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Analysis of complex building structures through cooperative learning: an approach to understand complex subjects

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Abstract

Analysis of complex building structures in civil engineering department is learning materials classified as very difficult to be understood by students. However, it can be more fun and easily understood by the student if the learning process is processed properly or find a suitable method. One of the methods that are considered appropriate in dealing with this difficult subject is the cooperative learning method. The purpose of the implementation of cooperative learning is to create opportunities for learning that are constructing and exploring insights not only receive knowledge. This method offers a learning model that can produce students who are more creative, critical thinking, extensive knowledge and raise the level of understanding of the students about the subjects structure analysis of the building complex that is deemed to be extremely difficult.

Keywords: Cooperative learning; Complex building structures.

1. Introduction

Education is an important means to realize the advancement of the nation. With quality education, will create quality human resources. Along with the function of education is to develop life and form the character and civilization, to develop the potential of students to become religious and devoted to God Almighty, noble character, healthy, knowledgeable, skilled, creative, independent, and become citizens democratic and accountable (UU No. 20 THN 2003). To be the implementation of the national education function, practitioners are trying to fix the

quality of education through learning models.

Education related to learning. Learning can be interpreted as an attempt to condition students to be able to learn effectively. Effective learning activities seen that there is activity choose, establish and develop methods to achieve the desired results in the learning process is carried out by students and lecturers. Lecturer in the implementation of learning professionals have a responsibility to achieve national education goals. Lecturers should present an interesting and enjoyable learning for students in order to achieve a competency and

professionalism of lecturers in learning activities. In learning activities lecturer role as a facilitator is needed in learning activities in achieving effective and efficient learning.

Learning activities undertaken by the lecturer should be able to provide a sense of calm and comfortable in the knowledge that students can be accepted quickly and a deep level of understanding is no longer memorization. Fun learning is expected to occur in the implementation of learning structure analysis of complex building as one of the subjects in the department of civil engineering that require deep reasoning mind.

In order to develop the learning climate in the department of civil engineering that fosters self-confidence, attitudes, and behaviors of innovative and creative, it is necessary the existence of linkages between educational components. Educational components that include faculty, students, curriculum, learning media and learning resources, materials, and methods of evaluation tools work

together to create a conducive learning process.

So far the analysis of the learning process in the college complex building structure is still dominated by a paradigm that states that a knowledge is the facts that must be memorized. In addition, the classroom situation is still largely focused on lecturers as the main source of knowledge, as well as the use of the lecture method as the primary choice of teaching and learning strategies. One of them by developing approaches, strategies, models, and existing learning methods. This is consistent with the fact that the majority of the teaching and learning process in the civil engineering department is still using the conventional method which is still limited to lecturer-oriented.

With the observation of the learning process today requires a new teaching and learning strategies that put more emphasis on student participation (student oriented). Fun learning is a model of cooperative learning. Learning model is considered relevant to present a real atmosphere in the learning process. A teaching approach

that uses real-world problems as a context for students to learn about critical thinking and problem solving skills, as well as to acquire the essential knowledge and concepts of the subject matter. Based on the general description of the problem and has been described above, the researcher deems it necessary to apply the methods of cooperative learning in the subjects of the analysis of complex building structures in civil engineering at the State University of Gorontalo.

2. Theory of Cooperative Learning

2.1 Defenition of Learning

Before the learning process teachers prepare learning device. Implementation of the learning process lecturer basically apply the learning model. The learning model is the description of learning activities that include learning steps are sequential. According to Sukirman and Jumhana (2006: 10) learning is the process of interaction with the environment, the teachers and other learning elements as well as the students themselves. According to Corey (Ruminiati 2007: 1.14) learning is a process where a person managed environment intentionally to enable

him to participate in a particular behavior, so that the special conditions will result in the response to certain situations as well.

According to Hernawan, et al. (2007: 117) in learning, there are several principles that must be known are: (1) Interactive is the good interaction between teachers and students, students with students or between students and their environment, (2) the Insfiratif insfiratif process, which allows students to try and do something, (3) Fun can be done by arranging the room is neat and interesting and varied, ie, by using patterns and models pembelajaran, media and relevant sources, (4) Challenging, and (5) Motivation is an aspect very important that students get a boost that allows students to act and do something.

