

## Research Article

# Implementation of the Team Based Learning Model in Improving Student Learning Outcomes in the Trigonometry Course

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## ABSTRACT

The purpose of this study is to analyze the improvement of student learning outcomes after the implementation of the team-based learning model in trigonometry courses. This study employs a classroom action research method, in which the implementation involves four key steps: 1) planning, 2) execution, 3) observation, and 4) reflection. This research was conducted at the Faculty of Teacher Training and Education, Universitas Malikussaleh. The sample in this study were 36 students of the Mathematics Education Study Program. The cycle in this classroom action research consists of two cycles (Cycle I and Cycle II). In the implementation of cycles I and II using a team-based learning model with the following stages: 1) preparation, 2) Readiness Assurance, 3) Application of Course Concepts, 4) Instructor Feedback. This study employs data collection methods consisting of test instruments to assess students' learning outcomes and observation sheets to monitor student activities throughout the instructional process. The results of the data analysis show that the completeness of student learning outcomes before the action or pre-cycle was 44.44%. Following the application of the team-based learning model in Cycle I, there was an increase to 97.22% and cycle II increased to 100%. So, it can be concluded that the team-based learning model improves student learning outcomes in trigonometry courses and encourages active participation in the learning process.

**Keywords:** Team-based learning; Learning Outcomes; Trigonometry

## 1. INTRODUCTION

Learning outcomes are an important indicator in assessing the success of learning implementation. Learning outcomes are also often a benchmark for a person's understanding of material (Zagoto, 2022). High and low learning outcomes are not only influenced by cognitive, but can also be influenced by motivation, interest and strategies used in the learning process (Yogi Fernando et al., 2024). Students who have a good understanding of concepts tend to be able to apply knowledge flexibly in various problem solving situations (Agustina & Nuriyatin, 2023). Apart from that, low learning outcomes often reflect a gap between the delivery of material and the process of internalizing concepts by students. Therefore, efforts to improve the quality of learning need to be directed at strengthening conceptual understanding and active involvement of students in the learning process.

In addition to these factors, students' academic readiness and basic abilities significantly influence learning outcomes, particularly in analytical courses. If students lack a grasp of previous concepts, they will struggle to develop their knowledge to more advanced levels. This often results in low participation and a lack of persistence in solving problems that require logical application. When students lack mastery of the basic concepts of a subject, this can lead to low self-confidence in solving problems and a reluctance to actively participate in the learning process. Self-confidence is crucial in learning (Oktaviani et al., 2023). This lack of confidence makes students increasingly reluctant to ask questions or express opinions during discussions. In the long term, this can lead to ineffective learning patterns, resulting in low student learning outcomes. This is especially evident in courses that require step-by-step reasoning and the interconnectedness of each concept.

One of the basic courses that has an important role in advanced mathematics learning is the trigonometry course. However, in practice, many students still experience difficulties in understanding trigonometry concepts, resulting in low learning outcomes and failure to pass. The reason why students struggle to understand trigonometry is due to a weak understanding of basic concepts such as trigonometric identities, angle relations, and the application of formulas to various trigonometry-related problems (Gusmania & Agustyaningrum, 2020). Students often simply memorize formulas without understanding the meaning and relationships between the underlying concepts. Consequently, when faced with varied or contextual problems, they experience confusion in determining the appropriate strategy. Furthermore, low student

engagement during the learning process contributes to suboptimal mastery of the material (Fauziyah, L.S., Sugiman, Munahefi., 2024). Active student engagement also impacts educational success (Salsabila et al., 2024). This situation indicates the need for innovation in learning models that can encourage students to be more active, creative, and collaborative in building an understanding of trigonometry concepts.

One learning model that can be used to address these issues is team-based learning. According to Nursulistyo et al., (2021) team-based learning is a learning strategy designed to improve the quality of learning through structured teamwork and individual accountability. In the team-based learning model, students first prepare independently, then take individual and team readiness tests, and complete assigned tasks collaboratively (Michaelsen et al., 2023). This learning model has been shown to increase student participation, responsibility, and conceptual understanding, which can result in positive learning outcomes.

The implementation of the team-based learning model not only focuses on systematic learning stages but also encourages active student involvement and interaction among students in understanding the material. The combination of individual preparation, team discussions, and problem-solving presented in groups creates a learning environment where students complement each other in understanding the material and are collectively responsible for learning outcomes. Therefore, the effectiveness of team-based learning not only increases participation but also fosters understanding and collaboration, leading to optimal learning outcomes.

