

Implementation of Peer Tutoring-Type Cooperative Learning to Improve the Cognitive Learning Outcomes of Grade XI Students in Mathematics at One of the Schools in Makassar

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Abstract

Based on the results of observations for three weeks and the results of the pre-test conducted on the mathematics lesson, it shows that there were 9 out of 15 students who got scores below the passing grade. The purpose of this research is to increase students' cognitive level by applying peer tutoring type of cooperative learning. The result of the research was showed escalation on study results of 11th grade students in Mathematics by all of the research objects which is the average of class became 89. Then we can conclude that the implementation of cooperative learning which is peer tutoring type can raise 11th grade students' cognitive results in Mathematics in one of Makassar's schools.

Keywords

Peer Tutoring; Cognitive Results



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INTRODUCTION

Students have different levels of learning ability, learning preferences, and ways of responding to classroom instruction. These differences require teachers to understand the characteristics and learning needs of their students so that the learning process can provide opportunities for every student to develop his or her potential. Students should be viewed as individuals who possess valuable potential that needs to be continuously developed through appropriate educational experiences. Therefore, teachers are not only responsible for delivering subject matter but also for creating learning environments that encourage students to participate actively, interact with others, and develop their intellectual abilities. Knight (2009) emphasizes that students possess potential that should be developed through education so that they can learn by utilizing the abilities and resources they already have. In mathematics learning, this perspective is particularly important because students are expected not only to remember formulas but also to understand concepts, apply procedures, and solve problems independently and collaboratively.

The initial classroom condition that motivated this study was identified through the researcher's teaching experience in Grade XI. The teaching experience was conducted from August 27 to September 17, 2018, with learning activities taking place twice a week. During the learning process, the teacher primarily used lectures and individual practice exercises. Although these approaches can provide students with opportunities to receive explanations and practice mathematical procedures, the initial classroom observations indicated that they did not sufficiently accommodate the learning preferences and needs of all students. One of the problems identified was that 9 out of 15 students obtained scores below the Minimum Competency Criterion (KKM). This condition indicates that some students experienced difficulties in achieving the expected learning outcomes. The pre-test results therefore provided an important indication that improvements in the learning process were needed, particularly in relation to students' cognitive learning outcomes.

The preliminary questionnaire further illustrated the learning conditions experienced by the students. Five students indicated that they were not interested in the learning methods being used, particularly lectures and individual exercises. Nine students stated that they did not like learning individually, while fourteen students expressed a preference for learning in pairs. These findings suggest that the students demonstrated a strong preference for learning activities involving interaction and collaboration with their peers. Such a condition provides an important basis for considering an instructional approach that allows students to learn together, exchange ideas, explain concepts to one another, and receive assistance from peers. Consequently, the learning approach selected in this study needs to respond not only to students' cognitive difficulties but also to the social characteristics of the classroom learning environment.

From a Christian educational perspective, learning can also be understood as an activity that encourages people to live and work together. Genesis 2:18 states that it is not good for human beings to be alone, emphasizing the importance of relationships and the need for people to support one another. This principle can be connected to collaborative learning in which students are encouraged to work together and assist one another in achieving common goals. Van Brummelen (2006) explains that collaborative learning can support students' ability to complete tasks and develop social skills while strengthening relationships and a sense of shared responsibility. In an educational context, cooperation therefore involves more than simply placing students into groups. It requires students to participate actively, accept responsibility, communicate with others, and contribute to the learning of their peers.

One instructional approach that reflects these principles is cooperative learning. Cooperative Learning is an instructional approach in which students work together in small groups to solve problems, complete tasks, and achieve shared learning objectives. Artzt and Newman (1990) describe cooperative learning as an approach that involves small groups of students working together as a team to solve problems and accomplish common goals. In this model, learning is no longer dominated by the teacher, but students are given greater opportunities to become active participants. The teacher functions primarily as a facilitator

who assists students in obtaining new information, developing specific skills, and reflecting on the learning process (Arends, 2007). Thus, cooperative learning can provide a learning environment in which students are encouraged to take responsibility for their own learning while also helping their classmates.