Based on expert opinion can be concluded that learning is a series of events designed by the teacher, arranged in such a way to influence and support the learning process of students to achieve the learning objectives.

2.2 Defenition of Cooperative Learning Model

Models of cooperative learning is a learning model that is widely used to achieve teaching and learning activities centered on the student (student oriented), especially to address the problems found in the teacher activates students (Isjoni, 2009: 9). According to Panitz (Suprijono, 2009: 54) the term to refer to the social-based learning and collaborative learning cooperative learning. Collaborative is about personal responsibility and an attitude of respect, while learning cooperative learning is a concept that covers all types of work groups. Artzt and Newman (Tritanto, 2009: 56) states that the cooperative learning students learn together as a team in completing the tasks the group to achieve a common goal. So each group has equal responsibility for the success of the group. Learning to use a model of cooperative learning, students not only learn and accept what is presented by the teacher in the learning, but can learn from other students as well as have the opportunity to

membelajarkan other students (Solihatin & Raharjo,2008: 2).

Roger, et al. (Huda 2011: 29) states cooperative learning is group learning activity organized by the principle that learning should be based on changes in social information among groups of learners in which each learner is responsible for their own learning and are encouraged to increasing the learning of other members .

Based on the understanding of cooperative learning can be concluded that the model of cooperative laerning a way of learning that requires good cooperation with friends and a group of student-centered learning to achieve learning objectives.

2.3 Cooperative Learning Excellence

The Cooperative learning excellence described by Isjoni (2010: 23-24), seen of various aspects of the student include: "1) Provide to the students to express and discuss a view, the experience gained students learning to cooperate in formulating a view group; 2) enable students can achieve success in learning, students have the skills to train, good thinking skills and social skills such as expression skills,

receive advice and input from others, work together, and the sense of Setiakawan reduce the incidence of deviant behavior in class life; 3) allow students to develop the knowledge, abilities and skills fully in a learning environment that is open and democratic; 4) allow students to have motivation high, increase academic skills, increase critical thinking skills, form relationships friendships, gain information, learn use good manners, increase student motivation, improve attitudes toward school and learning, reduce poor behavior and help appreciated main ideas of others ". Furthermore Jarolimek and Parker in Isjoni (2010: 24) said that the advantage gained from learning cooperative are: 1) positive interdependence, 2) lack of recognition in respond to individual differences, 3) students are involved in planning and classroom management, 4) and a relaxed atmosphere fun, 5) established a warm relationship and friends between students and teachers, 6) has many opportunity to express emotional experiences fun ". From the description of the advantages of cooperative learning delivered by

Isjoni and Jarolimek, it is said that learning model can support a cooperative learning view, the experience of learning to work together in a group. In addition, the development of students' knowledge, abilities and skills in critical thinking will continue to be honed to realize the positive dependence.

3. Research Method

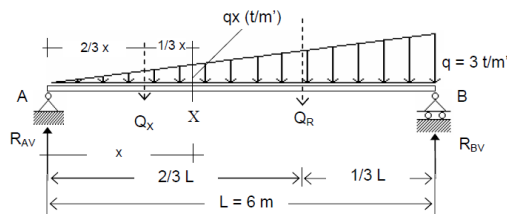
This study used a qualitative descriptive approach or method that aims to describe or depict the actual condition of a situation. A qualitative approach is used to obtain a clear and real picture of the implementation process are applied in the classroom teaching and student learning outcomes as a result of the application of the learning model of cooperative learning in the course of analysis of complex building structures in civil engineering. This research is a classroom action research that observed during the learning process takes place related cognitive aspects and the effectiveness of learning models that are applied in improving the learning activities, learning outcomes, and student responses on the subjects of the analysis of complex

building structures in civil engineering.

4. Result and Discussion

The Subjects of analysis of complex building structures including subjects are best avoided by students because these subjects require mathematical analysis and analysis of mechanical balance is very carefully. The phenomenon that occurs when this course will be taught, it is very much a student who does not attend even a student who attended also more simply sit and be quiet, but do not understand the explanation by the lecturer.