The learning process with the team-based learning model motivates students to actively share their ideas and respond to the results of discussions. Furthermore, discussions conducted during the team-based learning model allow students to directly engage in the process of understanding the concepts of a material, thus impacting learning outcomes. Indirectly, students can practice communication and collaboration, which are crucial in today's academic context. Active student participation during this learning process is crucial because it can be the first step in developing communication skills.

According to Pardamean et al., (2022), the team-based learning model is effective in increasing understanding and enhancing teamwork skills, which in turn impact learning outcomes. This demonstrates that collaboration and discussion among students can enhance student understanding of the material being studied. Team-based learning also helps students think critically in problem-solving, thus enhancing their understanding of the material, which can impact student learning outcomes (Islammarida, 2019). Furthermore, the Team-Based Learning model emphasizes that knowledge is built through social interaction and discussion with others. Through effective group work, students can exchange ideas, clarify understanding, and correct conceptual errors. This makes the learning process more meaningful and in-depth. The Team-Based Learning model consists of several stages: preparation, Readiness Assurance, Application of Course Concepts, and Instructor Feedback (Junanto & Sartika, 2023).

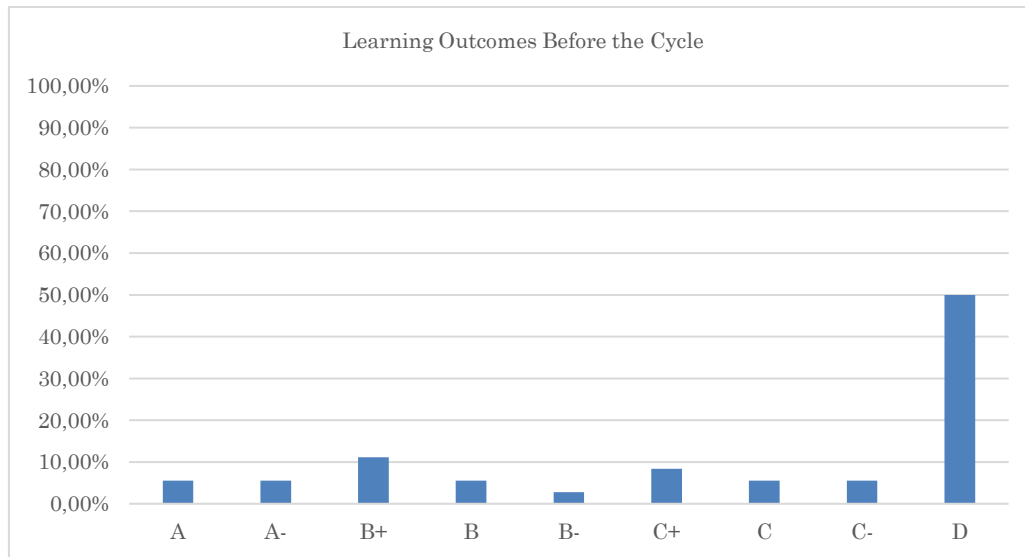
Each stage of the team-based learning model assigns responsibility to students, both individually and in groups. This includes finding learning resources, understanding the material before class, conducting group discussions, and providing feedback, all of which can help students follow lectures and understand the material related to trigonometry. The team-based learning model also provides students with more learning resources, which can help them understand the material. Based on the explanation above, this study seeks to examine the enhancement of student learning outcomes following the implementation of the team-based learning model in trigonometry courses.

## 2. RESEARCH METHOD

The method used in this study is classroom action research, which is carried out through four main stages: 1) planning, 2) implementation, 3) observation, and 4) reflection. This research was conducted at the Faculty of Teacher Training and Education, Malikussaleh University. The sample in this study were 36 students of the Mathematics Education Study Program, Class of 2024. This study has the main objective of improving student learning outcomes after the application of the team based learning model in learning in trigonometry courses. The cycle in this classroom action research consists of two cycles (Cycle I and Cycle II). This study uses data collection techniques in the form of test questions and student observation sheets. The stages of implementing classroom action research using the team-based learning model in each cycle are, 1) At the implementation stage, researchers compile learning devices including RPS, teaching materials, test instruments, and student activity observation sheets. In addition, researchers also design scenarios for implementing the team-based learning model, including the formation of heterogeneous groups and the preparation of questions for the Readiness Assurance Test stage both individually and in groups, 2) The implementation stage is the implementation of the prepared plan. At this stage, learning is carried out in accordance with the syntax of team-based learning, namely starting from preparation activities, implementation of individual and group readiness tests, discussion of concept applications through solving trigonometry problems, to providing feedback by lecturers, 3) The observation stage is carried out simultaneously with the implementation of the action. Researchers observe student activities, participation, cooperation, and responses during the learning process using the prepared observation sheets, 4) The reflection stage is carried out at the end of each cycle to evaluate shortcomings and advantages during the learning process. The results of reflection in cycle I are used as a basis for improvement and refinement of actions in cycle II so that optimal learning outcomes are obtained.

