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The Quizizz -Assisted Teams Games Tournament Model On The Science Learning Outcomes Of Grade IV Students

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Abstract

This study aims to analyze the effect of implementing the Teams Games Tournament (TGT) learning model assisted by the Quizizz application on the science and social (IPAS) learning outcomes of fourth-grade elementary school students. The background of this study is based on the low student learning outcomes and the lack of active engagement in conventional learning processes. This research employed a quantitative approach with a pre-experimental design using a one-group pretest-posttest design. The sample consisted of 29 students selected through purposive sampling. The research instrument was a 20-item multiple-choice test that had been validated and proven reliable. Data analysis was conducted using the Paired Sample t-Test to determine differences in learning outcomes before and after the treatment. The results showed a significant improvement in student learning outcomes, with the average pretest score increasing from 43.27 to 70.86 in the posttest. The significance value of 0.001 (<0.05) indicates that there is a significant effect of the TGT learning model assisted by Quizizz on students' learning outcomes. In addition, the effect size value of 1.98 is categorized as very large, indicating that this learning model is highly effective. Therefore, the implementation of the TGT learning model assisted by Quizizz can serve as an innovative alternative to improve student learning outcomes, engagement, and understanding in IPAS learning at the elementary school level.

Keywords: Teams Games Tournament, Quizizz, Learning Outcomes, IPAS, Elementary School

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1. INTRODUCTION

Learning in the current digital era requires innovation in the strategies and methods used by teachers to increase student engagement and learning outcomes. One approach that is currently widely used is gamification and the application of technology-based learning media, such as the *Quizizz application* . Gamification has been proven to be an effective method in increasing student motivation, interest, and involvement in the learning process (Zainuddin, 2020). *Quizizz,* as one of the gamification platforms, provides an interactive mechanism for taking quizzes individually or in groups, so that it can increase active student participation and encourage more enjoyable learning (Chen, Wang, & Liu, 2023).

In the context of science and social studies learning in elementary schools, low learning outcomes are often a complex problem. This is influenced by various factors, including conventional learning methods, the lack of use of interactive media, and minimal student engagement in the teaching and learning process (Gunarta, 2019). Research shows that the use of gamification-based media such as *Quizizz* can provide greater stimulation to students' cognition, thereby improving memory, conceptual understanding, and critical thinking skills (Haris, Krismanto, & Shasliani, 2024). *Quizizz* offers automatic assessment features, time management, and healthy competition through a points system and *leaderboard,* which indirectly motivate students to learn more actively (Zhang & Crawford, 2024).

Besides digital media, learning models are also important factors in improving the quality of learning. One effective model is *the Teams Games Tournament* (TGT), a form of game-based cooperative learning. This model emphasizes cooperation among students in groups, developing communication skills, and collaborative problem-solving (Sa'diyyah, Rahayu, & Dahlani, 2024). The application of TGT in learning has been proven to improve learning outcomes, particularly in the context of *science* and social concepts that require interactive understanding (Zalza Luthfiatun, Lutfi Ardiansyah, & Rahmawati, 2024).

Combining TGT with *the Quizizz platform* provides a powerful synergy in learning. TGT allows students to work in teams, discuss, and solve problems together, while *Quizizz* adds a competitive and interactive element that stimulates students' intrinsic and extrinsic motivation (Gunarti, Septia Isma, Setiawan, Wibowo, Haryanto, Mukti Sintawati, & Meyyana Andriyani, 2022). International studies have shown that the effective use of *Quizizz* in elementary education can improve academic achievement and student engagement in various subjects, including mathematics and foreign languages (Miller & Young, 2023). The integration of cooperative learning methods and gamification technology is considered an innovative approach capable of bridging the gap between conventional learning and today's digital needs of students (Subhash & Cudney, 2018).

The importance of implementing TGT with *Quizizz* is also driven by the fact that elementary school students tend to be more motivated by competitive, interactive, and fun learning activities. Research shows that game-based learning activities can reduce boredom, improve focus, and motivate students to achieve higher learning goals (Wang & Rønningsbakk, 2021). Therefore, implementing the TGT model combined with *Quizizz* can create a dynamic learning environment, increase student participation, and foster social and collaborative skills that are essential for children's academic and character development (Balqis, Ayssyiyah, & Andriani, 2024).

The success of implementing educational technology depends not only on the availability of media, but also on appropriate learning design and student acceptance of the technology. *The Unified Theory of Acceptance and Use of Technology* (UTAUT) model emphasizes that factors such as perceived ease of use, perceived usefulness, and social support significantly determine the effectiveness of technology in learning (Alshehri, Rutter, & Smith, 2020). In this context, *Quizizz,* as an easily accessible, flexible, and enjoyable medium, has great potential to be accepted and optimally used by elementary school students (Venkatesh, Morris, Davis, & Davis, 2003).