Examples of basic analysis that is taught to students in civil engineering departement at the State University of Gorontalo related to the analysis of complex building structures is the calculation of beam placement on the two charges carry a triangle.



Solution :

a. Placement Reaction

$$Qr = q \cdot \frac{1}{2} L = \left(3 \frac{t}{m'} \right) x \frac{1}{2} x (6 m) = 9 \text{ ton}$$

$$\sum M_B = 0, \\ R_{AV} \cdot L - Q_R \cdot \frac{1}{3} L = 0 \\ R_{AV} = +\frac{1}{3} Q_R = +\frac{1}{3} q \cdot \frac{1}{2} L \\ R_{AV} = \frac{1}{6} q L = \frac{1}{6} x \left(3 \frac{t}{m'} \right) / (6 m) \\ R_{AV} = +3 \text{ ton } (\uparrow)$$

$$\sum M_A = 0, \\ -R_{BV} \cdot L + Q_R \cdot \frac{2}{3} L = 0 \\ R_{BV} = +\frac{2}{3} Q_R = +\frac{2}{3} q \cdot \frac{1}{2} L \\ R_{BV} = \frac{1}{3} q \cdot L = \frac{1}{3} x \left(3 \frac{t}{m'} \right) / (6 m) \\ R_{BV} = +6 \text{ ton } (\uparrow)$$

b. Latitude Force

$$D_{A-B} = + R_{AV} = +\frac{1}{6} q \cdot L = +3 \text{ ton} \\ D_{B-A} = + R_{AV} - Q_R = \frac{1}{6} q \cdot L - \frac{1}{2} q L \\ = -\frac{1}{3} q L = -R_{BV} = -6 \text{ ton}$$

c. Review the cross section X Cross section X is located as far from the placement A, the moment of the cross section of X, counted from right to left.

$$q_x = q \cdot x/L \\ Q_x = q_x \cdot \frac{1}{2} x = \left(q \cdot \frac{x}{L} \right) \cdot \frac{1}{2} x \\ = \frac{1}{2} q x^2/L \\ M_x = R_{AV} \cdot x - Q_x \cdot \frac{1}{3} x \\ = \left(\frac{1}{6} q L \right) \cdot x - \left(\frac{1}{2} q x^2/L \right) \cdot \frac{1}{3} x \\ M_x = \frac{1}{6} q L x - \frac{1}{6} q x^3/L \dots\dots\dots(1)$$

Maximum moment occurs when the force of latitude is equal to 0,

$$D_x = d(M_x)/dx = 0 \\ = d\left(\frac{1}{6} q L x - \frac{1}{6} q x^3/L \right) / dx \\ D_x = \frac{1}{6} q L - \frac{1}{2} q x^2/L \dots\dots\dots(2) \\ \frac{1}{6} q L - \frac{1}{2} q x^2/L = 0 \\ x^2 = \frac{1}{6} q L \cdot \frac{2 L}{q} \\ x = \sqrt{\left(\frac{1}{3} L^2 \right)} \\ x = \frac{1}{3} L \sqrt{3} \dots\dots\dots(3)$$

$$= \frac{1}{3} \cdot (6 m) \cdot \sqrt{3} \\ x = 3.5 m \text{ (from palcement A)}$$

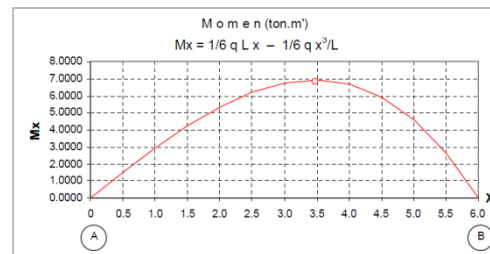
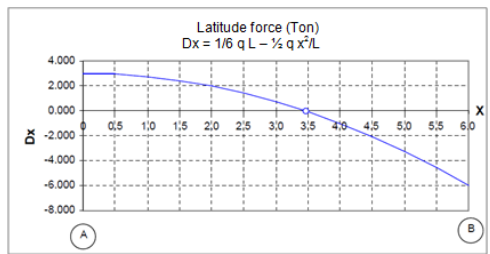
Substitute equation (3) into (1), then the maximum moment obtained

