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Engineering Mechanics Learning Model Planning

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Abstract: Engineering Mechanics is a branch of the branch of mechanics with the stem of physics. The ability of students in the Engineering Mechanics course is low on average, so various learning models are needed to improve students' ability to achieve their competency standards. This research was conducted to make a plan for the learning model of Engineering mechanics at the Faculty of Engineering, University of Muhammadiyah Cirebon, which was based on the results of research in various educational institutions with various learning models, the purpose of this research is so that students can follow the Engineering mechanics course comfortably and enjoyably. The method used in this study is a literature review from various sources. The results showed that planning the learning model of Engineering mechanics needs to involve sharing dimensions of human life, not limited to cognitive, affective, and psychomotor, but also cooperation, collaboration, the friendship between friends, play, and the active role of lecturers to unite in student activities to do assignments both in groups and individually. Several models can be applied together including NHT, HOTS, STAD, Expository, innovative learning, social relations, and pair-check models.

Keywords: Planning, Model, Learning, Mechanics, Engineering.

INTRODUCTION

The ability of students in the Engineering Mechanics course is on average less because the learning process in lectures is still conventional, namely handover communication from lecturers to students. The material is delivered with explanations and students mostly listen to lecturers' explanations while taking notes as necessary or as recommended by lecturers (Jumanta, 2014).

With this learning model, most students do not understand the material presented by lecturers, while this engineering mechanics lesson requires a relatively sufficient basic mathematics and physics lesson. In fact, on the other hand, most students have relatively fewer math and physics skills.

Many students do not understand quantities and units and their conversions, forces, and balances, and do not understand the limits of linear equations in mathematics. Do not understand the discussion of trigonometry, especially in calculating the angles and sides of triangles using sine, cosine, and tangent and using sine postulates and cosine postulates.

Lack of supporting knowledge, the average student's understanding of engineering mechanics is also lacking. Learning as above is less effective, which will cause boredom in lecturers and students in the learning process. Teaching is said to be effective if the recipient of the message can understand the meaning ordered by the teacher as his learning environment (Sudjana, 2001). As a result of this ineffective teaching, students are often unsuccessful when faced with situations that require applying the knowledge gained from teaching and learning activities. It is necessary to plan a varied learning model so that students are happy in college and can achieve their competency standards. The learning model, which can also be called a learning strategy, can be interpreted as a general pattern of actions of student teachers in the realization of teaching and learning activities with other strategies (Cony, 1980).

Some things that influence include learning objectives, students, material taught, and other factors that support the achievement of learning objectives. Therefore, it is necessary to develop the learning process according to the characteristics of learning materials, students, and other supports.

Arikunto (2017) said that basically, the learning model is a form of learning that is illustrated from beginning to end and is presented typically by the teacher. In other words, the learning model is a wrapper or frame of the application of a learning approach, method, and technique. With various problems in learning, of course, a way is needed to overcome these problems, so that in learning problems do not arise, at least these problems are reduced. To overcome various problems in the implementation of learning, of course, learning models are needed that are considered able to overcome the difficulties of teachers carrying out teaching tasks and also the difficulties of student learning.

Using the appropriate learning model will cause enthusiasm and feelings of pleasure in students to carry out learning activities. And of course, it will affect the quality of the teaching and learning process on campus (Berowijayana, 2017).

LITERATURE REVIEW

Tree of engineering mechanics

Engineering Mechanics is a branch of mechanics as a branch and physics is the stem of science. Engineering Mechanics studies the behavior of machines and building structures against loads, reaction forces, and internal forces that work. By knowing the forces and deflections that occur, then the structure can be planned or proportioned in dimensions based on the material used so that it is safe and comfortable (the deflection is not excessive) in accepting the load.