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Quizizz -based learning activities can also support real-time measurement of students' cognitive competencies, making it easier for teachers to evaluate conceptual understanding and adjust learning strategies (Magadán Díaz & Rivas García, 2022). The integration of TGT and *Quizizz* provides a unique combination of cooperative learning and gamification, allowing students not only to compete for scores but also to learn to work together, build effective communication, and support each other in teams (Hermawanti, Elita, Grasianus, Aga Prasetya, Nensi Desiana, Purnamasari, Ratnasari, Dyah Utami, & Nur Laili Maulidah, 2025).

International research confirms *Quizizz's effectiveness* in increasing learning motivation and academic achievement. Zhang & Crawford (2024) showed that using *Quizizz* in foreign language classes increased student motivation and engagement. Furthermore, Ccoa, Torres, & Ramirez (2023) found that elementary school students experienced decreased learning anxiety and increased active participation when using *Quizizz* as a learning tool. Similar research by Maraza Quispe, Vargas, & Quispe (2024) confirmed that utilizing *Quizizz* with learning analytics provides teachers with critical information to tailor their teaching approaches to student needs.

Overall, the implementation of TGT assisted by *Quizizz* is seen as a relevant solution to address low student learning outcomes, particularly in science and social studies. This model offers a learning approach that combines cognitive, affective, and social aspects, and utilizes digital technology to increase student engagement. Therefore, this research is expected to make a significant contribution to the development of innovative learning strategies in elementary schools, while also providing empirical evidence regarding the combined effectiveness of TGT and *Quizizz* in improving student learning outcomes and motivation (Gunarti, Septia Isma, Setiawan, Wibowo, Haryanto, Mukti Sintawati, & Meyyana Andriyani, 2022; Fajri, 2025; Owen & Silvester, 2024).

Through this research, teachers are expected to utilize the *Quizizz- assisted TGT model* as an innovative, effective, and enjoyable learning alternative. The implementation of this model also aligns with educational needs in the digital era, where collaborative skills, problem-solving, and the use of technology are essential competencies for students from an early age. With this approach, it is hoped that the teaching and learning process will be more interactive, participatory, and able to encourage optimal learning outcomes in science and social studies subjects at the elementary school level (Haris, Krismanto, & Shasliani, 2024; Balqis, Ayssyiyah, & Andriani, 2024).

RESEARCH NOVELTY

This study has several novel aspects *that* distinguish it from previous research in the field of technology-based learning and cooperative models. First, this study combines two learning approaches that have been proven effective individually, namely *the Teams Games Tournament (TGT) model and Quizizz* media , into one integrated intervention. The TGT model is known as a cooperative learning strategy that emphasizes collaboration between students in completing tasks and solving problems as a team (Sa'diyyah, Rahayu, & Dahlani, 2024). Meanwhile, *Quizizz,* as a gamification platform, provides an interactive quiz mechanism that increases learning motivation, student engagement, and conceptual understanding through real-time assessment and a competitive point system (Zhang & Crawford, 2024). The integration of these two approaches has not been widely studied empirically in the context of fourth-grade science learning in elementary schools in Indonesia, so this study offers a new contribution to innovative learning practices.

Second, this study presents the interaction between healthy competition and teamwork through the implementation of TGT assisted by *Quizizz.* Previous studies generally examined TGT or *Quizizz* separately. For example, a study by Gunarta (2019) only emphasized the effect of TGT on science learning outcomes, while a study by Chen, Wang, & Liu (2023) focused on the effectiveness *of Quizizz* in increasing individual student engagement. By combining these two elements, this study explores how competition in quizzes can enhance students' intrinsic and extrinsic motivation, while maintaining the collaborative aspect that is at the heart of TGT. This


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presents a dual-benefit approach, namely improving both learning outcomes and students' social skills, which is a novel contribution to the development of learning strategies in elementary schools.

Third, this study emphasizes the application of educational technology in a real classroom with a pre-experimental design. Many international studies evaluating the effectiveness of gamification or TGT have been conducted in laboratory or simulated experimental contexts (Miller & Young, 2023) (Ccoa, Torres, & Ramirez, 2023). This study differs in that it was directly applied to a fourth-grade elementary school classroom under realistic conditions, providing empirical evidence of the effectiveness of *Quizizz- assisted TGT* in everyday learning situations. The results of this study are expected to serve as a reference for teachers and curriculum developers in designing technology-based learning strategies that are more realistic and adaptive to student needs.

Fourth, this study incorporates *cognitive* and affective evaluation aspects simultaneously. *Quizizz* allows teachers to assess cognitive achievement through validated quizzes, while TGT encourages students' affective and social engagement within teams. This approach provides new insights into the relationship between the use of gamification media, cooperative learning models, and student learning outcomes holistically. Previous studies tend to separate *cognitive evaluation* from affective aspects, so this study offers a more comprehensive approach (Haris, Krismanto, & Shasliani, 2024).

Fifth, from a technological innovation perspective, this study emphasizes the use of *the Quizizz feature* in team mode to support the TGT model. This feature allows students to answer quizzes as a team, view a leaderboard, and receive immediate feedback, thus combining gamification elements with authentic cooperative learning (Magadán Díaz & Rivas García, 2022). This approach is relatively novel, as previous studies have mostly used Quizizz solely individually, without integrating it into a TGT-based team context (Gunarti, Septia Isma, Setiawan, Wibowo, Haryanto, Mukti Sintawati, & Meyyana Andriyani, 2022).

