



The Effect of the Teams Games Tournament (TGT) Cooperative Learning Model on the Mathematics Learning Outcomes of Fourth-Grade Students at SD Inpres 5 Lolu

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ABSTRACT

This study aims to analyze the effect of the Teams Games Tournament (TGT) cooperative learning model on the mathematics learning outcomes of fourth-grade students at SD Inpres 5 Lolu, specifically on the topic of fractions. The research used a quantitative approach with a One-Group Pretest–Posttest Design involving 20 students as the experimental sample. Data were obtained through pretest and posttest instruments and analyzed using descriptive statistics, the Shapiro–Wilk normality test, the Paired Sample t-test, and the N-Gain test with the assistance of SPSS Statistics. The results revealed a substantial improvement in students’ cognitive abilities after the application of the TGT model. The average pretest score of 22.5 increased to 81 on the posttest, yielding a mean gain of 58.5 points. The Paired Sample t-test produced a significance value of <0.001 , indicating a statistically significant effect of the TGT model on learning outcomes. Furthermore, the N-Gain value of 0.7663 categorized the improvement as high. These findings indicate that the TGT model is effective in enhancing students’ understanding of fractions, increasing engagement, and creating a more interactive learning environment. Thus, TGT can be considered an innovative alternative learning strategy for improving mathematics outcomes at the elementary school level.

1. Introduction

Learning is a conscious effort made by teachers to encourage students to learn, characterized by behavioral changes in students involved in the process (Faizah, 2017). These changes include the development of new skills that last for a relatively long period of time as a result of the efforts made (Nurlaelah & Sakkir, 2020). Learning should emphasize student activity in acquiring knowledge through various

methods, so that the knowledge gained has deep meaning for them (Ramli, 2020). In this context, teachers not only act as material transmitters, but also as facilitators, motivators, and guides who are able to create a learning environment that is fun, challenging, and supports the optimal development of students' potential (Nurzannah, 2022).

Mathematics is an important subject to learn because this subject provides benefits in everyday life. The important role of mathematics can be proven by looking at the subject mathematics, which has more hours than other subjects (Sarah et al., 2021). Students should master mathematics, but in reality some students in Indonesia from various levels of education believe that the subject of mathematics is the subject that is difficult (Parwati et al., 2023). Ideal learning should take into account the stages of students' cognitive development. Piaget emphasized that students need to experience active and meaningful learning processes through interactions with their environment and peers to optimally develop their cognitive and social abilities. These interactions not only enhance academic understanding but also shape students' character and identity within a broader social context (Nirmala, 2023). Effective learning does not only focus on the delivery of information, but also on the development of understanding gained through direct experience, discussion, and collaboration. This shows that a more innovative learning approach is needed so that students can understand the material better (Silaban et al., 2022).

Based on an interview with one of the teachers in class IV B of SD Inpres 5 Lolu, who stated that student learning outcomes in mathematics, specifically fractions, were still low, as evidenced by the students' daily test scores, where 55% of students scored below the minimum passing grade of 75. To determine the cause of the low learning outcomes, the researcher conducted observations during the mathematics learning process in the classroom. The observations showed that there was still a lack of two-way interaction between teachers and students and among students themselves in the learning process. The method commonly used by teachers was the conventional learning method, namely lecturing, in which teachers were more dominant in delivering material and only gave essay-type exercises. This resulted in teacher-centered learning and students tending to be passive during the learning process. Students did not take the initiative to ask questions if there was something they did not understand, even when the teacher gave them the opportunity. When the teacher asked questions, they tended to remain silent or just wait for other friends to answer.

Although the lecture method has advantages in delivering material systematically and efficiently, this method is less effective in increasing student motivation (Febrianti, F., 2019). In addition, this learning method does not emphasize social interaction and cooperation among students, which can actually help in understanding concepts more deeply. This is in line with the opinion Vygotsky which emphasizes that social interaction plays an important role in building student understanding. Student learning achievement is greatly influenced by the level of learning motivation of a student, thus it is suspected that there is a positive influence between learning motivation and learning achievement

(Matondang, 2018). Students who experience learning difficulties are often affected by internal and external factors that hinder their learning process (Hidayah et al., 2025).