Engineering Mechanics is useful in various fields such as Industrial engineering, Civil engineering, Mechanical engineering, Electrical engineering, Aeronautical engineering, Ocean engineering, etc. Areas covering the study of engineering mechanics include the study of stationary objects (static), moving objects (dynamic), changes in objects (deformation), flowing objects (fluids), soil movement (soil mechanics), and analysis of continuum mass objects (continuum mechanics).

The use of engineering mechanics in civil engineering and architecture, especially to study building structures fundamentally. In particular, engineering mechanics is used to determine the load acting on a building based on the behavior of the building structure itself

The behavior of building structures is analyzed using Newton's laws of motion by being represented in the form of reaction forces, action forces, and deflections. More specifically, engineering mechanics in civil engineering and architecture makes use of Newton's third law. The principle used is the balance of the resultant force between the action force and the reaction force.

Factors affecting the achievement of engineering mechanics competency standards

The results of learning Engineering Mechanics are obtained or obtained after the student concerned makes a business, namely learning activities. Learning achievement is actual or potential for a long time and occurs because of effort. Factors that affect the achievement of Engineering mechanics competency standards include initial ability and assignment. Learning in each individual is a psychic process that takes place in the active interaction of the subject with his environment and will produce changes in knowledge, skills, and attitudes. To achieve good learning outcomes and program planning, it is necessary to first know the purpose of the teaching program and the initial ability of students to enter a particular teaching program. Initial abilities are needed to be able to find out what knowledge, skills, and competencies students already have when they will follow a teaching program, to be able to learn a new set of lesson assignments. In engineering mechanics, the initial ability is the initial ability of Engineering Physics from students distinguished by: the high initial ability of Engineering Physics and low initial ability of Technical Physics, which is thought to affect student learning outcomes in the Engineering Mechanics course (Sebayang, 2023).

To develop students' abilities in calculating and determining the forces that work on a construction, the application of teaching methods that can provide activities independently needs to be applied in teaching and learning activities for the Engineering Mechanics course. Assignment according to Sudirman (1987) is a way of presenting learning materials where teachers give certain tasks so that students carry out learning activities. From the opinion above, it can be said, that giving assignments to students will be able to improve learning activities. The success of individual class assignments is largely determined by the interaction between teachers and students. With the provision of assignments individually, teachers can guide students who experience difficulties, obstacles, or misdirection in doing tasks, and can encourage, especially students who are slow or less enthusiastic about doing assignments. Besides individual tasks, there are group tasks. Group work is one alternative to teaching management that is expected to be more effective than classical teaching and more efficient than individual teaching. Group work provides opportunities for students to practice problem-solving, rational and democratic ways of life so that group work can improve student learning outcomes To carry out their duties properly, lecturers are required to master various methods of assigning tasks that will be used in teaching and learning activities, besides that lecturers must also pay attention to student characteristics. By mastering various methods of assigning assignments, lecturers master the advantages and disadvantages of each of these methods. Furthermore, by knowing the characteristics of students, lecturers can determine the right assignment method to be applied according to the known characteristics of students

In learning the Engineering Mechanics course, good learning results will be obtained if in delivering the subject matter, lecturers can apply assignment methods that are following the characteristics and interests of students, therefore professional lecturers are lecturers who continue to compile and design interesting and effective assignment methods to achieve learning goals.

METHOD

This research uses the literature review method from various studies on the learning process of Engineering mechanics in various educational institutions. Literature is all written works that can be used as reference or reference material in conducting various fields of research or scientific papers.

Literature is reading material used in various activities, both intellectually and recreationally. Literature is used as a reference because it is considered that in literature there are a lot of valid data. In addition, literature is also considered to have many lasting benefits. In other words, literature will never die and will continue to exist and will continue to grow.

RESULTS AND DISCUSSION

Engineering Mechanics Lecture Event Unit

Semester Learning Plan of Engineering mechanics courses includes basic concepts, force decomposition, SFD, BMD, NFD support, simple reverse construction, KBS with even loads and combinations, and simple beam construction with triangular loads. Construction of overcutting beams, construction of barovercuttings beams with variable loads, construction of indirect and oblique load beams, lines of influence, lines of influence of moments and latitude forces on evenly divided loads, running loads, evenly divided running loads (Ma'arif, 2012).