Thus, *the novelty* of this research can be summarized in four main aspects: the integration of the TGT model with *Quizizz* as an integrated approach, a focus on healthy competitive interactions and team collaboration, implementation in real classrooms with *cognitive* and affective evaluations, and the utilization of innovative technology features to support cooperative learning. This contribution is not only practical for teachers and elementary schools but also adds to the scientific literature related to innovative learning strategies in the digital era, particularly in science and social studies subjects (Balqis, Ayssyiyah, & Andriani, 2024); (Owen & Silvester, 2024).

2. METHOD

This study used a quantitative approach to test the effect of *the Teams Games Tournament learning model, supported by the Quizizz* application, on elementary school students' science learning outcomes. The quantitative approach was chosen because this study focused on measuring numerical data and analyzing statistical data to test the formulated hypotheses (Sugiyono, 2019).

The type of research used was pre-experimental with *a one-group pretest-posttest design* . This design was used to determine differences in learning outcomes before and after treatment was given in the same group (Sugiyono, 2019).

The study population was all fourth-grade students at SDN 13 Nanga Pinoh. The study sample consisted of 29 students selected using purposive sampling, a sampling technique based on specific considerations tailored to the research objectives (Sugiyono, 2019). This technique is effective in educational research because it allows researchers to obtain relevant data that meets the research needs.

The research instrument was a multiple-choice learning outcome test consisting of 20 questions structured based on the social science learning indicators. The instrument underwent validity and reliability testing to ensure its suitability for use. Validity testing was conducted to determine the instrument's ability to measure the intended competencies, while reliability testing was used to determine the consistency of the measurement results (Sugiyono, 2019; Suprihatien,

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Rafiah, Iqtiran, Widyaningsih, and Risnita, 2024). Therefore, the research instrument can be considered valid and reliable.

The research procedure was carried out through several stages, namely the preparation stage, implementation, and the final stage. The preparation stage includes the preparation of learning tools, instrument preparation, and validity and reliability tests. The implementation stage began with a pretest to determine students' initial abilities before the treatment was given. Next, *the Teams Games Tournament learning model was implemented* using *Quizizz* in science learning, where students were divided into heterogeneous groups and participated in interactive quiz-based games and tournaments using *Quizizz* . The final stage was carried out by administering *a posttest* to determine students' learning outcomes after the treatment.

The data collection technique used a test method, with the collected data in the form of student *pretest* and *posttest scores. Data were analyzed using the Paired Sample t-Test* to determine the average difference between pre- and post-treatment scores (Sugiyono, 2019; Suprihatien, Rafiah, Iqtiran, Widyaningsih, and Risnita, 2024).

Before conducting a hypothesis test, a prerequisite analysis test, called a normality test, is performed to determine whether the data is normally distributed. If the data is normally distributed, the analysis can be continued with a *paired sample t-test* . The decision-making criteria in a hypothesis test are: if the significance value is less than 0.05, there is a significant difference between the *pretest* and *posttest results,* thus concluding that the treatment has an effect (Sugiyono, 2019).

Furthermore, to determine the extent of the learning model's impact, an *effect size calculation is performed.* Effect size measures the strength of the learning model's influence on student learning outcomes and is categorized as small, medium, or large, providing a clear picture of the effectiveness of the applied learning model (Sugiyono, 2019; Suprihatien, Rafiah, Iqtiran, Widyaningsih, and Risnita, 2024).

With systematic research procedures and precise data analysis, this study is expected to provide an accurate picture of the impact of the *Teams Games Tournament learning model* , supported by *Quizizz,* on the science learning outcomes of fourth-grade elementary school students. The results are also expected to serve as a reference in developing more innovative, effective, and technologically advanced learning strategies.

3. RESULTS AND DISCUSSION

3.1 Pretest and *Posttest* Results in Measuring Students' Initial and Final Abilities in Science Learning

The questions were tested in another school to ensure the reliability and validity of the instrument before the study was conducted. Fourth-grade students from SDN 01 Nanga Pinoh participated in the pilot study. Both the pretest and posttest consisted of 25 multiple-choice questions, with 20 valid and 5 invalid items. In the testing phase, 26 students were administered the instrument (Pangestu et al., 2024). We used the product-moment correlation method to check validity. If the calculated r value of an item is greater than the critical r value at a significance level of $\alpha = 0.05$, then the item is considered valid. A question is considered valid if the correlation value is greater than or equal to the threshold specified in the r table. A question is considered invalid if the correlation value is less than the r value in the table. The table below shows the questions determined to be valid through the product-moment correlation. These questions are based on calculations performed with SPSS version 27:

Table 1. Validity Test

Pernyataan	R Hitung	R Tabel	P (Sig.)	Keterangan
P1	0,4	0,388	0,043	Valid
P2	0,579	0,388	0,002	Valid