One relevant approach to addressing this issue is the Teams Games Tournament (TGT) learning model. Discussions that occur in TGT learning can increase the knowledge of all discussion members. With TGT learning, students' understanding will be stronger so that the concepts constructed by the students themselves will be stronger. In TGT learning, there is interaction between students. "Students who are less intelligent or weak will be helped by more intelligent students, thereby enriching their knowledge and hopefully improving their learning outcomes (Susanti et al., 2024). In addition, TGT can significantly improve mathematical problem-solving compared to conventional learning methods. This is because this model encourages students to be active in group discussions, develop problem-solving strategies, and improve healthy academic competitiveness (Sari et al., 2021; Rizqi & Setiawan, 2025; Sani et al., 2025). Thus, students not only better understand the concepts taught but also gain a more enjoyable and meaningful learning experience. The novelty of this model lies in the integration of game elements into mathematics learning, which is expected to increase student engagement and build critical thinking skills more effectively.

Through this approach, students not only practice solving problems more actively, but also engage in social interactions that can improve critical and collaborative thinking skills (Krisnawati et al, 2024). Similar results were also found in a study published in (Sanusi & Widyaningsih, 2014; Rosyida et al., 2025; Paraswati et al 2025; Lapabande, 2026), which showed that a game-based approach can improve students' social interaction and critical thinking skills. This approach is in line with the demands of Merdeka Belajar (Freedom of Learning), which emphasizes the importance of authentic assessment in basic education (Kartini, 2024).

Not only does it impact conceptual understanding, the TGT model is also effective in increasing student motivation to learn (Fadila et al., 2023). Competition-based learning provides its own challenges for students, so that they are more motivated to participate in learning more actively (Rifqi, 2022). A study conducted by (Armadani et al., 2022) shows that students who learn using the TGT method show higher learning motivation compared to those who learn using traditional lecture methods. This is because the game elements in TGT create a more dynamic learning environment, where students feel more motivated to complete the challenges given (Gustika et al, 2024). Students will also learn appreciate each opinion friend group so that they can improve their character and tolerance among students and between students and teachers (Hasan et al., 2023).

Based on the above description, this study aims to analyze the effect of implementing the Teams Games Tournament (TGT) cooperative learning model on the mathematics learning outcomes of fourth-grade students at SD Inpres 5 Lolu. This study is expected to contribute to the development of more effective and innovative mathematics learning strategies in elementary schools and to provide

alternative solutions for teachers in improving student engagement and learning achievement in fractions.

2. Methodology

This type of research is quantitative research with a *One-Group Pretest-Posttest Design*. This design was chosen because it aims to determine the effect of treatment through the application of the *TGT* model on improving student learning outcomes. According to Arikunto (in Amin et al., n.d. 2023), a sample is a small part of a population that is considered representative of the population being studied. The sample in this study consisted of 20 students in class IV B as the experimental class. This study used random sampling techniques. In general, the research design can be seen in Table 1:

Table 1. One-Group Pretest–Posttest Design

Pretest	Treatment	Posttest
O ₁	X	O ₂

Explanation:

O₁: pretest of students' cognitive abilities before being given the TGT model treatment

X: Treatment with the application of the TGT model

O₂: Posttest of students' cognitive abilities after being given the TGT model treatment

The research procedure was carried out in three main stages, namely the preparation stage, the implementation stage, and the evaluation stage. In the preparation stage, the researcher conducted preliminary observations to identify learning conditions and develop learning tools according to students' needs. The implementation stage was carried out by first giving students a pretest to measure their initial cognitive abilities. Next, the learning process was carried out by applying the *TGT* model in the Fractions material. In the final stage, the researcher administered a posttest to measure the improvement in students' cognitive abilities after the treatment. The research instrument used was a written test in the form of multiple-choice questions that measured several aspects of cognitive ability based on Bloom's taxonomy. The questions were compiled in accordance with the learning indicators and had been validated by experts and tested using the SPSS Statistics program to ensure their validity and reliability.

The variables in this study consist of *independent* variables and dependent variables. The independent variable is the *Teams Games Tournament* (TGT) learning model applied in mathematics learning, while the dependent variable is the learning outcomes of fourth-grade students in fraction material. Data collection instruments in the form of pre-tests and post-tests were used to measure the level of achievement of students' cognitive abilities in the " " before and after the application of the learning model. The instrument grid was developed based on learning

indicators and cognitive aspects to be measured, including students' abilities to recognize, understand, and apply fraction concepts appropriately.

The data analysis techniques in this study included descriptive and inferential statistical analysis. Descriptive analysis was used to describe the students' cognitive ability data before and after the implementation of the *Teams Games Tournament* model, such as mean, median, and standard deviation. Inferential analysis was conducted to test the hypothesis regarding the effect of the learning model on improving students' cognitive abilities. Before testing the hypothesis, the data was first tested using *the Wilcoxon Signed-Rank Test* as a prerequisite test. Next, hypothesis testing was performed using *the Paired Sample t-test* to see the significance of the difference between the pretest and posttest results. The entire data analysis process was carried out with the help of SPSS Statistics software to ensure the accuracy of the statistical calculations.