$$\begin{aligned}
 M_{maks} &= \frac{1}{6} q L \cdot \left(\frac{1}{3} L \sqrt{3} \right) \\
 &\quad - \frac{1}{6} q \left(\frac{1}{3} L \sqrt{3} \right)^3 / L \\
 &= \frac{1}{6} q L^2 \left(\frac{1}{3} \sqrt{3} - \frac{1}{9} \sqrt{3} \right) \\
 M_{maks} &= \frac{1}{27} q L^2 \sqrt{3} \dots\dots\dots(4) \\
 M_{maks} &= \frac{1}{27} \times 3 \times 6^2 \times \sqrt{3} \\
 &= 6.930 \text{ t.m}'
 \end{aligned}$$

The learning method used is the lecture method, the direct translation method of analysis and discussion monotonous expressed by lecturer without actively involves students so that when the settlement has been translated apparently inactive students ask and discuss them with other student groups so that the completion of the analysis carried out tend not to be understood so this course has no meaning in improving the quality of students.

Of course if this is left not given solution will inhibit the level of students' understanding of the material taught by professors that have implications for improving the quality of students. These events need to look for a solution that is more active student learning and eager to

understand the contents of the subject matter provided by the lecturer. In addressing this issue, the authors present a method that is more vibrant, comfortable, and allows students to understand the complex levels of analysis. With models such items are tested with a model of cooperative learning turns teaching students further develop ideas with other students, more active learning environment and lead to a deepening of the problem-solving so that students can develop a settlement by making graphics for more comprehensible. The addition of problem-solving by students described in detail in the form of graphs through cooperative learning outcome results are :



With the elaboration of detailed analysis to the learning patterns of students learning turns better understand the content of the subject matter and encourage students to be more active in learning and most important is to assume that students need each other. This interdependent relationship gave rise to positive interdependence that demands an interaction that allows fellow students to ask each other and explore the subject matter in detail so visible results demonstrated academic achievement.

By comparing models of cooperative learning with the conventional method in the analysis of subjects of complex building structures. The results of this study indicate that academic learning outcomes produced by students in cooperative learning models is significantly higher compared with the results of learning with conventional learning models. From the results of the application of cooperative learning subjects analysis of complex building structures in civil engineering more berorientasi on aspects of understanding and vocational increased competence on cognitive

aspects, namely 86.29%. This acquisition is greater than 85% when compared to the previous cycle which only reached 56.37%. The achievement of these cognitive aspects in the implementation of cooperative learning because students better understand the material taught thus solving the problem in answering difficult questions become easier.

This shows that subjects analysis of complex building structures that are considered difficult and not enthused by the students have a solution to improve student learning outcomes by changing the conventional learning models that only describe the formula until the completion stage of completion is very confuse students into cooperative learning by involving students active in the learning process so as to provide a positive impact on the quality of interaction and communication quality more quickly so that students understand and explore the material taught by lecturers. Furthermore, the cooperative learning method is applied it can motivate students to improve their academic achievement. The presence of this cooperative learning

model in the course of analysis of complex building structures it can make teaching and learning activities in the classroom more fun and create an atmosphere of collaborative learning activities.

5. Conclusion

From various considerations and empirical evidence show that the cooperative learning model needs to be applied in civil engineering teaching on the subjects of analysis of complex building structures in improving student learning outcomes. Based on the test results of the application of cooperative learning model was superior in many ways when compared to conventional learning, such as: a) the achievement of higher academic learning outcomes; b) is more conducive to improving relationships between students and professors c) more psychologically healthy, increased confidence in the understanding of the lesson content.

The advantages of cooperative learning is not just focused on what was taught by lecturers but rather on understanding and deepening of the lesson content that involves

interaction with other students. Lecturers not only to transfer knowledge to students, but students also facilitated and motivated to interact with other students in the group, with the lecturer and the teaching materials optimally so successfully able to construct their own knowledge.

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