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P3	0,494	0,388	0,01	Valid
P4	0,494	0,388	0,01	Valid
P5	0,543	0,388	0,004	Valid
P6	0,56	0,388	0,003	Valid
P7	0,483	0,388	0,012	Valid
P8	0,483	0,388	0,012	Valid
P9	0,494	0,388	0,01	Valid
P10	0,518	0,388	0,007	Valid
P11	0,419	0,388	0,033	Valid
P12	0,531	0,388	0,005	Valid
P13	0,561	0,388	0,003	Valid
P14	0,532	0,388	0,005	Valid
P15	0,393	0,388	0,047	Valid
P16	0,583	0,388	0,002	Valid
P17	0,39	0,388	0,049	Valid
P18	0,494	0,388	0,01	Valid
P19	0,494	0,388	0,01	Valid
P20	0,574	0,388	0,002	Valid

Reliability testing is conducted after validity testing. If the results of the reliability test are consistent across various measurements, the instrument is concluded to be reliable (Lamanasa et al., 2025). The reliability of a research instrument and the consistency of its results are the objectives of reliability testing (Wahyuningsih & Slamet, 2022). Table 1.2 shows the results of the Cronbach's Alpha method based on an analysis conducted using IBM SPSS 27.

Table 2. Reliability Test Results

Reliability Statistics

Jumlah Pernyataan	Cronbach's Alpha	Syarat	Keterangan
20	0,833	0,6	Reliabel

With a Cronbach's Alpha value higher than 0.6, the reliability level is considered satisfactory. Therefore, it can be said that this research instrument is highly reliable. Table 1.2 shows the results of the reliability test, which, when analyzed using SPSS 27, showed a Cronbach's Alpha of 0.833. These results indicate that the instrument can consistently measure the same thing over time or across different subjects.

Table 3. Results of Students' Pretest and Posttest in Science Learning

No	Test Types	Average value	Category
1	Pretest	43.27	Low
2	Posttest	70.86	High enough

The results of the study showed that there was a significant difference between students' initial and final abilities in science learning after *the Teams Games Tournament* (TGT) learning model was implemented using the Quizizz application. Students' initial abilities were measured through a pretest before the treatment was given, while their final abilities were measured through a posttest after the learning process took place. Based on the results of data analysis, the average pretest score for students was in the low category, namely 43.27. This indicates that most students do not yet have an optimal understanding of the science material to be studied.

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These low pretest scores could be due to several factors, including a lack of student engagement in prior learning, the use of less varied learning methods, and the minimal use of engaging and interactive learning media. Teacher-centered learning tends to make students passive and less motivated to understand the material in depth. Furthermore, the nature of science subjects, which integrate abstract concepts, also presents a challenge for elementary school students in understanding the material .

Table 4. Comparison of Students' Pretest and Posttest Results

No	Category	Average value	Information
1	Pretest	43.27	Low
2	Posttest	70.86	High enough
3	Difference in Value	27.59	Increase
4	Significance	0.001	Significant (<0.05)
5	Effect Size	1.98	Very large

After being treated with *the Teams Games Tournament learning model* supported by Quizizz, there was a significant improvement in student learning outcomes. This was evident in the average posttest score, which rose to 70.86, a relatively high score. This improvement indicates a positive change in students' understanding of the science material after participating in the learning process with a more innovative and interactive model.

These improvements in learning outcomes are inseparable from the characteristics of the TGT learning model, which emphasizes group collaboration, healthy competition, and active student involvement in the learning process. In this model, students not only act as recipients of information but also as active participants in discussions, games, and academic tournaments. This aligns with the concept of cooperative learning, which can improve student motivation and learning outcomes through social interaction and group collaboration.

Furthermore, using the Quizizz app as a learning tool also significantly contributes to improving student learning outcomes. Quizizz allows students to learn through interactive quizzes presented in a game-like format, creating a fun and engaging learning environment. Features such as live scoring, rankings, and engaging visuals can boost student motivation to learn and compete in a healthy manner.

Furthermore, the improvement in learning outcomes from pretest to posttest indicates that the learning process has helped students better understand science concepts. Technology-based learning provides a more concrete and contextual learning experience, making it easier for students to grasp the material. Furthermore, game-based learning can also improve students' memory because it simultaneously engages both emotional and cognitive aspects.

This learning model not only impacts cognitive aspects but also affects students' affective and social aspects. Students become more active in asking questions, discussing, and participating in group activities. This demonstrates that learning involving social interaction, such as in the TGT model, can improve students' communication and collaboration skills.

Thus, it can be concluded that there was a significant improvement between students' pretest and posttest results after implementing the TGT learning model assisted by Quizizz. This model has proven effective in improving fourth-grade students' science learning outcomes and can be used as an alternative, innovative learning strategy in elementary schools

3.2 Analysis of Improvement in Student Learning Outcomes After Implementing *the Teams Games Tournament Learning Model* Assisted *by Quizizz*

An analysis of student learning outcomes after implementing the *Teams Games Tournament learning model* with the Quizizz application showed significant changes in students' cognitive abilities in science learning. This improvement can be seen from the difference in the average pretest


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and posttest scores, which experienced a significant increase, namely from 43.27 to 70.86. This difference indicates an increase in students' understanding of the material they have learned after being treated using an innovative and interactive learning model.