3. Results and Discussion

This study was conducted in class IV B of SD Inpres 5 Lolu, consisting of 20 students, including 11 male students and 9 female students with diverse academic characteristics. In general, the students' initial mathematics abilities were in the moderate category, but there was a clear gap between high-ability and low-ability students. During the learning process, most students tended to be passive and simply waited for instructions from the teacher without showing any initiative to ask questions or engage in discussion. Initial observations showed that motivation to learn mathematics was still low, especially when students were faced with material that required conceptual understanding. Many students admitted that they had difficulty following the lessons because the delivery method was monotonous and lacked variety. In addition, interaction between students during learning is still limited to individual activities, so that opportunities to exchange ideas or work together in groups have not developed optimally. This condition has resulted in minimal active involvement of students and low learning achievement in certain subjects.

Until now, the mathematics learning process in grade IV at SD Inpres 5 Lolu has predominantly used lecture and exercise methods, where teachers explain the material on the blackboard, then students are asked to do exercises individually. This model is quite helpful for delivering basic material, but it is unable to encourage active student participation or interaction between peers. The lack of variety in learning activities causes some students to quickly become bored and lose focus, especially on material that requires in-depth understanding. This situation is exacerbated by the lack of interesting learning media and the lack of strategies that can facilitate healthy competition among students. Therefore, the application of the TGT learning model is considered relevant because TGT provides opportunities for students to learn in groups, discuss, and compete in a fun atmosphere. It is hoped that with the implementation of TGT, students can become more active, motivated, and able to improve their mathematics learning outcomes.

Before implementing the Teams Games Tournament (TGT) learning model, the researchers first coordinated with the classroom teachers regarding the schedule, materials to be used, and technical aspects of the activity. The researchers prepared learning tools such as lesson plans, group activity sheets, game questions, and evaluation instruments for the tournament. In addition, the researchers also conducted a brief socialization session with students regarding the learning objectives and basic rules of TGT so that they understood the flow of activities to be carried out. The classroom was then arranged to allow students to work in small groups with their seats facing each other. Groups were divided heterogeneously based on academic ability, gender, and level of student activity to ensure an even distribution of roles in group activities. Each group was given an identity or name to facilitate coordination during the learning process.

During the lesson, the teacher begins by giving a brief explanation of the material to be studied, then the students are directed to form groups and work in their respective groups. At this stage, students have the opportunity to discuss, ask questions, and solve problems together. The teacher and researcher act as facilitators who oversee interactions between students and ensure that all group members are actively involved. Each group is given a task sheet that they must complete before entering the game or tournament stage. This discussion activity is designed to train critical thinking skills, encourage mutual assistance, and prepare students to be more ready to face healthy competition in the next stage. Some students who were initially passive began to participate when working in groups, mainly because the learning atmosphere felt more relaxed and enjoyable.

After the group discussion activity was completed, learning continued with games and tournaments in accordance with the TGT format. At this stage, students moved to tournament tables that had been arranged based on their skill levels, so that each student competed with friends of similar ability. Researchers provided question cards and score sheets to guide the tournament, while teachers ensured that the competitive atmosphere remained conducive and sporting. Each correct answer earned individual points, which were then accumulated into a group score. At the end of the tournament session, the teacher gave awards to the students and groups with the highest scores. These awards were a form of appreciation for their efforts, cooperation, and perseverance during the learning process. The awards were proven to increase student motivation, strengthen the spirit of healthy competition, and encourage active participation in each stage of the activity. The competitive yet enjoyable atmosphere of the tournament made the students appear very enthusiastic and fully engaged throughout the learning process.

Data collection was conducted in two stages, namely before and after the implementation of the TGT learning model. In the initial stage, the researcher administered a pretest to all students to determine their basic abilities related to the mathematics material to be studied. After the TGT learning was completed over several meetings, the researcher administered a posttest that had a structure and level of difficulty equivalent to the pretest. The results of the pretest and posttest were analyzed to measure the improvement in student learning outcomes through N-Gain calculations. In addition, the researcher also observed student activities

during the TGT process to obtain an overview of changes in activity, motivation, and social interaction among students. All data were collected and processed using statistical analysis methods to obtain valid and reliable results.

After the entire series of activities was completed, the researchers and classroom teachers evaluated the implementation of TGT, both in terms of the effectiveness of the strategy and the students' responses during learning. Students were also asked to provide simple feedback on their experiences participating in TGT activities, for example through short interviews or questionnaires. Most students stated that learning felt more exciting and easier to understand because of the games and opportunities for collaboration. From the perspective of researchers and teachers, the TGT model was proven to improve classroom dynamics, encourage active participation, and increase motivation to learn mathematics. The results of this reflection were used as consideration for the application of TGT in other materials or classes in the future. Thus, the implementation of TGT not only improved learning outcomes but also the overall quality of learning.

