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Application of the Student Teams Achievement Division (STAD) Model to Improve Learning Outcomes in Angle Measurement for Fifth-Grade Students

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Abstract

Low mathematics learning outcomes in angle measurement at Socah 3 elementary school result from dominant lecture methods and a lack of concrete media. This Classroom Action Research aims to improve grade V students' learning outcomes using a Student Teams Achievement Division (STAD) cooperative model assisted by paper protractors. Initial observations revealed low student involvement and suboptimal conceptual understanding. The results showed significant improvements. In Cycle I, the average score was 78.25 with 14.29% classical completeness, failing due to unfamiliarity with STAD group work. After strengthening peer tutoring and group structures, Cycle II achieved an average of 89.29 and 85.71% completeness, meeting the success indicators. Using paper protractors successfully bridged abstract concepts to concrete understanding. This study highlights shifting teachers into collaborative facilitators and proves that simple, local material-based media impacts learning positively, especially in schools with limited facilities. Future research should test the STAD model broadly using pre-cycle test instruments.

Keywords: *Angle Material, Mathematics Learning Outcomes, STAD Model*

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1. Introduction

Education is a structured process that aims to develop students' intelligence, morals, and potential through effective and active learning activities. Through education, individuals obtain a clear and directed direction of life, a character formed, and a clear and directed outlook on life in the face of change (Rahmadhani & Sutriyani, 2025). It is also supported by the submission that through Agustini et al., (2025) education for individuals can get the direction of life, form character, and be able to have a clear and directed view of life in the face of change. Therefore, education is one of the main factors in improving the quality of human resources and plays an important role in the progress of a nation.

In the context of basic education, mathematics learning plays a strategic role in training students' logical, systematic, and critical thinking skills. However, learning math, especially angular material, tends to make it difficult for students to understand abstract and boring concepts. This condition causes low interest in student learning which can have an impact on suboptimal learning outcomes (Wirtaria et al., 2023). One of the math materials that often cause difficulties for students is angular material that requires an understanding of complex concepts, such as angle types, angle measurements, and relationships between angles (Setyawan et al., 2025). Observations in the field show low student engagement during learning, where they are often distracted by conversations with friends and do not focus on the material being delivered, and even tend to ignore the presence of teachers (Yanuar & Pius, 2023). These difficulties are often influenced by the use of learning methods that are still teacher-centered and the lack of use of concrete learning media. This condition is the cause of the difficulty in understanding the concept of angle in students, so a more active and collaborative learning model, such as *the Student Teams Achievement Division* (STAD) model, is needed. Improving student learning activities relies heavily on the teacher's ability to design correct instruction, master classroom dynamics, and build strong interactions.

The application of the STAD-type cooperative model is one of the innovative efforts that teachers can make to create participatory learning that is no longer centered on one direction only (Abrori & Sumadi, 2023). According to Wulandari, (2022), STAD it is a cooperative learning model that involves small groups of 4 to 5 students with heterogeneous abilities. The researcher who also conducted class actions using cooperative learning in this type of student team achievement division (STAD) was divided into small groups of students consisting of 3-4 students heterogeneously to cooperate with each other in the learning process (Manjani et al., 2022). In addition, according to Wulandari, (2022), STAD is a cooperative learning model that involves small groups of 4 to 5 students with heterogeneous abilities. With this in mind, it can be interpreted that the main focus of this model is collaborative cooperation between members to ensure that each individual understands and masters the learning material as a whole.

Based on the results of initial observations in grade V of elementary school, researchers found that student learning outcomes in corner materials are still low. The learning process tends to be dominated by only a few students, while most other students are passive and only listen. Math learning, especially corner material, tends to make it difficult for students to understand abstract and boring concepts. In addition, students also experience difficulties in understanding the concept of angle measurement, which can be seen from the results of learning evaluations. This condition causes low interest in learning students which can have an impact on less than optimal learning outcomes (Wirtaria et al., 2023).