Improved student learning outcomes are inseparable from the characteristics of *the Teams Games Tournament learning model* , which emphasizes group learning activities, healthy competition, and active student involvement in the learning process. This model provides opportunities for students to exchange information, discuss, and test their understanding through tournament activities. These activities can increase student motivation due to the positive elements of play and competition (Sa'diyyah, Rahayu, and Dahlani, 2024).

Table 5. Analysis of Improvement in Student Learning Outcomes

No	Indicator	Mark	Information
1	Pretest Average	43.27	Low
2	Posttest Average	70.86	High enough
3	Difference in Improvement	27.59	Significant Increase
4	Significance (Sig.)	0.001	Significant (<0.05)
5	Effect Size	1.98	Very large

After being treated with *the Teams Games Tournament learning model* supported by Quizizz, there was a significant improvement in student learning outcomes. This was evident in the average posttest score, which rose to 70.86, a relatively high score. This improvement indicates a positive change in students' understanding of the science material after participating in the learning process with a more innovative and interactive model.

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Furthermore, using the Quizizz app as a learning tool also significantly contributes to improving student learning outcomes. Quizizz allows students to learn through interactive quizzes presented in a game-like format, creating a fun and engaging learning environment. Features such as live scoring, rankings, and engaging visuals can boost student motivation to learn and compete in a healthy manner.

Furthermore, the improvement in learning outcomes from pretest to posttest indicates that the learning process has helped students better understand science concepts. Technology-based learning provides a more concrete and contextual learning experience, making it easier for students to grasp the material. Furthermore, game-based learning can also improve students' memory because it simultaneously engages both emotional and cognitive aspects.

This learning model not only impacts cognitive aspects but also affects students' affective and social aspects. Students become more active in asking questions, discussing, and participating in group activities. This demonstrates that learning involving social interaction, such as in the TGT model, can improve students' communication and collaboration skills.

Thus, it can be concluded that there was a significant improvement between students' pretest and posttest results after implementing the TGT learning model assisted by Quizizz. This model has proven effective in improving fourth-grade students' science learning outcomes and can be used as an alternative, innovative learning strategy in elementary schools.

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3.3 Analysis of Improvement in Student Learning Outcomes After Implementing *the Teams Games Tournament Learning Model* Assisted *by Quizizz*

An analysis of student learning outcomes after implementing the *Teams Games Tournament learning model* with the Quizizz application showed significant changes in students' cognitive abilities in science learning. This improvement can be seen from the difference in the average pretest and posttest scores, which experienced a significant increase, namely from 43.27 to 70.86. This difference indicates an increase in students' understanding of the material they have learned after being treated using an innovative and interactive learning model.

Improved student learning outcomes are inseparable from the characteristics of *the Teams Games Tournament learning model* , which emphasizes group learning activities, healthy competition, and active student involvement in the learning process. This model provides opportunities for students to exchange information, discuss, and test their understanding through tournament activities. These activities can increase student motivation due to the positive elements of play and competition (Sa'diyyah, Rahayu, and Dahlani, 2024).

Table 6. Analysis of Improvement in Student Learning Outcomes

No	Indicator	Mark	Information
1	Pretest Average	43.27	Low
2	Posttest Average	70.86	High enough
3	Difference in Improvement	27.59	Significant Increase
4	Significance (Sig.)	0.001	Significant (<0.05)
5	Effect Size	1.98	Very large

In addition to learning models, the use of Quizizz as a learning medium also significantly contributes to improving learning outcomes. Quizizz offers interactive and fun game-based learning, thereby increasing student attention and engagement during the learning process. Features such as automatic scoring, leaderboards, and engaging visual displays further motivate students to achieve optimal learning outcomes (Aditiyawarman, Sondang, Hanifah, and Kusumayati, 2022).

Improved learning outcomes can also be analyzed from the ongoing learning process. During the implementation of *the Teams Games Tournament learning model* assisted by Quizizz, students demonstrated positive changes in learning behavior. They became more active in discussions, expressed their opinions, and were more confident in answering questions. Interaction between students in groups helped strengthen conceptual understanding due to the process of mutual explanation of the material (Gunarta, 2019).

From a learning theory perspective, this improvement aligns with the constructivist approach, where students construct knowledge through active and meaningful learning experiences. In this model, students not only receive information but also actively construct understanding through discussions and games. This has been proven effective in improving students' conceptual understanding and retention (Susilowati, 2023).

Furthermore, a variety of learning methods is also a crucial factor in improving learning outcomes. Monotonous learning tends to demotivate students, while interactive and varied learning can increase student interest (Salsabila, Habiba, Amanah, Istiqomah, and Difany, 2020). The combination of *the Teams Games Tournament model* and Quizizz media creates a more engaging, enjoyable, and less boring learning environment.