Some of the TGT concepts taught to students during learning are:

1. Team Study Concept

Students are introduced to the concept of group cooperation, where they must help each other understand the material. Each group member is responsible for mastering the material because individual scores will affect the group score. This concept emphasizes the importance of mutual support, sharing problem-solving strategies, and enhancing a sense of togetherness in the learning process.

2. Games & Tournament System

Students are given an understanding that learning in TGT involves educational games followed by tournaments, where each student competes with friends at the same skill level. Students are given an explanation about the rules of the game, how to earn points, and how individual scores will contribute to the final group score. This concept aims to promote healthy competition and strengthen motivation to learn.

Pretest Results

A pretest was administered before the TGT intervention to determine students' initial level of understanding of fractions. The pretest results are shown in Table 2.

Table 2. Pretest Data Analysis

Statistic	Pretest
Mean	22,5
Standard Deviation	10,18
Minimum Score	5
Maximum Score	45

Based on Table 1, the average pretest score of 22.5 indicates that students' initial understanding of the material is still relatively low. The high standard deviation (10.18) indicates considerable variation in students' initial abilities. This reinforces the assumption that conventional learning methods have not been able to

accommodate individual differences optimally. A minimum score of 5 indicates that there is a group of students who need a more concrete learning approach, while a maximum score of 45 indicates that a small number of students already have a good basic understanding.

Posttest Results

After implementing the TGT model, students' cognitive abilities showed significant improvement. The post-test results can be seen in Table 3.

Table 3. Posttest Data Analysis

Statistic	Posttest
Mean	81
Standar Deviation	14,01
Minimum Score	50
Maximum Score	100

The data in Table 2 shows an increase in the average learning outcome to 81. The increase in standard deviation from 10.18 to 14.01 indicates that the distribution of scores is more homogeneous, reflecting a more diverse improvement across all students. The minimum score increased dramatically from 5 to 50, indicating that low-ability students experienced significant improvement, while the maximum score of 100 shows that the potential of high-ability students can be optimized. Classically, 80% of students exceeded the Learning Objective Completion Criteria, confirming the effectiveness of this learning approach.

Normality Test

The normality test is an analysis that aims to determine whether the data of a sample is normally distributed or not. The normality test in this study used the *Shapiro-Wilk* method with the help of the SPSS program. The results of the analysis can be seen in Table 4.

Table 4. Normality Test Results

Class	Shapiro wilk		
	statistic	df	sig
Pretest experiment	.938	20	.224
Posttest experiment	.948	20	.338

Based on the table above, it shows that the *Shapiro-Wilk* significance value in class IV B on *the pretest* is 0.224, which is greater than the specified α ($0.224 > 0.05$). This indicates that the *Pretest* data is normally distributed, and the *Shapiro-Wilk* value for class IV B in *the Posttest* is 0.338, which is greater than the specified α level ($0.338 > 0.05$). This indicates that the *Pretest* and *Posttest* data are normally distributed. Because the data is normally distributed, a *Paired Sample T-test* hypothesis test was conducted.

Paired Sample T-Test

Furthermore, hypothesis testing using the Paired Sample T-Test yielded the results shown in Table 5.

Table 5. Hypothesis Test Results

	Paired Differences		95% Confidence Interval of the Difference		t	df	One-Sided p	Two-Sided p	
	Mean	Std. Deviation	Std. Error Mean	Lower					Upper
Pair 1 (Pretest - Posttest)	-58.50000	11.13317	2.48945	-63.71048	-53.28952	23.499	19	<0,001	<0,001

These results show a mean difference of -58.50000 with a significance value of <0.001, so H_0 is rejected and H_a is accepted. This means that the TGT model has a significant effect on improving students' cognitive abilities.

N-Gain Test

In this study, the N-Gain test was used to determine the level of improvement in learning outcomes between before and after treatment in the experimental class. The analysis was conducted using the SPSS Statistics program with reference to the N-Gain score categories, namely $g > 0.7$ classified as high, $0.3 \leq g \leq 0.7$ classified as moderate, and $g < 0.3$ classified as low. The results of the data analysis were obtained through processing using SPSS Statistics as shown in Table 6.

Table 6. N-Gain Test Results

Variabel	N	Minimum	Maximum	Mean	Std. Deviation
N-Gain Score	20	0,41	1,00	0,7663	0,16433

The average N-Gain value of 0.7663 indicates a high level of cognitive improvement. This shows that the application of TGT is effective in improving learning outcomes, although there is still room for further improvement.

