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Cooperative Learning Model on Learning Outcomes in Basic Concrete Structure Subjects, Building Engineering Education Study Program, Faculty of Engineering, Makassar State University

Dewi Satriyati Ninsyi[1], Nurlita Pertiwi[2,]
[12]Fakultas Teknik Universitas Negeri Makassar

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Abstract
This study aims to evaluate the effectiveness of cooperative learning models in improving student learning outcomes in the Basic Concrete Structures course. This course, which is known to have a high level of difficulty, showed low learning achievements in the previous period. The results showed that the application of the cooperative learning model significantly improved student achievement, especially characterized by the percentage of A grades that increased dramatically in the 2024/2025 academic year. This finding indicates a positive correlation between the use of cooperative learning models and the improvement of student learning outcomes in the course.

Corresponding Author:
Dewi Satriyati Ninsyi
Universitas Negeri Makassar
Email : dewi.satriaty.ningsi@unm.ac.id

1. INTRODUCTION

The Building Engineering Education Study Program is one of the Study Programs at the Faculty of Engineering, Makassar State University which aims to become a center for the development of building engineering education. This institution is also responsible for developing human resources in the field of vocational technology who have entrepreneurial insight and are competent in disseminating building engineering knowledge to future generations. Therefore, the implementation of education takes place in a planned manner and is adjusted to the availability of facilities and students' cognitive abilities.

One of the courses applied in the Building Engineering Education study program is Basic Concrete Structures. This course aims to improve logical and critical thinking skills so that you are able to solve problems systematically. The specific target that will be achieved in learning in this course is to develop students' abilities in designing, analyzing and solving civil engineering problems in order to produce civil engineering building designs that are safe, comfortable and efficient. Decision making regarding building design includes students' mastery of the material properties of reinforced concrete structures as well as nominal moment calculations based on cross-sectional analysis. Learning outcomes in this course also include students' ability to design earthquake-resistant reinforced concrete construction and make detailed construction drawings.

Factually, the learning process has been carefully designed in accordance with the Semester Learning Plan. However, the implementation of learning did not achieve optimal results. The results of tracking student grades in the last three years

revealed a picture of low learning achievement. The data illustrates that the graduation percentage is less than 60%. Even less than 10% of students show scores above 90. This indicates that lecturers who teach courses must make changes to learning strategies. Based on research by researchers, various obstacles were found that influenced the learning outcomes of the Basic Concrete Structure course, namely the calculation stages for concrete construction designs which were very long and required various conditions. As a result, students cannot carry out research systematically.

Understanding learning models is very important in the world of modern education. Each learning model offers a unique approach in designing, managing and evaluating the learning process (Sappaile, 2023). Learning models offer various forms of approaches and strategies to improve learning outcomes so it is very important to choose the right learning model to achieve good learning outcomes. (Khairun, 2023) The learning model is not only a tool for conveying information, but also a means of exploration, in-depth understanding and skill development. The cooperative learning model is very effective in catching up with educational equality which has inequality like today (Sarumaha, 2023) based on research results in journals (Use the "Insert Citation" button to add citations to this document.

(Purwaningsih, 2018) that Learning outcomes are obtained after the learning process takes place, become a learning experience and produce relatively permanent changes. This understanding can be interpreted as low student learning outcomes caused by the design of the learning process which is not adapted to the learning content and student needs.

Cooperative learning is one solution used to overcome problems in educational activities. different from other learning strategies. (Abdulwahab, 2020) The learning process in this method places more emphasis on the process of working together in groups to complete tasks. Collaborative activities between students encourage discussion and activity among all group members. Various literature explains that cooperative learning emphasizes the process team learning with appropriate management processes. Each group member must not only be assigned their own duties and responsibilities, but also instill the need to collaborate with each other in achieving goals. This learning model is more effective in developing students' mastery of the material because each individual gets the same opportunity to find ideas and express their knowledge. The awards obtained in each learning process become a source of motivation for students to be active in completing assignments.

In the previous learning process, the learning model still used a simple method where students, after receiving the material, were given assignments in the form of questions, which then after they had completed the assignments would then be checked. From the application of the previous learning model, the learning outcomes obtained by students were in the low category. This requires teachers to make changes so that learning is more meaningful and acceptable to students, so that students can get changes in learning outcomes and positive changes in thinking patterns. To achieve the objectives of this research, the cooperative learning model is an option to achieve better learning outcomes in the Basic Concrete Structures course.

2. RESEARCH METHOD

This research is quantitative descriptive research with an exploratory approach. This research was carried out in the odd semester of the 2022/2023

academic year. The place of implementation is at the Department of PTSP FT UNM. The research object is data on the grades of the Basic Concrete Structure course in three periods, namely 2020/2021, 2021/2022 and 2021/2022. 2022/2023. Furthermore, the data selected is the learning results of students who had their first experience learning basic concrete construction.