### 3. RESULTS AND DISCUSSION

At the beginning of the course, it was agreed that students who passed the trigonometry course would receive at least a C grade. However, before the cycle began, 20 (55.55%) students still received grades below a C, meaning they failed. These results are shown in the [Figure 1](#).



**Figure 1.** Learning Outcomes Before the Cycle

It was apparent from the results before the intervention that students still did not fully understand the material. To address this issue, the team-based learning model was used for Cycles I and II. Learning was implemented in accordance with the Semester Lecture Plan Guidelines for two meetings (2 x 150 minutes). In Cycle I, learning activities will be conducted using the team-based learning method. The main aspects of the team-based learning model are: 1) student groups (consisting of 5-6 students with different characteristics, facilitating learning and discussion), 2) accountability (meaning the team-based learning model requires students to be responsible for both individual and group roles), and 3) direct feedback (increasing the effectiveness of the learning method). The implementation stages are as follows:

#### 1. Preparation Stage (pre-class)

In this preparation stage, students are given the task of independently or individually finding learning resources related to the material to be studied. Learning resources can also be derived from available teaching materials. In addition, students independently study the material and problem-solving questions they have obtained and can also discuss them with peers. This preparation stage is carried out by students at home or before the lesson begins. In this preparation stage, the lecturer's task is to identify the instructional objectives for the upcoming learning process. The goal of independent learning is to foster student learning independence. Independent learning can impact student success in learning (Marito & Riani, 2022). Therefore, learning independence is crucial in the learning process, especially for university students.

#### 2. Readiness Assurance

In this stage, students are given the opportunity to review previously learned material or refer to available learning resources. During this stage, students discuss material they have not yet understood with their peers in their groups. This activity allows students to discuss material they have not yet understood so that in the next stage, they can effectively solve the problems presented.

#### 3. Application of Course Concept

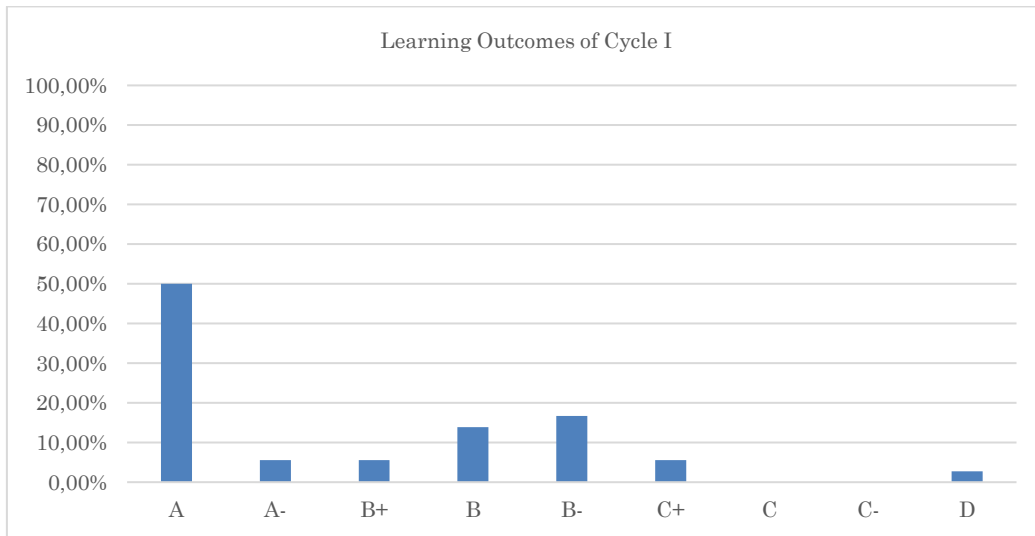
In this stage, students are given a trigonometry problem to be solved collaboratively (discussion). Students apply what they have learned in the previous stage. Students work collaboratively in pre-formed teams to solve the presented problems. During this stage, students can also exchange information, allowing those who are unfamiliar with the material to better grasp the material. After all groups have completed the assigned problem, a presentation will be held, with one group representing the other. Groups that are not presenting will be asked to provide their opinions regarding the answers of the groups that are presenting.