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Improved learning outcomes were also observed evenly across almost all students, demonstrating that this learning model is able to accommodate a variety of learning styles. Quizizz supports visual learning styles, while the TGT model supports kinesthetic and social activities through group discussions and games. This makes learning more inclusive and effective for a variety of student characteristics (Natalia, Peterianus, and Saputri, 2024).

Furthermore, significant improvements in learning outcomes indicate that the learning objectives have been successfully achieved. Students are not only able to retain information but also to understand concepts more deeply. This is crucial in science learning, which emphasizes conceptual understanding and its application in everyday life (Agustina, Robandi, Rosmiati, and Maulana, 2022).

Thus, it can be concluded that the implementation of *the Teams Games Tournament learning model* assisted by Quizizz has a positive impact on improving student learning outcomes. This improvement is influenced by active student involvement, the use of engaging learning media, and the presence of social interaction in the learning process. Therefore, this model can be used as an effective alternative to improve the quality of science learning in elementary schools.

Overall, the results of this analysis reinforce the importance of innovation in learning to address low student learning outcomes. The use of appropriate learning models supported by interactive digital media can create more effective, enjoyable, and meaningful learning for students.

3.4 Testing Research Hypotheses Using *Paired Sample t-Test* to Determine Differences in Learning Outcomes

Hypothesis testing in this study was conducted to determine whether there was a significant difference between student learning outcomes before and after the implementation of *the Teams Games Tournament learning model* assisted by the Quizizz application. This test used the *Paired Sample t-Test statistical test* , which is an analytical technique for comparing two averages from the same group under different conditions, namely before and after treatment (Suprihatien, Rafiah, Iqtiran, Widyaningsih, and Risnita, 2024).

Before conducting the hypothesis test, a prerequisite analysis test, called a normality test, was first performed. This test aims to determine whether the pretest and posttest data are normally distributed. The test results showed that the data were normally distributed, thus meeting the requirements for a *paired sample t-test* . This is important because the t-test, as a parametric test, requires a normal distribution for the analysis results to be valid (Agus Nurmantio, 2023).

Table 7. Paired Sample t-Test Results

No	Indicator	Mark	Information
1	Pretest Average	43.27	Before treatment
2	Posttest Average	70.86	After treatment
3	Significance Value (Sig.)	0.001	< 0.05 (Significant)
4	Hypothesis Decision	Ha accepted	H0 is rejected
5	Interpretation	There is a significant difference	Effective

the Paired Sample t-Test calculation , a significance value (Sig.) of 0.001 was obtained, which is smaller than the significance level of 0.05. Thus, it can be concluded that there is a significant difference between student learning outcomes before and after the implementation of the learning model. This means that the alternative hypothesis (Ha) is accepted, while the null hypothesis (H0) is rejected.


JURNAL
Pendidikan Dasar dan Keguruan
Volume 11, No. 1, 2026
P-ISSN: 2527-578X
E-ISSN: 2715-2818
Homepage: https://journal.uiad.ac.id/index.php/JPDK/index

These results demonstrate that the implementation of the learning model has a significant impact on improving student learning outcomes. The significant difference between pretest and posttest scores indicates that the learning process has improved students' understanding of the science and science material. This aligns with research showing that the use of innovative and interactive learning models can significantly improve student learning outcomes (Sa'diyyah, Rahayu, and Dahlani, 2024).

This success also demonstrates that learning that actively involves students, such as in *the Teams Games Tournament model* , is more effective than conventional learning. In this model, students not only receive information but also directly participate in discussions, games, and competitions, thereby increasing learning motivation and strengthening conceptual understanding (Gunarta, 2019).

The use of the Quizizz app as a learning tool also contributed to the results of the hypothesis test. Quizizz creates an interactive and enjoyable learning environment and provides immediate feedback through its evaluation feature. This helps students identify errors and quickly improve their understanding (Aditiyawarman, Sondang, Hanifah, and Kusumayati, 2022).

From a theoretical perspective, these results can be explained through a constructivist approach, which emphasizes that knowledge is actively constructed by students through learning experiences. In the implementation of *the Teams Games Tournament model* with the help of Quizizz, students are actively involved in the learning process, enabling them to construct their own understanding (Susilowati, 2023).

Furthermore, the integration of cooperative learning models and digital media has proven to be an effective strategy in improving learning quality. The combination of social interaction and technology creates a more engaging and meaningful learning experience for students (Salsabila, Habiba, Amanah, Istiqomah, and Difany, 2020).

Thus, the results of the hypothesis testing using *the Paired Sample t-Test* provide empirical evidence that there is a significant difference between student learning outcomes before and after treatment. This indicates that *the Teams Games Tournament learning model* assisted by Quizizz is effective in improving elementary school students' science learning outcomes.

Overall, this hypothesis test confirms that innovation in learning through cooperative learning models and digital media support is crucial for improving student learning outcomes. Therefore, this learning model can be used as an effective alternative for science teaching in elementary schools.