One feasible alternative is the Student Teams Achievement Divisions (STAD) cooperative learning model, which emphasizes collaboration in heterogeneous groups where students support each other in understanding the material (Amalia et al., 2023). This model encourages social interaction and active participation of students in learning. Several studies have shown that the application of this model can improve student activity and learning outcomes in mathematics learning (Nggariwo et al., 2024). The use of this STAD learning model can improve student learning outcomes and be more interactive with peers

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because heterogeneous groups are formed so that the learning process can be more effective (Firdaus et al., 2023). The research structure states that Suniana & Ratnasari, (2025) the application of the STAD model is able to significantly increase the completeness of student learning outcomes through discussion and group cooperation activities, so that learning becomes more active, interactive, and student-centered.

Previous researchers also did not specifically examine the application of learning models to corner materials in elementary schools, nor did they highlight the relationship between student activities and learning outcomes in the context of real classroom learning. Therefore, this study seeks to strengthen and develop previous findings through the application of a learning model to corner materials with different learning conditions. Based on this description, this study aims to improve student learning outcomes in angle measurement materials through the application of the Student Teams Achievement Divisions (STAD) learning model among fifth grade elementary school students.

The use of the right learning model and the use of learning media also play an important role in improving student learning outcomes (Rahmadhani & Sutriyani, 2025). It is stated that the application of the STAD model combined with instructional media can effectively improve students' understanding and optimize their learning outcomes. Low mathematics learning outcomes can be overcome with the application of the right learning model. One model that has proven to be effective is STAD, which is in line with the opinion that Oktavia et al., (2025) the STAD model can significantly improve the mathematics learning outcomes of elementary school students. The Student Teams Achievement Divisions (STAD) cooperative learning model has the advantage of improving students' academic achievement, promoting social engagement, and reducing achievement inequality between students (Rozzy et al., 2024). The application of the STAD-type cooperative learning model in classroom action research can improve mathematics learning outcomes of elementary school students and is widely applied in the current curriculum (Ningrum, 2023).

2. Method

This research uses the design of Classroom Action Research (PTK) which aims to improve the quality of learning outcomes in the classroom and the learning process itself. Classroom Action Research (PTK) refers to a form of action research that involves a systematic and reflective process carried out by educational practitioners to improve instructional practices implemented in the curriculum (Abdillah et al., 2021). The model used for this study is the Kemmis and McTaggart model which includes four stages, namely planning, implementation of actions, observation, and reflection carried out in two cycles (Susilo et al., 2022).

This research was carried out at SDN Socah 3 which is located in Socah District, Bangkalan Regency. The research was conducted for three weeks in March of the 2025/2026 academic year. The subject of the study was 21 students in grade V of elementary school Socah 3. The research is carried out through two action cycles which include the planning stage, implementation of actions, observation, and reflection to improve student learning outcomes through the application of a cooperative learning model of the Student Teams Achievement Division (STAD) type. The process also includes observation of student learning activities and reflection aimed at improving implementation in the next cycle. The data collection techniques used include interviews, observations, tests, and documentation (Rumina, 2024). Interviews were conducted to obtain information about the initial conditions of the learning process. Observations were carried out to assess student activities during learning activities. The test is carried out to measure student learning outcomes in each cycle, while documentation is used as supporting data in the form of notes and photos of learning activities (Siswanto et al., 2024).

The validity test was carried out using Pearson Product Moment correlation with the help of the SPSS program. An item of a statement is declared valid if the value of r is greater than the r of the table at a significance level of 5%. The results of the validity test showed that of the 11 statements tested, there were 6 valid points, namely S3, S5, S6, S7, S8, and S9. Meanwhile, items S2 and S11 were

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declared invalid because they had a calculated r value that was smaller than the r of the table. The items S1, S4, and S10 cannot be calculated for their correlation values because the data is constant so they are not used in the research. The reliability test was carried out using Cronbach's Alpha coefficient. The test results showed a Cronbach's Alpha value of 0.856. The value is greater than 0.70 so that the instrument is declared reliable and suitable for use as a data collection tool in research. The criteria for the success of the action are determined based on the completeness of classical learning, namely if at least 85% of the students achieve the completeness of learning stated by Zainal Aqib (Maulana & Nurfauzi, 2023). Data analysis was carried out qualitatively and quantitatively. Qualitative analysis uses the Miles and Huberman model, which consists of data reduction, data presentation, and conclusion drawn, while quantitative analysis is used to calculate the percentage of student learning mastery in each. Students are declared complete if they get a score of ≥ 85 and incomplete if they get a score of < 85. The percentage of learning mastery is calculated using the formula:

$$P = \left(\frac{n}{44}\right) x100\%$$

Description:

P = percentage of learning mastery

n = total score obtained by students

44 = maximum score obtained from 11 assessment indicators with the highest score of 4 on each indicator

The percentage results obtained were used to determine the level of student learning mastery in each research cycle.