Engineering mechanics learning model

Quizizz app Evaluation of distance learning.

The evaluation tool of Engineering Mechanics using the Quizizz application is very good in representing a measured construct so that it can support the distance learning evaluation process in Engineering Mechanics subjects effectively and efficiently.

Distance learning is learning that can be carried out entirely remotely or a combination of distance and face-to-face in class so that it does not require students and lecturers to be physically present at school at the same time. Engineering Mechanics is an applied science that requires adequate numeracy skills. Therefore, the deepening of Engineering Mechanics material will be greatly influenced by adequate mathematical and physical skills

Engineering mechanics requires formal reasoning skills because students must concentrate on their imaginary logic to be able to develop theories and analysis of material that has no tangible form Evaluation of Engineering mechanics learning can use applications. Quizizz is an educational application for game-based exercises that use electronic devices that can be used by educators in conducting evaluations without being limited to the place of Quizizz as an eLearning-based learning evaluation media Quizizz has game characteristics such as avatars, themes, memes, and music that make the learning process fun and allow students to be motivated to compete because students can see their position on the leaderboard directly. Quizizz as an evaluation tool makes the evaluation process part of a fun interactive learning process (Narasati et.al., 2021).

Increased learning and student activity
Model Number Head Together (NHT)

Source: dwmedia.my.id

Student activity is monitored in cycles. Each cycle consists of a planning stage, an implementation stage, an observation, and a reflection stage. In this case, the cooperative learning model is one solution. Researchers see that the Number Head Together (NHT) learning method can create interesting learning conditions.

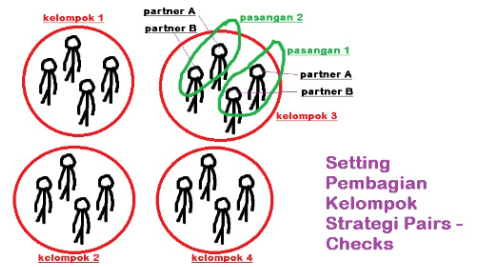
In addition, the Number Head Together (NHT) Method is expected to be able to involve the activeness of students to make their discoveries in analyzing the material. So that the implementation of learning is not only teacher-centered but students are also required to actively communicate and work together, to improve student learning outcomes in the learning process of Engineering Mechanics (Rahmadi, et al., 2019).

Pair Check type cooperative model

The Pair Check model trains students' social responsibility, cooperation, and assessment skills. The Pair Check type cooperative learning model is a group learning method between two people or in pairs popularized by Spencer Kagan in 1990. This model applies cooperative learning that demands independence and students' ability to solve problems. This method also trains students' social responsibility, cooperation, and assessment skills (Lestari, 2015).

The Pair Check type cooperative learning model is student-centered where students are required to be more active in the learning process. The Pair Check type cooperative learning model is based on students' skills in collaborating with their group mates and taking advantage of opportunities according to their respective tasks.

The advantages of the Pair Check method are (1) increase cooperation between students; (2) peer tutoring; (3) increase understanding of concepts and/or learning processes; and (4) train students to communicate well with their deskmates.