3.5 Analysis of the Effect *Size* of the Application of Learning Models on Student Learning Outcomes

The effect size analysis in this study was conducted to determine the strength of the impact of *the Teams Games Tournament learning model* supported by the *Quizizz application* on student learning outcomes. Unlike hypothesis testing, which only indicates the presence or absence of a significant difference, *the effect size calculation* provides information on the strength of the influence of the given treatment. Therefore, effect size analysis is important in educational research to more deeply understand the effectiveness of a learning model (Suprihatien, Rafiah, Iqtiran, Widyaningsih, and Risnita, 2024).

Based on the calculation results, an effect size value of 1.98 was obtained. This value is included in the very large category, indicating that the implementation of the learning model used in the study has a very strong influence on improving student learning outcomes. This interpretation is based on the effect size criteria, where values above 0.8 are categorized as a large influence. Thus, a value of 1.98 indicates that the applied learning model not only provides a statistically significant effect but also has a substantial impact on improving student learning outcomes.

The large *effect size* indicates that the changes in student learning outcomes were not small or coincidental, but rather the result of systematic treatment. The implementation of *the Teams Games Tournament learning model,* supported by *Quizizz,* created an active, interactive, and enjoyable


JURNAL
Pendidikan Dasar dan Keguruan
Volume 11, No. 1, 2026
P-ISSN: 2527-578X
E-ISSN: 2715-2818
Homepage: https://journal.uiad.ac.id/index.php/JPDK/index

learning environment, making it easier for students to understand the material. This aligns with the notion that learning that directly involves student activity can significantly improve learning effectiveness and learning outcomes (Susilowati, 2023).

The Teams Games Tournament learning model provides students with opportunities to learn through group collaboration and healthy competition. In this process, students learn not only from the teacher but also from their peers through discussion and social interaction. This learning process can improve conceptual understanding because students can explain and reinforce their knowledge to each other (Gunarta, 2019). Therefore, active student engagement in learning is a key factor contributing to the large effect size obtained.

Furthermore, the use of the *Quizizz app* as a learning tool also plays a crucial role in improving student learning outcomes. *Quizizz* provides an engaging and interactive game-based learning platform, further motivating students to learn. Features such as automatic scoring, rankings, and engaging visual displays challenge students to achieve their best. This can increase student engagement in learning, ultimately improving learning outcomes (Aditiyawarman, Sondang, Hanifah, and Kusumayati, 2022).

The large *effect size* also indicates that the applied learning model is able to accommodate various student learning styles. Students with visual learning styles can be helped by the attractive graphics displayed on *Quizizz* , while students with kinesthetic learning styles can be actively engaged through games and tournaments. Furthermore, students with auditory learning styles can also benefit from group discussions. Thus, this learning model is able to optimally reach various student characteristics (Natalia, Peterianus, and Saputri, 2024).

From a learning theory perspective, the magnitude of this influence can be explained through constructivism and social learning theory. In *constructivism,* students construct their own knowledge through active learning experiences. Meanwhile, in social learning theory, interaction between individuals is a crucial factor in the learning process. The implementation of *the Teams Games Tournament model* with *Quizizz* combines both approaches, resulting in more effective and meaningful learning (Sa'diyyah, Rahayu, and Dahlani, 2024).

Furthermore, the results of this *effect size analysis* also indicate that the use of technology-based learning media can significantly improve learning quality. Technology-supported learning can provide a more engaging and interactive learning experience, making it easier for students to understand the material being taught. This is supported by research showing that the use of digital media in learning can improve student learning outcomes and their engagement in the learning process (Salsabila, Habiba, Amanah, Istiqomah, and Difany, 2020).

Thus, the high effect size in this study indicates that the implementation of *the Teams Games Tournament learning model* assisted by *Quizizz* is highly effective in improving student learning outcomes. This significant impact is evident not only in improved grades but also in changes in student learning behavior, which leads to students becoming more active, motivated, and engaged in the learning process.

Overall, the effect *size analysis* provides a more comprehensive picture of the effectiveness of the implemented learning model. These results reinforce the finding that innovation in learning, particularly through the use of cooperative learning models supported by digital media, is an effective strategy for improving the quality of education. Therefore, *the Teams Games Tournament learning model* assisted by *Quizizz* can be recommended as an alternative learning model capable of significantly impacting student learning outcomes in elementary schools.

3.6 *Of the Teams Games Tournament* Learning Model Assisted by *Quizizz* in Improving the Science Learning Outcomes of Fourth Grade Students

The Teams Games Tournament learning model, supported by the *Quizizz* application, in improving fourth-grade students' science learning outcomes, shows that this model has a significant contribution to the learning process. This effectiveness is not only seen in terms of quantitative


JURNAL
Pendidikan Dasar dan Keguruan
Volume 11, No. 1, 2026
P-ISSN: 2527-578X
E-ISSN: 2715-2818
Homepage: https://journal.uiad.ac.id/index.php/JPDK/index

improvements in learning outcomes but also in the quality of the learning process that occurs in the classroom. This is evident in the improvement in student grades, active engagement in learning, and increased student motivation and interest in learning.

the Teams Games Tournament learning model provides a different learning experience compared to conventional learning methods. In this model, students are actively involved through group discussions, educational games, and academic tournaments. These activities create a more dynamic and enjoyable learning environment, so students don't feel burdened in understanding the learning material. Active student involvement in the learning process is one of the main factors influencing learning success, as students are not only recipients of information but also play an active role in constructing knowledge (Susilowati, 2023).