3. Results and Discussion

The results of the classroom action research conducted over two cycles showed that the application of the Student Teams Achievement Division (STAD) cooperative learning model, combined with the use of concrete instructional media in the form of simple protractors, succeeded in improving student learning outcomes in angle measurement materials. Before the action was given, the researcher conducted an observation process in the learning process on the corner material in class V of elementary school Socah 3 which was still dominated by the

lecture method and practice questions that were done by only a few students, namely as many as 3 students actively. Based on the results of observations made related to the concept of angles, other students tend to be passive and some have difficulty in understanding the material because the delivery is delivered with the help of the use of concrete media, namely large degree arcs. However, the use of concrete media is still centered on the teacher when delivering and there is very little opportunity for students to manipulate the media directly.

Figure 1. Teachers Use Concrete Media in the Learning Process

Figure 2. Activities for Working on Problems on the Board

With this, according to the observation of the researcher by conducting a question and answer session for grade V students through reflection on involvement during the learning process is still quite low, which results in the optimal learning process has not been realized. The pre-cycle stage to obtain initial data does not use learning outcome tests as an initial condition, but through observational and interview data as well as qualitative oral diagnostics to identify students' initial abilities. With this, the initial conditions are not presented in the form of test scores, but in the form of a description of the observation results that are the basis for the preparation of actions in cycle I.

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Figure 3. Researchers Reflect on the Material Discussed with Students

The action of implementing the STAD-type cooperative learning model with the help of concrete media in the form of simple degree arcs, student learning outcomes have increased. In the first cycle, the average student learning outcome reached 78.25% with classical completeness of 14.29% or as many as 3 out of 21 students achieved KKM. This condition shows that the initial implementation of the STAD model is still not running optimally, especially in the aspects of group management and student participation. Some students are still passive and not used to working in heterogeneous groups so that learning interactions have not been carried out effectively.

Actions in the second cycle began to increase by making improvements in the learning process, namely heterogeneous grouping based on academic ability, motivation, and role assignments for each group that had a significant impact on learning outcomes. The average student score increased to 89.29% with classical completeness of 85.71% or classical completeness student learning outcomes were 18 out of 21 students. This shows that the actions taken have succeeded in answering the research problem, namely the low student learning outcomes in the corner material. A clearer division of roles and groupings aims to be based on the diversity of academic abilities, the dynamics of the classroom become more lively. Here, the peer tutor system begins to be seen; Students who already understand help their friends who are struggling, so that the understanding of angle measurement becomes more evenly distributed throughout the class. This condition is in line with the argument that (Ripa et al., 2021) the STAD model is able to trigger active student participation through teamwork.

Table 1. Cross-Cycle Data Form

Stages	N	Form data	Average (%)	Complete Amount	Incomplete Amount	Classical Completeness
Pre-cycle	21	Observations, interviews, oral diagnostic assessments	-	-	-	-
Cycle I	21	Learning outcome test (LKPD)	78,25	3	18	14,29%
Cycle II	21	Learning outcome test (LKPD)	89,29	18	3	85,71%

Remarks: The pre-cycle stage does not carry out a learning outcome test. The initial condition was obtained through observation, interviews, and qualitative diagnostic assessments. So that neither the average score nor the percentage of classical completeness were obtained.

Based on table 1. it can be seen that the success of the application of the STAD model in research is influenced by the attitude of responsibility of each individual in the group which encourages each student to understand difficulties, so that the learning process creates active and mutually supportive conditions. Interaction between students is more intensive, learning participation is increased, and understanding of the concept of angle measurement becomes more even, as well as encouraging students to implement a collaborative attitude between others. This is in line with the findings from Luthfi & Murtiyasa, (2024) who stated that the STAD-type cooperative learning model is more effective than conventional learning in improving the ability of elementary school students' mathematics subjects to provide opportunities for students to discuss, exchange ideas, and solve problems collaboratively.