Source: blogspot.com

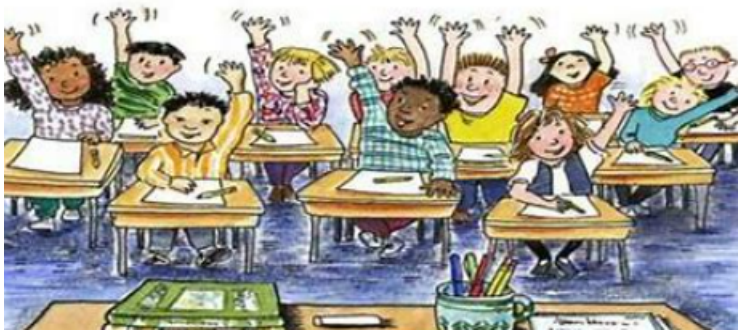
Meanwhile, this method also has drawbacks, mainly because it requires (1) adequate time and (2) the readiness of students to become trainers and partners who are honest and understand the problem well. In general, the learning syntax of Pair Check is (1) Working in pairs (2) Division of partner and trainer roles (3) Checking answers (4) Exchanging roles (5) Conclusion (6) Evaluation (7) Reflection.

Expository Learning Model

Source: ajudansoal.blogspot.com

The expository model can be applied to learning engineering mechanics in the subchapter of rod frame construction, From the results of this study we suggest: (1) for researchers, so that the learning process with the expository learning model can run well and smoothly, problem exposure is needed, used language that can be understood, appropriate and interesting intonation, maintain attention and eye contact with students, so that there are no errors in perception and meaning in determining the meaning of the problem, so that students can easily solve engineering mechanics problems, (2) for students, in solving engineering mechanics problems with expository methods, in addition to active teachers, students must also be active, both when delivering material by the teacher, holding questions and answers and summing up subject matter, and especially in completing tasks given by the teacher, including discussion of student assignments by teachers and other students, (3) For co-teachers who will conduct research with an expository learning model, in order to run smoothly and well, it is necessary to properly prepare all the necessary devices and instruments.

Learning Innovation Model



Source: ohlappetlah.blogspot.com

Innovation is carried out through the development of animation-based presentation learning media using the Powerpoint program and interactive game learning media using the Macromedia Flash program. The development of learning media is carried out through the stages of defining (define), design (design), development (develop), and dissemination stage (disseminate). The results of this study show that the learning media developed is suitable for use and successfully improves student learning outcomes. that the learning media developed is suitable for use and successfully improves student learning outcomes. One of the learning media that is widely used for material presentations today is Microsoft PowerPoint, which is a computer program specifically designed for presentations developed by Microsoft in an application package (Nana, 2005).

This program is easy to implement and develop, so educators in schools can easily operate it. With Microsoft PowerPoint, educators can also present teaching materials that will be given to students with a more attractive appearance. Presentations using Microsoft PowerPoint are equipped with writing, images, sound, and animation that can attract students' attention. Student interest in learning increases so that the quality and learning outcomes of students also increase. Other learning media that can also be used to increase student interest in learning are gaming-based, one of which is Macromedia Flash 8. This program can help to design a game by referring to learning materials packaged into gaming-based interactive modules.

According to dual coding theory, information is processed through two independent channels, namely verbal channels such as text and voice, and visual channels such as diagrams, animations, and images. Further research related to dual coding theory conducted by Paivio, Bagget (1989), and Kozma (1991) indicated that by choosing the appropriate mix of media, the learning outcomes of a person can be improved. For example, information that uses words (verbal) and visually relevant illustrations has a tendency to be easier to learn and understand than information that uses text alone, sound alone, a combination of text and voice, or illustration alone (Sutrisno J, 2008)

Model STAD (Student Teams Achievement Division)

The STAD (Student Teams Achievement Division) model is one of the cooperative learning applied to deal with heterogeneous students. This learning model provides opportunities for collaboration and elaboration with peers in the form of group discussions to solve a problem. (Sedayu, 2016).

Source: slideteam.net

CONCLUSION

Planning the learning model of Engineering mechanics needs to involve sharing dimensions of human life, not limited to cognitive, affective, and psychomotor, but also cooperation, collaboration, friendship between friends, play, and the active role of lecturers to unite student activities to do assignments both in groups and individually. Several models can be applied together including NHT, HOTS, STAD, Expository, innovative learning, social relations, and pair check models.

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