The implementation of cooperative learning is also relevant to the development of student responsibility. Students are expected not only to understand the learning material for themselves but also to contribute to the learning of their group members. This process encourages students to explain ideas, ask questions, listen to different perspectives, and solve problems collaboratively. Such activities can be particularly relevant in mathematics because understanding mathematical concepts often requires students to move beyond memorizing formulas toward explaining procedures and applying concepts to different forms of problems. Therefore, an instructional model that provides opportunities for students to explain and discuss mathematical concepts may help address some of the difficulties identified during the preliminary observation.

Peer tutoring is one form of cooperative learning that can provide such opportunities. Peer tutoring involves students helping other students within the same social or learning group. In this approach, students with relatively stronger understanding of the material can act as tutors, while students who require additional assistance can act as tutees. Topping (1996) explains that peer tutoring involves individuals from similar social groups helping one another in the learning process, particularly when more capable students assist students who have greater learning difficulties. Falchikov (2002) similarly emphasizes that peer tutoring requires differences in knowledge or ability between the tutor and tutee so that students can perform complementary roles during the learning process. Through this arrangement, students are provided with opportunities to learn not only from the teacher but also from their peers.

The use of peer tutoring is particularly relevant to the classroom condition identified in this study because most students expressed a preference for learning in pairs. Peer tutoring allows learning activities to become more interactive while providing students with opportunities to communicate mathematical ideas using language that may be more familiar to their peers. Students who act as tutors can reinforce their own understanding by explaining the material, whereas tutees can receive additional assistance in a less formal interaction. The peer tutoring process therefore has the potential to create a supportive learning environment in which students can participate more actively. The implementation of peer tutoring in this study follows several stages, including determining the grade level and objectives, selecting tutors and tutees, matching students, creating a positive tutoring atmosphere, and providing instructions to tutors (Karsenty, 2010).

The effectiveness of peer tutoring in this study is related specifically to the improvement of students' cognitive learning outcomes. Cognitive learning outcomes represent students' mastery of knowledge and intellectual skills developed through the learning process. Erina and Kuswanto (2015) explain that cognitive learning outcomes reflect students' mastery of subject matter, including knowledge, theories, facts, procedures, and concepts. Bloom's revised

taxonomy categorizes cognitive processes into six levels: remembering (C1), understanding (C2), applying (C3), analyzing (C4), evaluating (C5), and creating (C6) (Musfah, 2012). In the present study, particular attention is given to the understanding and application levels, namely C2 and C3. This focus is consistent with the learning material and the initial condition of the students, who were generally able to recognize formulas and basic procedures but experienced difficulties when applying their knowledge to mathematical problems presented in story-problem form.

The selection of C2 and C3 is therefore important because mathematics learning requires students to understand the meaning of mathematical concepts and apply appropriate procedures to solve problems. Students may know which formula should be used but still experience difficulties when the same mathematical concept is presented in a different context. Peer tutoring can provide opportunities for students to discuss such problems, explain the steps involved in solving them, and receive immediate feedback from their peers. Through repeated interaction and explanation, students may develop a deeper understanding of the material and become better able to apply mathematical concepts.

Based on the classroom problems, students' learning preferences, the principles of cooperative learning, and the characteristics of peer tutoring, the implementation of peer tutoring is considered a relevant instructional alternative for improving cognitive learning outcomes in mathematics. The present study therefore focuses on the implementation of peer tutoring-type cooperative learning among Grade XI students in mathematics at one of the schools in Makassar. The study aims to examine how the implementation of this learning approach can improve students' cognitive learning outcomes and to describe the learning process through the stages of peer tutoring. The findings are expected to provide practical information for teachers regarding the use of peer tutoring as a student-centered learning strategy, particularly in mathematics classrooms where students demonstrate different levels of ability and a preference for collaborative learning.

METHODS

This study employed Classroom Action Research (CAR) to examine the implementation of peer tutoring-type cooperative learning and its contribution to improving the cognitive learning outcomes of Grade XI students in mathematics. Classroom Action Research was selected because it provides teachers and researchers with a systematic approach to identifying classroom problems, implementing instructional interventions, observing their effects, and evaluating the outcomes for subsequent improvement. The study adopted the action research model proposed by Pelton (2010), which consists of five iterative stages: problem identification, data collection, action planning, action implementation, and assessment of results. According to Pelton (2010), these stages form a continuous process that enables researchers to reflect on classroom practices and make appropriate improvements based on evidence.

