleged result that is answered requires proof; and (7) finally, conclusions can be drawn from the discussion that has been resolved in class. Thus, educators must be able to adapt to conditions. Thus, educators should be able to adapt to conditions and situations in learning by utilizing the steps in cased based learning.

A lecturer is not only able to master lecture material. but it is also required to be able to create situations and conditions that enable students to receive the material well, lecturers who are able to create situations and conditions for students to absorb the material. This means that the lecturer is able to stimulate and motivate students to study harder. Often lecturers only present lecture material without caring whether the lecture material presented can be understood or not. As we all know, lecturers who are able to stimulate and motivate students to learn are lecturers who are dedicated. This depends on each lecturer's personal and personal responsibility towards their profession.

Based on observations, students' learning achievements in the past often received grades below the average, namely around 75. To get a good grade, the student's average grade should be above 75. There are many factors that often prevent students from getting a score of 75, one of the factors is the method of giving assignments that are often given, namely group assignments. Group assignments

often do not involve all members because some of them only rely on friends. So the author assumes that independent assignments are very effective so that there is no dependence on group friends alone. This has a negative impact on the teaching and learning process of courses that will be supported in the following semester. Therefore, efforts need to be made to develop better teaching methods in order to increase student learning achievement in the Mechanical Earth Moving course. Based on several supports and as an alternative solution, of course there is a need to apply the case based learning method in the learning outcomes of mechanical earthmoving courses, especially in building engineering education classes.

## METHOD

This research leads to classroom action research where the implementation of the learning process is carried out using the case based learning method for the learning outcomes of students in the building engineering education class in the mechanical earth moving course for the 2022/2023 academic year. Then the research subject was carried out in a building engineering education class of 20 students. The next research object is the application of the case based learning method for student learning outcomes. This research procedure is based on classroom action research using 2 cycles where each cycle has Action planning, Action Implementation, Observation, and Reflection (Hussain et al., 2018) . The following are the cycle stages in Figure 2 below.

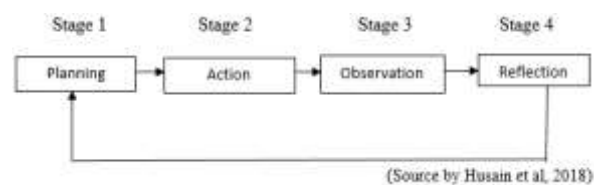


Figure 2. classroom action research cycle

Firstly, for the planning stage, the researcher prepared learning tools starting from semester learning plans, teaching materials, and question instruments, then the implementation stage began by conditioning the class, both students, learning media and case based learning step-by-step methods by presenting cases of fluid material problems, and mechanical ground construction for buildings in high and low positions, then holding discussions by looking for book references then recording the results of the data obtained until they are presented by taking the problem points into a summary. The next stage is observing actions where the lecturer's role is to guide and facilitate learning support in the form of test question instruments on soil mechanical construction material and book references, then the researcher makes observations from each individual and group in answering the problems given in the form of test questions. Finally, the reflection stage is where the researcher carries out an analysis of learning outcomes in the form of tests that have been given through observation sheets and test question instruments which will then be processed data based on the success criteria in the course. If the reflection shows results that have not been met, then proceed to cycle two by following every

aspect of cycle one but carrying out more innovation, especially the case based learning method in each learning process in the mechanical earthmoving course.

Next, the research instrument uses observation, tests and documentation. Then data analysis is used to determine the increase in individual learning outcomes. The minimum target score that students must achieve must be a minimum completeness criterion of 75. To find out whether or not the actions to be carried out in classical (overall) research are successful or not. The value that is said to be a high learning outcome is if the student's level of success increases in value and reaches the minimum target.

## RESULT AND DISCUSSION

In the first cycle research was carried out on the learning process in the mechanical soil transmission course based on material that had been given for 4 weeks in the building engineering education class. During the learning process, researchers have used the case based learning method. The data obtained for the first cycle from 20 students in the building engineering education class obtained a total score of 1365 where the average was 67.50. The following is the presentation of student learning outcomes for building engineering education classes in table 1 below:

Table 1. Presentation of student learning outcomes for building engineering education class cycle 1

The number of students	Presentase	Information
7	35 %	Complete
13	65 %	Not finished yet
20	100%	Total Number of Students

(source of research data)

In table 1 above, the results of student learning based on the material taught in the form of mechanical soil removal turned out that after being given a complete test, only 7 students and 13 people were incomplete. If a presentation is made, as many as 35% of students have reached the graduation criteria for the mechanical earthmoving course, while 65% of students have not passed the criteria in the course. Therefore, of course, in this first cycle, the learning outcomes of each student are low, so it is necessary to do a reference by looking at every aspect of the steps in cycle 1. Reflection is carried out by innovating the case-based learning method with discussion and question and answer. During the learning process, researchers have used the case-based learning method. The results of the data obtained for the first cycle of 20 students of the building engineering education class obtained a total score of 1565 where the average was 78.25. The following is the acquisition of student learning results after actions are taken in table 2 below.