Table 1. Number of Participants in Basic Concrete Structure Courses in 3 Years

Year	Number of participants	Expenditure Method
2020/2021	42	Case study method
2021/2022	44	Case study method
2022/2023	43	Cooperative learning method

Categorization of learning outcome data is carried out to make it easier to draw conclusions. Student learning outcomes are divided into five categories which are presented in the table

Table 2. Assessment Categories

Mark	Category
0,0 – 20,0	Very low
20,1- 40,0	Low
40,1 – 60,0	Currently
60,1 – 80,0	High
80,1 - 100	Very high

Students who get grades in the low and very low categories are declared not to have passed, and must repeat it in the next learning period.

The data was then analyzed by comparing learning outcomes using the cooperative learning method with the lecture method. A ratio between the two forms of learning that is higher than 1 indicates success

3. RESEARCH RESULTS AND DISCUSSION

Implementation of learning in the Basic Concrete Structure Course

Process learning This course lasts for 16 meetings with various stages of material.

Table 3. Basic Concrete Structure Lecture Material

Meeting	Material
1-2	Basic principles of reinforced concrete systems
3-4	load distribution
5-6-7-8	Simple beam design (*simple beam*)
9 - 10	Continuous beam design

11-12	T Beam Design
13 – 14- 15- 16	Plate planning

The learning method applied in the 2021/2022, 2022/2023 academic year is the case study method through two stages, namely lecture and assignment. The lecturer provides material using the lecture method and explains the analysis stages used in designing concrete construction. The lecturer then gives students the opportunity to ask questions if there is something they do not understand. The question-and-answer process and consultation take place during learning activities. However, the evaluation results of this process showed the students' low level of knowledge. This was revealed from the assessment of concrete construction design analysis reports for planning simple beams, continuous beams, T beams and slabs.

Based on these problems, the lecturer team designed a cooperative learning process. The learning process takes place in eight stages, namely providing material, discussion and question and answer, presentation of group assignment questions, group discussion to discuss assignment alignment, presentation of report/assignment presentation, question and answer, report revision and deposit if approval has been obtained from the lecturer team.

Description of student learning outcomes in the Basic Concrete Structures course in three observation periods presented in the table.

Table 4. Course Learning Results

Period	Average value	Category	Pass percentage
2020/2021	46,73	Currently	54,78
2021/2022	41,02	Currently	59,09
2022/2023	56,26	High	72,09

The description of the average scores for the two periods shows that student learning outcomes are in the medium category. Furthermore, in the third period, better learning results were found, namely in the high category. The student graduation rate shows a figure of less than 60% in the first two periods and in the third period it shows a figure higher than 70%. These results illustrate that the learning process has a significant effect on increasing students' knowledge in analyzing problems regarding concrete construction planning.