The effectiveness of this learning model is also supported by the use of *Quizizz* as a learning medium. *Quizizz* provides an interactive learning environment through engaging game-based quizzes. Students become more motivated to learn due to the competitive and challenging elements present in each learning activity. Furthermore, *Quizizz* provides direct feedback to students, allowing them to assess their level of understanding of the material being studied (Aditiyawarman, Sondang, Hanifah, and Kusumayati, 2022). This helps students correct errors and improve conceptual understanding more effectively.

The research results show a significant improvement in student learning outcomes after implementing this learning model. This demonstrates that *the Teams Games Tournament learning model* , supported by *Quizizz,* can enhance the effectiveness of science learning. This improvement is not only evident in the average grades but also in the equitable distribution of learning outcomes across all students. This demonstrates that this learning model is able to accommodate various student characteristics and abilities in learning.

Furthermore, the effectiveness of this learning model is also evident in the increased social interaction among students. During learning activities, students work collaboratively in groups to understand the material and complete assignments. This interaction allows students to exchange information, engage in discussions, and help each other understand difficult material. This process not only improves cognitive understanding but also develops students' social skills, such as cooperation, communication, and tolerance (Sa'diyyah, Rahayu, and Dahlani, 2024).

From a learning theory perspective, the effectiveness of this learning model can be explained through constructivism theory, which emphasizes that learning will be more meaningful when students are actively involved in the learning process. In *the Teams Games Tournament model,* students construct their knowledge through learning experiences involving physical and mental activity. This aligns with the notion that active and participatory learning can significantly improve student learning outcomes (Gunarta, 2019).

The use of technology-based learning media such as *Quizizz* also aligns with the demands of 21st-century learning, which emphasizes the use of technology in the learning process. Technology-supported learning not only increases student interest but also facilitates teachers' delivery and evaluation of learning. This demonstrates that integrating cooperative learning models and digital media is an appropriate strategy for improving learning quality (Salsabila, Habiba, Amanah, Istiqomah, and Difany, 2020).

In addition to improving learning outcomes, this learning model can also increase student motivation. Students become more enthusiastic about participating in learning due to the variety of methods and the use of engaging media. High learning motivation will have a positive impact on student learning outcomes, as students will be more enthusiastic about understanding the material and completing assigned tasks (Aisyah, 2025). Therefore, the improvement in learning outcomes is a result of increased student motivation and engagement in learning.

The effectiveness of this learning model also demonstrates the need for innovation in learning to address the challenges of conventional learning. Teachers need to develop learning strategies that foster an active, creative, and enjoyable learning environment. Implementing *the Teams Games*

JURNAL
Pendidikan Dasar dan Keguruan
Volume 11, No. 1, 2026
P-ISSN: 2527-578X
E-ISSN: 2715-2818
Homepage: https://journal.uiad.ac.id/index.php/JPDK/index

Tournament learning model , supported by *Quizizz,* is one innovation that can be implemented to improve the quality of science learning in elementary schools.

Overall, this discussion shows that *the Teams Games Tournament learning model* assisted by *Quizizz* is effective in improving fourth-grade students' science learning outcomes. This effectiveness is supported by various factors, including active student involvement, the use of engaging learning media, and the presence of social interaction in the learning process. Therefore, this learning model can be used as an appropriate alternative to improve the quality of learning in elementary schools, particularly in science subjects.

4 CONCLUSION

Based on the results of the research and discussion that has been carried out, it can be concluded that the application of *the Teams Games Tournament learning model* assisted by the *Quizizz application* had a significant impact on improving the science learning outcomes of fourth-grade students. This was demonstrated by the significant difference between the pretest and posttest results, where the students' average scores increased from a low category to a higher category after being given the treatment.

The results of the hypothesis testing using the *Paired Sample t-Test* showed a significance value of 0.001, which is smaller than 0.05. Therefore, it can be concluded that there is a significant influence of the implementation of the learning model on student learning outcomes. Furthermore, the effect size analysis results of 1.98 indicate that the influence provided is in the very large category, so the learning model used is proven to be very effective.

Improved student learning outcomes are inseparable from the characteristics of *the Teams Games Tournament learning model* , which emphasizes group collaboration, healthy competition, and active student involvement in the learning process. The support of *Quizizz media* also plays a crucial role in creating an interactive, enjoyable learning environment and motivating students to learn more actively. This combination of cooperative learning models and digital media can improve student conceptual understanding, engagement, and motivation.

Thus, *the Teams Games Tournament learning model,* supported by *Quizizz,* can be used as an effective alternative learning strategy to improve science learning outcomes in elementary schools. Implementing this model is expected to help teachers create more innovative, engaging learning that is tailored to the needs and characteristics of students in today's technologically advanced era.

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