Discussion

The results of this study indicate that the application of the TGT learning model has a positive impact on learning outcomes, student engagement, and their response to learning. Based on the pretest and posttest results, there was an increase in the average student score from 22.5 to 81, indicating that this method is effective in helping students better understand fractions. This increase of 58.5 points shows that the TGT model effectively helps students understand fractions better. This increase

shows that games in learning not only make the classroom atmosphere more enjoyable, but also improve in-depth understanding of concepts. This model encourages students to learn more effectively, both individually and in groups, so that they can understand the material being taught more easily. This is in line with research (Nur, 2025) who found that the application of the TGT type cooperative learning model can improve the mathematics learning outcomes of class IV SDN 217 Kampuno, Bone Regency. In his research, before the application of the TGT model, students' pretest scores averaged 47.08 and after applying the TGT model, students' posttest results increased with an average of 84.31, this shows that the TGT model is effective in improving student learning outcomes.

The improvement in learning outcomes found in this study is also consistent with the findings of (Putri et al., 2024), which show that game-based learning models can improve students' understanding of abstract mathematical concepts, as seen in the improvement in students' understanding of fractions. This proves that game-based learning not only increases student motivation but can also deepen their understanding of complex concepts in mathematics. In addition to improving learning outcomes, this study also revealed that the TGT model increased student engagement in learning. Before implementing this method, only 50% of students showed active engagement in class, but after implementation, this figure increased to 80%. This increase shows that game-based learning methods have a significant impact on making students more enthusiastic about learning. One of the main reasons for this increase in engagement is the competitive element in TGT, which naturally motivates students to participate. In addition, the team system in TGT also makes students feel more confident in working on problems and discussing material with their friends. Higher student engagement in learning is also supported by research from (Ni'matuzzuriyah, 2024), which states that competition-based learning models, such as those applied in Teams Games Tournament, can increase interaction between students. Through the application of the TGT model, students involved in the game are more likely to communicate and share ideas, which in turn enriches their learning experience. Thus, students not only learn from teachers but also from their peers through discussion and teamwork. This is in line with research showing that interactive and enjoyable learning methods can increase student interest and engagement in the teaching and learning process.

Although the TGT model shows positive results, there are several challenges in its implementation. One of them is the difference in student participation levels in the game. Not all students have the same confidence in competing, so in some cases, students who are more shy or less confident tend to be more passive in this activity. This can cause a gap in student involvement, where some students are very active, while others are less involved. In addition, students who are quicker to understand may dominate the game, causing those who are slower to understand the material to feel left behind. Research by (Wulandari et al., 2024) found that the application of the TGT model can gradually increase student confidence, even though some students initially feel less confident in competing.

To overcome these challenges, educators need to implement additional strategies, such as adjusting the difficulty level of questions, organizing teams based on

student abilities, and providing rewards that focus not only on winning, but also on student effort and participation in the learning process. This way, all students, including those with low self-confidence, will remain motivated and engaged in learning. Overall, the results of this study not only answer the hypothesis that the TGT learning model has a significant effect on students' cognitive abilities, but also contribute theoretically to the development of learning models that are relevant to the cognitive development characteristics of elementary school children. Practically, these findings have important implications for teachers in choosing effective, innovative, and creative learning strategies.

4. Conclusion

Based on a series of studies that have been conducted, it can be concluded that the application of the Teams Games Tournament (TGT) cooperative learning model has a significant effect on improving the mathematics learning outcomes of fourth-grade students at SD Inpres 5 Lolu. Data analysis shows a clear increase in scores between the pretest and posttest after students participated in learning using the TGT model. These findings answer the research question that the TGT model is proven to be more effective than the learning methods that have been used so far, especially in improving students' conceptual understanding, critical thinking skills, and learning completeness.

In addition to improving learning outcomes, the learning process implemented through group work, discussions, games, and tournaments has succeeded in creating a more active and enjoyable classroom atmosphere. Students appear more enthusiastic, participate actively, and show higher motivation to learn compared to before this model was implemented. The star reward system also encourages positive competition and motivates students to achieve better results. With stronger interaction between students and varied learning activities, TGT is able to improve the overall quality of learning. Overall, this study proves that the TGT model is feasible to be applied as an alternative to mathematics learning in elementary schools. The application of this model not only improves learning outcomes but also improves classroom dynamics and fosters a spirit of cooperation, self-confidence, and sustained motivation. Thus, TGT can be recommended as an effective learning strategy to support the achievement of learning objectives at the elementary school level.

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