#### 4. Instructor Feedback

This final stage involves feedback provided directly by the instructor. During this stage, the instructor re-explains any concepts that students have not yet grasped to prevent misunderstandings. Furthermore, the instructor explains and

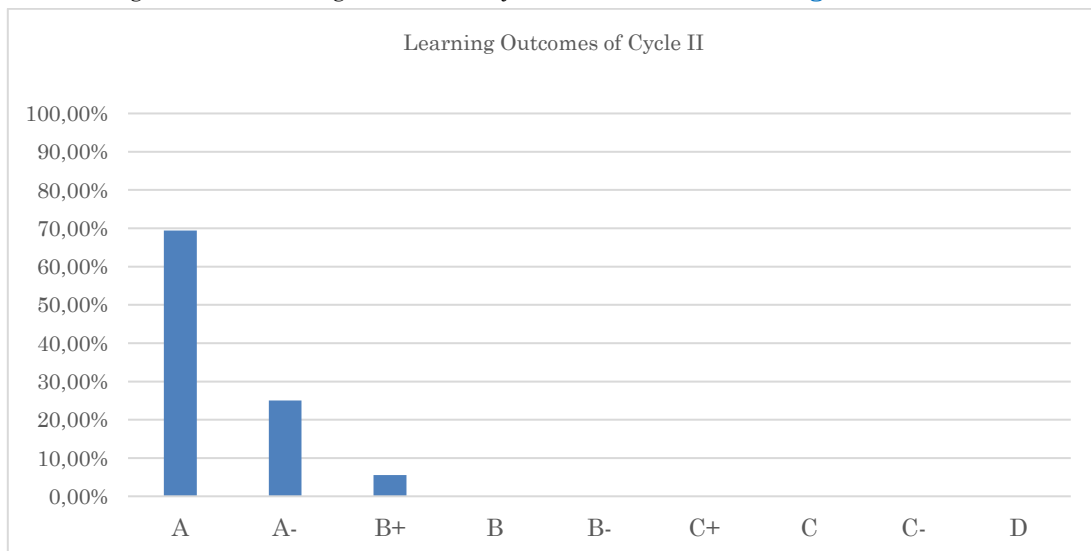
reinforces the trigonometry material being studied. Feedback should be provided frequently, as it not only reinforces correct answers but also corrects any misconceptions (Sumarno, 2020) .

During the learning process with the team-based learning model, some students remained less active in participating. At the conclusion of the lesson, the lecturer administered a quiz to be completed individually. The students' learning outcomes for Cycle I are presented in the **Figure 2**.



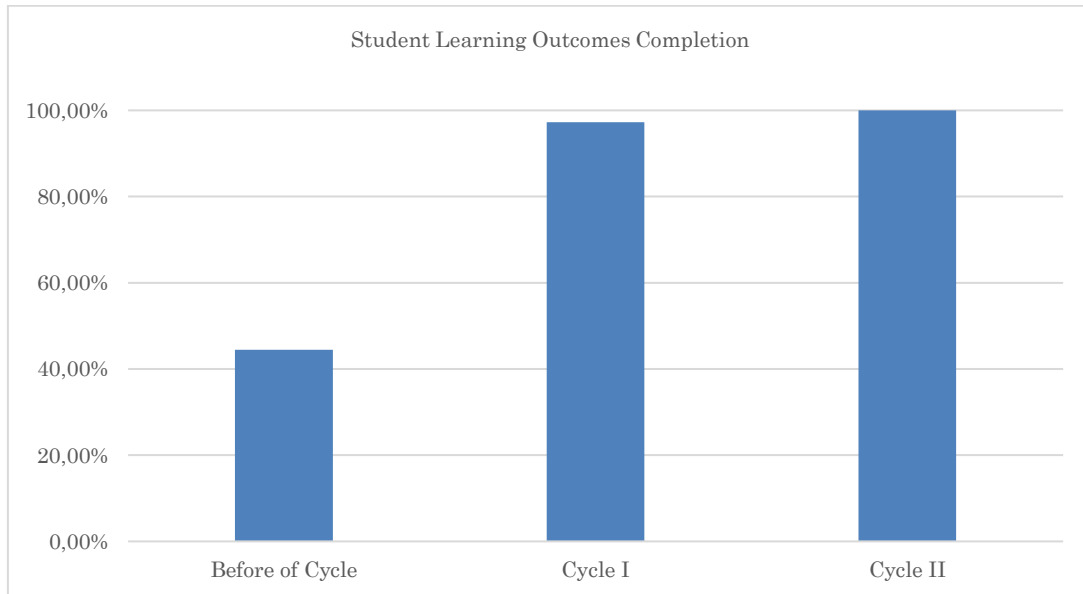
**Figure 2.** Learning Outcomes of Cycle I