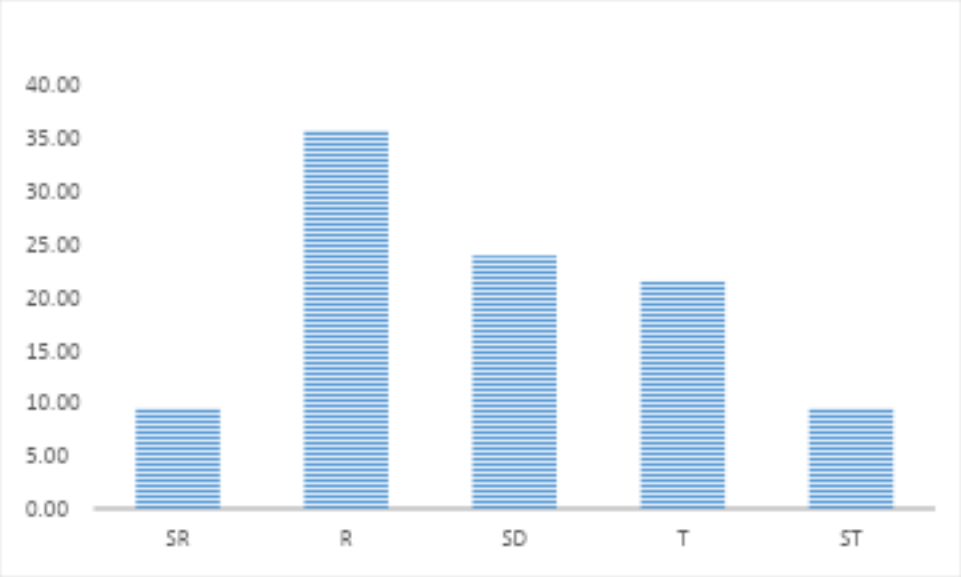

Figure 1. Distribution of Assessment Percentages in the 2020/2021 Academic Year

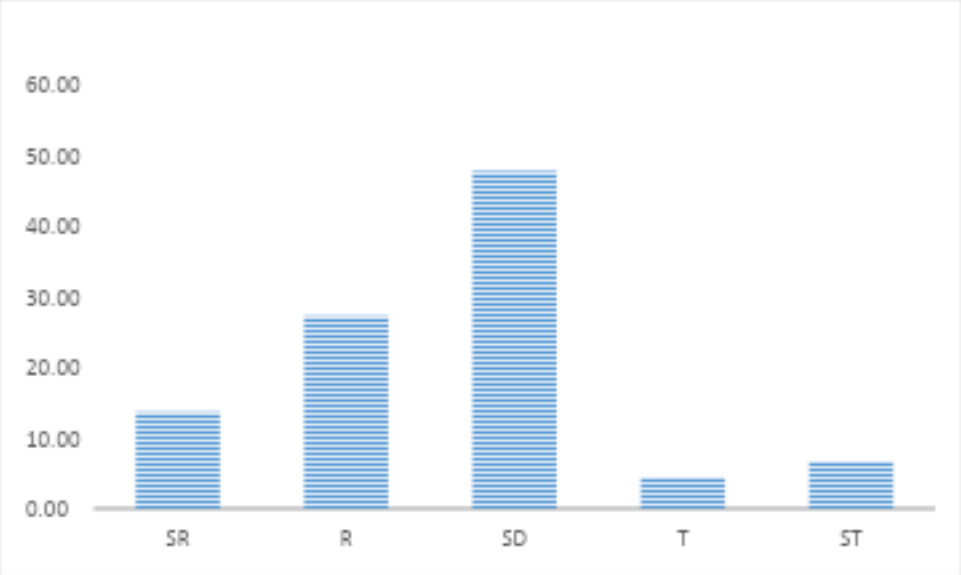

Figure 2. Distribution of Assessment Percentages in the 2021/2022 Academic Year

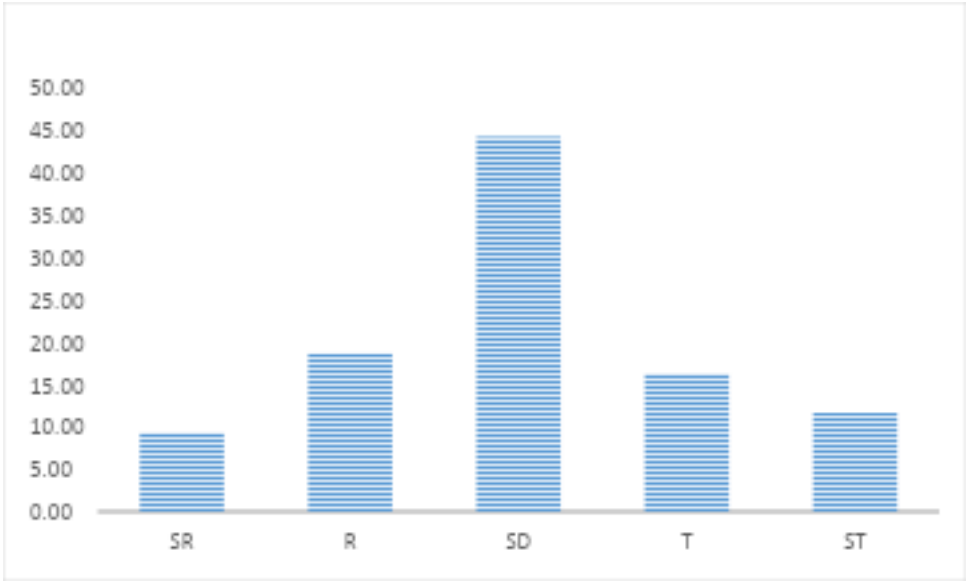

Figure 3. Distribution of Assessment Percentages in the Academic Year 2022/2023

Figure 1 and Figure 2 show that the distribution of student scores is dominated by the very low, low and medium categories. This indicates that the learning outcomes have not been optimal. Learning difficulties in basic concrete structure courses cannot be overcome personally and result in many indicators not being met. Figure 3 shows that the number of students in the high and very high categories is more dominant than those in the low and very low categories. The learning outcomes achieved in the cooperative learning model are better than the previous learning process.

4. DISCUSSION

The use of the Cooperative Learning model has proven an increase in student learning outcomes. (Michaelsen, 2023) The process of discussion and interaction between students has an impact on their mastery of the material and contributes to their ability to complete assignments. The system of grouping students in small numbers (3 – 5 people) allows students to interact intensively with each other in solving problems (Qureshi, 2023)

Mastery of material in basic concrete construction requires high concentration and problem analysis skills. Basic concepts and various calculation requirements are a source of learning difficulties for students. These difficulties can be overcome through a process of discussion and exchanging ideas. Apart from that, the presence of direction from the teaching lecturer also makes it easier to achieve learning objectives.

5. CONCLUSION

In conclusion, the results of the analysis show that cooperative learning has contributed to increasing the average value of student learning outcomes, and increasing the number of students who passed the basic concrete structures course. This achievement is proven by increasing student motivation in completing assignments

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