Table 2. presentation of student learning outcomes for Cycle 2 building engineering education class.

The number of students	Presentase	Information
18	90 %	Complete
2	10 %	Not finished yet
26	100%	Total Number of Students

(source of research data)

In table 2 above, the results of student learning based on the material taught in the form of mechanical soil removal turned out that after being given a complete test, only 18 students and 2 people were incomplete. If a presentation is made, as many as 90% of students have reached the graduation criteria for the mechanical earthmoving course, while 10% of students have not passed the criteria in the course. Therefore, of course, in cycle 2, the achievement of student learning outcomes has increased. Of course, this is supported by the case-based learning method which is able to display problems in learning by following the process every step of the way. Based on the presentation of cycle 1 and cycle 2 The increase in student learning outcomes in Learning Cycle I to Cycle II can be seen in table 2 below.

Table 3. Summary of Learning Results for Cycle I and Cycle II

<b>Information</b>	<b>Cycle I</b>	<b>Cycle II</b>
Complete	7	18
Not finished yet	13	2
Percentage of completeness of learning outcomes	35%	90%

(source of research data)

In table 3, the percentage of student learning outcomes in the mechanical earthmoving course in the building engineering education class in cycle 1 is 35%, while in cycle II it is 90%. Based on the results obtained each cycle changes in this case, the improvement of student learning outcomes in the application of the case-based learning method. This certainly proves that when students achieve learning outcomes, the learning process becomes better when student understanding is repeated by strengthening every material taught by the teacher in class. So that when students are given tests, they are able to solve problem solving as evidenced by learning outcomes that exceed the minimum learning completeness target. This means that the case based learning method is effectively used in mechanical earth moving courses in building engineering education classes. This is proven when the lecturer provides a real picture of the problem, the lecturer assigns students to study it in a complex manner in the form of material support/references by observing cases in the field. This will be obtained from students based on observations and experiences made and then supporting data will be taken to be discussed in discussion and question and answer during the classroom learning process.

This research is in line with that conducted who stated that the case-based learning method has a significant effect on understanding the material and improving students' soft skills, especially in material that is directly related to theoretical analysis. with practice. Other research support shows that the presentation of learning using Case Based Learning Instruction is facilitated by Student Worksheets (LKS) which are completed by students through discussion (Dharmayanthi, 2022; Rismawati & Jasman, 2016). Students are given common cases in everyday life for each factor that influences the reaction rate, where some types of cases are in the form of analysis and some are problem solving. Discussion results from each group (Arjayadi, 2017). presented in class, which will then be responded to with rebuttals or questions and answers from other groups. Then a few experiments were carried out to prove the theory and discussion results from previous learning

(Arjayadi, 2017). Learning based on the case based learning method can be solved individually or in groups with the hope that learning outcomes can improve (Gesya et al., 2022)

Based on several studies supported by student learning outcomes using the case based learning method in the 4 week mechanical earthmoving course, it turns out that student knowledge and skills from the cases given can be implemented well by reviewing and proving theoretically and practically from references and observations. in practice. The support of this case based method can be used as a reference or implementation in accordance with courses that lead to evidentiary analysis involving real cases which later students will need to look for supporting studies in the form of material or strong references proven by practical work so that the results of the data obtained can be presented and answered during the learning process in class.

## **CONCLUSION**

The conclusion of research results that have been carried out in building engineering education classes is that the implementation of the case based learning method can improve student learning outcomes in mechanical earth moving courses in building engineering education classes for the 2022/2023 academic year. This is proven by the achievement of student learning outcomes in the first cycle where the completion percentage was 35%, where only 7 students completed, while in the second cycle there was an increasing change where the completion percentage was 90%, where 18 students passed. Thus, student learning outcomes for the mechanical earthmoving course experienced many changes in the second cycle which had a target of passing the course. Then, while implementing the case based learning method, there are suggestions that are worth paying attention to, especially on improving achievement not only in the Mechanical Earth Moving course but also for other courses in the Building Engineering Education Department, Faculty of Engineering, Unima so that the quality of graduates is accountable to society.

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