The research was conducted in a Grade XI mathematics class at one senior high school in Makassar. The participants consisted of 15 students, comprising 5 male students and 10 female students. Of these participants, 9 students obtained initial test scores below the class average, indicating that they experienced difficulties in understanding and applying mathematical concepts. The research was conducted from July 18 to October 3, 2018. The research activities included classroom observation, an initial assessment, implementation of peer tutoring, and two subsequent post-tests. The initial observation was conducted to identify learning problems and students' responses to the existing instructional practices. A pre-test was administered on September 24, 2018, followed by the selection of peer tutors and the first implementation of peer tutoring on September 26, 2018. The first post-test and second peer tutoring activity were conducted on October 1, 2018, while the second post-test was administered on October 3, 2018.

The intervention was designed as peer tutoring-type cooperative learning, in which students were organized to support one another during the learning process. Students with relatively stronger understanding of the learning material were assigned as tutors, while students requiring additional assistance acted as tutees. This approach was consistent with the concept of peer tutoring described by Topping (1996), in which students provide academic assistance to their peers through structured learning interactions. The implementation also considered the principles of cooperative learning, particularly active participation, interaction, shared responsibility, and mutual assistance among students. Lie (2010) emphasizes that cooperative learning provides opportunities for students to learn from and teach one another, making the classroom learning process more interactive and student-centered.

Data were collected from several sources to obtain information about both the implementation of the intervention and changes in students' learning outcomes. The instruments included student questionnaires, mentor observation sheets, a researcher's reflection journal, and achievement tests. The student questionnaire was used to obtain students' responses regarding the implementation of peer tutoring, while the mentor observation sheet was used to evaluate the extent to which the planned learning activities were implemented. The researcher's reflection journal documented observations, difficulties, classroom dynamics, and improvements identified during each action. Achievement tests were administered before and after the intervention to determine changes in students' cognitive learning outcomes. The use of multiple data sources enabled the researcher to compare findings and obtain a more comprehensive description of the learning process.

Data analysis was conducted descriptively by comparing the results obtained before and after the implementation of the actions. Student questionnaire and mentor observation data were analyzed using percentage scores to determine the level of implementation of peer tutoring. The achievement-test data were analyzed by comparing students' pre-test and post-test scores, particularly their performance in understanding and applying mathematical concepts. The assessment focused on cognitive processes corresponding to the understanding and application levels of Bloom's revised taxonomy. The results of each action were then evaluated and reflected upon to determine whether the instructional strategy had achieved the

intended improvement. If weaknesses were identified, the findings were used as a basis for improving the subsequent action. Thus, the analysis followed the iterative nature of Pelton's (2010) action research model, in which planning, implementation, observation, assessment, and reflection are connected as part of a continuous process of instructional improvement. The principal methodological reference was Pelton, R. P. (2010), *Action Research for Teacher Candidates: Using Inquiry to Improve Practice*, published by Rowman & Littlefield Education.

This research took place in the eleventh grade of a high school in Makassar, studying Mathematics. The researchers selected 15 students as subjects. Nine of the students received below-average initial ability test scores. The subjects consisted of five male students and ten female students. The research took place from July 18, 2018, to October 3, 2018. The details of the research period are as follows:

NO	DAY	DATE	ACTIVITY
1	Mon day- Wed nesd ay	July 18, 2018 – 3 October 2018	Observation
2	Mond ay	September 24, 2018	Conducting a Pre-test
3	Wedn esday	September 26, 2018	Determine tutors and carry out peer tutoring
4	Mond ay	October 1, 2018	Carrying out post-test I and peer tutoring II
5	Wedn esday	October 3, 2018	Conducting post-test II

Table1: Research Time Details
Source: Data Processing Results

FINDINGS AND DISCUSSION

Based on the results of data processing in actions I and II, it shows that the implementation of peer tutoring cooperative learning was successful. The success of the implementation of peer tutoring cooperative learning can be seen from three data sources: student questionnaires, mentor observation sheets, and reflection journals. The following is a comparison diagram. between action I and action II in the application of peer tutoring type cooperative learning:

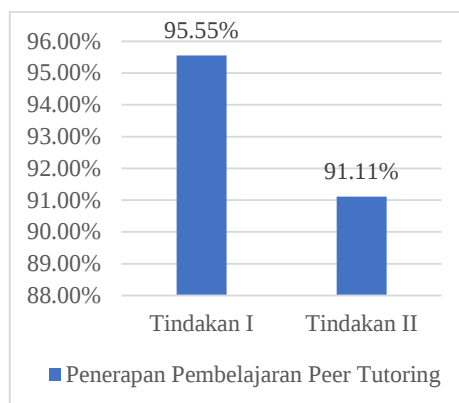


Chart1: Peer Tutoring Learning Chart
Source: Data Processing Results

Based on the results of the student questionnaire, it can be seen that the implementation of learning in action II decreased, namely from 95.55% to 91.11%. Action II experienced a decrease because there was one student who stated that there were students who did not sit according to the established plan and there were three students who stated that the teacher did not convey the learning objectives. Meanwhile, during action I, only one student stated that the researcher did not convey the learning objectives, even though the researcher had ensured that students were seated according to the seating plan based on the reflection journal and conveyed the learning objectives based on the RPP and the mentor observation sheet. The decrease that occurred in action II can be said to be one of the weaknesses of the questionnaire, namely that there were respondents who gave dishonest answers, thus making the questionnaire's accuracy questionable (Arikunto, 2014).

Despite experiencing a decrease in percentage, the percentage of action I and action II is still above 90. Based on the score classification, a score of 90 is in the good and optimal category, therefore it can be said that the implementation of peer tutoring type cooperative learning based on the results of the student questionnaire was successful (Arikunto, 2014). The following is a comparison diagram of the mentor observation sheet between action I and action II to determine the success of implementing peer tutoring type cooperative learning:

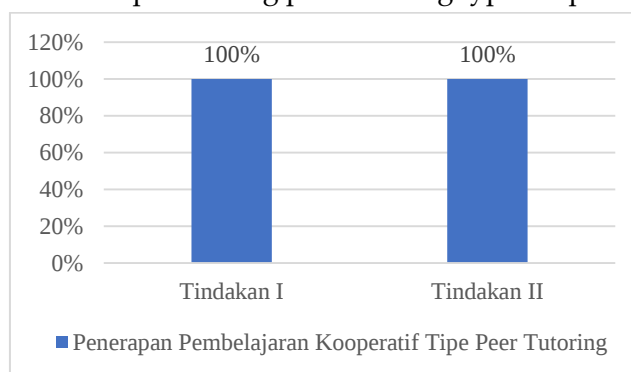


Chart2Mentor Observation Sheet for the Implementation of Peer Tutoring Type Cooperative Learning
Source: Data Processing Results

Based on the mentor's observations, the percentages for both Actions I and II were 100%. The mentor's observations indicated that the researcher had implemented the learning 100% of the time. Therefore, it can be concluded that, based on the mentor's observation sheet, the implementation of peer tutoring cooperative learning was successful. The researcher's reflection journal on September 26, 2018, namely when the implementation of learning took place, students followed the rules and procedures that had been set, but there were some students who walked around or asked friends who were not in the same group, but after being told the students became aware of their mistakes and returned to their seats to discuss with their group friends. The reflection journal on October 1, 2018, contained after teaching, namely based on the evaluation from the mentor, stating that the implementation of learning used by the researcher this time was better than before. The results of the reflection journal on the implementation of action I and action II stated that the implementation of learning was successfully implemented.