Based on the learning outcomes of cycle I, 50% of students obtained an A, 5.56% of students obtained an A-, 5.56% of students obtained a B+, 13.89% of students obtained a B, 16.67% of students obtained a B-, 5.56% of students obtained a C+, and 2.78% of students obtained a D. Based on the data above, with a minimum passing grade of C, the total number of students who passed was 97.22%. Based on the results of Cycle I, several students had not yet achieved the minimum passing criteria. In cycle I, many students experienced improvements in learning outcomes compared to before the cycle. Furthermore, some students were able to actively participate, but others remained passive in participating in the learning using the team-based learning model. Reflections on the students who remained passive included: 1) some students still had low independence, and 2) group discussions were not optimal because only certain students were solving problems. Cycle II will then be implemented. In Cycle II, the instructional procedures followed the same sequence as in Cycle I, consisting of: 1) Preparation Stage, 2) Readiness Assurance, 3) Application of Course Concepts, and 4) Instructor Feedback. In cycle II, it can be seen that students have begun to get used to learning independently and discussions in a group have been seen to be active. Students have dared to ask questions and express opinions regarding material that has not been understood and has been understood. Based on the results of observations, students are also motivated to solve the problems given. At the end of cycle II, questions are also given to see the extent of individual student understanding regarding conceptual understanding. Student learning outcomes in cycle II can be seen in the **Figure 3**.



**Figure 3.** Learning Outcomes of Cycle II

Based on the learning Outcomes of cycle II, it can be seen that 69.44% of students obtained an A, 25% of students obtained an A-, 5.56% of students obtained a B+. If seen from the learning Outcomes of cycle II, all students were declared to have passed. In cycle I, the A score was obtained by 50% and cycle II 69.44%, which means an increase of 19.44%. In cycle II, students obtained the smallest B+ score. For graduation with the minimum criteria of obtaining a C score. Cycle I was 97.22% declared to have passed and cycle II 100% declared to have passed. The percentage of passing the trigonometry course by implementing the team-based learning model from before the cycle, cycle I, and cycle II can be seen in the **Figure 4**.



**Figure 4.** Student Learning Outcomes Completion

**Figure 4** shows that the student learning outcomes before the cycle were 44.44%. In cycle I, it increased to 97.22%, and in cycle II, it increased to 100. Therefore, the students' achievement results indicate an improvement in learning outcomes following the implementation of the team-based learning model in the trigonometry course. Research conducted by Syafmen, (2021) found that the team-based learning model can improve student learning achievement. Furthermore, research by Laune et al., (2021) found that the team-based learning model can improve learning outcomes.

#### 4. CONCLUSION

Based on the results and discussion of this study, it is concluded that the team-based learning model can improve student learning outcomes in trigonometry. Furthermore, students are motivated to understand concepts, which leads to independent learning in seeking learning resources. The student learning completion rate before the first cycle was 44.44%. In the first cycle, it increased to 97.22%, and in the second cycle, it increased to 100%. Future research is expected to be applied to different courses to motivate students to be more active in group discussions. In addition, further researchers can integrate team-based learning models with digital learning media to determine the impact on student engagement, collaboration, and learning outcomes.

#### ACKNOWLEDGEMENTS

Praise and gratitude to Allah SWT, for His blessings, mercy, and grace, enabling the researcher to successfully complete this research. The researcher would like to thank the FKIP at Universitas Malikussaleh for providing the opportunity to conduct this research. The researcher would also like to express her deepest gratitude to all parties who have contributed to the implementation of this research activity.

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