The learning model factor is one of the successes of the application of the STAD model in the student learning process supported by the use of props in the form of paper protractors which play a crucial role. Angular material that would normally only be imagined in the abstract is now easier for students to understand, as they can hold and practice directly how to measure angles visually. This simple but interactive media helps students overcome difficulties in understanding the

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concept of measurement Setyawan et al., (2025), in accordance with the view that concrete media is very helpful for elementary school students in understanding complex mathematics material. The findings are also explained through Piaget's theory of cognitive development, which states that elementary school students have a concrete operational stage. Thus, this stage is easier for students to understand in obtaining learning experiences through real objects that can be observed and manipulated directly. With this, the use of simple protractors as a concrete medium helps students visualize abstract angular measurement concepts into more concrete for a better understanding of concepts.

Overall, the combination of structured group work and practical learning media has proven to be effective in changing the classroom atmosphere to be more interactive. These results confirm that to improve mathematics learning outcomes, teachers need to implement learning innovations that facilitate cooperation and use tools that are close to the reality of students in the classroom. These findings are in line with the statement that Oktavia et al., (2025) the STAD model has a positive effect on student learning outcomes. The results of this study show the benefits by increasing student participation and collaboration in group learning, making the learning process more interactive. The use of concrete media also helps students understand concepts more easily and meaningfully. This is in line with the statement that Nggariwo et al., (2024) the STAD model increases student participation, and is supported by the statement that Khoirina et al., (2025) concrete media is effective in improving understanding of concepts.

Applied learning not only improves learning outcomes, but also fosters a more interactive and inclusive learning environment. This is supported by the opinion that Rosit & Putri, (2023) cooperative learning has a positive impact on student learning outcomes. The use of interactive learning media is a protractor that can be used by each student. This learning media also affects the presence of students in the learning process which is in line with the opinion that Rahmadhani & Sutriyani, (2025) the application of the STAD model combined with interactive-effective media in improving concept understanding and student participation can improve learning outcomes. In addition, the use of interactive

media in the STAD model in learning that engages students during the learning process can increase as students will be more likely to be active in participation and motivated. Therefore, the presence and involvement of students during the learning process will be better (Nurluthfiana et al., 2025).

However, the study has limitations in the pre-cycle stage of not using learning outcome tests but obtained from observations, interviews, and qualitative oral diagnostic assessments. The research was conducted only in one class with 21 students, so the results of the study could not be generalized to a wider context. The results of the study provide practical implications that Oktavia et al., (2025) the STAD-type cooperative learning model with the help of concrete media can be used as an alternative to mathematics learning in elementary schools, especially in abstract materials. This model supports the ability to improve student learning outcomes, but also encourages active participation, cooperation, and communication between students during the learning process.

4. Conclusion

The application of a cooperative learning model of the Student Teams Achievement Division (STAD) type assisted by concrete media of paper degree arcs has proven to be effective in improving the learning outcomes of corner material of grade V students through structured group work that brings to life the peer tutor system to support each other and overcome difficulties together. This direct manipulation of real objects has succeeded in helping elementary school students bridge their understanding from mathematical concepts that were originally abstract to more concrete, meaningful, and easy to understand. The practical implications for teachers are the importance of moving away from the traditional teacher-centered lecture method to the role of facilitator who designs collaborative learning with clear division of roles to trigger individual responsibility. In addition, teachers in the classroom are advised to be more creative in utilizing simple but interactive non-digital learning media to increase student engagement, focus, and active participation during the learning process. However, this class action research has limited subject scope (21 students) so that

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the results cannot be generalized in a broader context, and in the pre-cycle stage they do not use quantitative test instruments but are only based on observation data and qualitative interviews. Therefore, recommendations for future research are to test the STAD model on a broader class scale, apply learning outcome test instruments from the early stages (pre-cycle) for more valid comparative data, and develop a combination of this cooperative model with other interactive media variations.

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