Based on the results of the student questionnaire, the mentor observation sheet, and the reflection journal, it can be concluded that the implementation of peer tutoring cooperative learning was successful. This action was considered successful if it achieved 75% success (Djamarah & Zain, 2004). Based on the results of data processing in actions I and II to answer the second research problem formulation, it shows an increase in student learning outcomes. This improvement can be seen from the post-test results. The following are the post-test results based on the indicators:

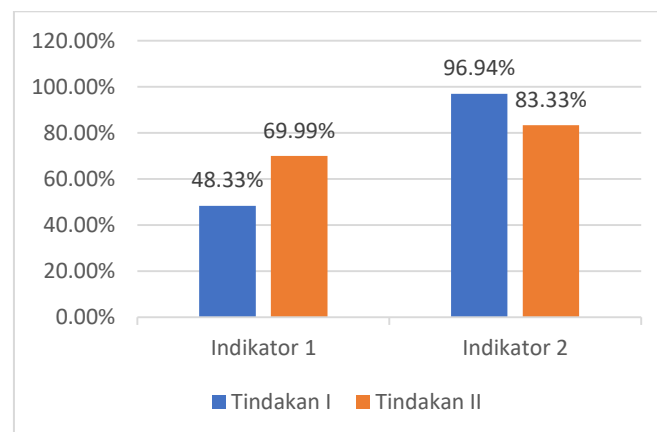


Chart3 Post-test Results Based on Indicators
Source: Data Processing Results

Based on the post-test results of the implementation of action I and action II based on indicators, the percentage of indicator I increased from 48.33% to 69.99%. The percentage of indicator II decreased from 96.94% to 83.33%. The decrease in indicator II occurred because question number 5 in action II used an arithmetic series that ran backwards, while the researcher had never taught how to work on an arithmetic series that ran backwards so that some students could not work on it. Although the percentage of indicator II decreased, the increase in cognitive learning outcomes can be seen through the

average student learning outcomes. The following is a diagram of the average student learning outcomes:

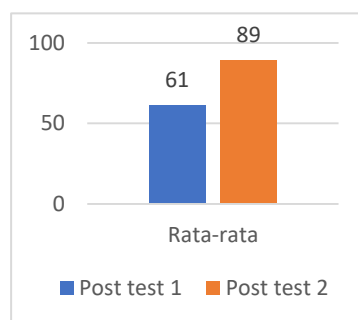


Chart4Student Learning Outcomes
Source: Data Processing Results

The diagram above shows that student learning outcomes have improved. Based on this improvement, it can be concluded that the implementation of peer tutoring cooperative learning has successfully improved students' cognitive learning outcomes in mathematics. This success rate is considered successful if it reaches 75%. (Djamarah & Zain, 2004).

Discussion

Based on the research results, it can be seen that in the class there are students with diverse abilities and personalities. Some students are smart but prefer to learn individually, this is evident when students are asked to work on assignments in pairs, there are students who instead divide the assignment and work individually; there are students who are less smart but do not dare to ask their partners, resulting in them not understanding the material being taught; and there are also students who are smart but only want to discuss with friends who have similar abilities, this causes students to not trust their partners, even though the success of a peer tutoring team is influenced by students who play an active role in the team. This is what should be a concern for teachers to be able to shape students to be able to respect each other's differences in learning abilities so that they can become a community that builds each other. Therefore, teachers should pay attention to what students do, so that through the attention teachers provide, students become more aware of their shortcomings and can develop their abilities to the maximum.

CONCLUSION

Through the test results, student questionnaire results, and mentor observation sheet results, it can be stated that the implementation of peer tutoring type cooperative learning has succeeded in improving the learning outcomes of class XI students in one of the schools in Makassar, namely based on the pre-test results, the post-test results of action I experienced an increase of 7.67 points and the post-test of action II experienced an increase of 35.67. The results of the student questionnaire for action I were 95.55% and the results of the

questionnaire for action II were 91.11%. The results of mentor observations, action I and action II have been 100% implemented. The first step in implementing the peer tutoring method to improve learning outcomes for eleventh-grade students at a school in Makassar is determining the grade level and objectives of the peer tutoring period. The second and third steps are selecting the tutee and tutor. The fourth step is creating a positive atmosphere for the peer tutoring process. The fifth step is conducting the peer tutoring.

Based on the results above, it can be seen that humans cannot live alone. Humans are social creatures, and therefore, they need other people to live their lives. Humans were created by God with diverse abilities that aim to be able to help one another, just as happens in the classroom. A class has students who have diverse abilities, such as students who are smart but not able to communicate well, there are also students who are able to communicate well but have less learning ability, for that reason as a teacher must be able to understand the differences that students have so that students can support each other in learning and also can be able to use the abilities that God has given to the maximum.

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