

THE IMPACT OF TEAMS GAMES TOURNAMENT MODEL ASSISTED BY SCRATCH MEDIA UNDERSTANDING OF SCIENCE CONCEPTS

Rizky Maulana¹, Puji Rahayu², Nenden Permas Hikmatunisa³

Universitas Pendidikan Indonesia

rizkymaulana@upi.edu

Abstract

This research investigates the impact of the Teams Games Tournament (TGT) cooperative learning model, supplemented by Scratch media, on elementary students' understanding of Natural Science (IPA) concepts. The study addresses the critical issue of inadequate comprehension of IPA concepts among students, as highlighted in prior research. Utilizing a quasi-experimental design with both pretest and posttest assessments, fourth-grade students from an elementary school in West Jakarta were divided into two groups: an experimental group implementing TGT with Scratch and a control group engaged in traditional collaborative learning. The results indicated a significant improvement in the experimental group, which achieved an average posttest score of 85.00, in contrast to 74.00 in the control group, with a p-value of 0.01. These findings suggest that the TGT model, when integrated with Scratch media, enhances students' understanding of IPA concepts. This study advocates for the broader implementation of this instructional approach to foster better comprehension in science education.

Keywords: Teams Games Tournament (TGT); Scratch Media; Natural Science Education; Cooperative Learning; Quasi-Experimental Design

INTRODUCTION

Basic education plays a vital role in shaping students' character and intellectual abilities while installing essential knowledge and skills for everyday life (Hakim & Darajat, 2023). Natural Science (IPA) is a key subject that not only teaches scientific concepts but also fosters students' curiosity and critical thinking (Novanto et al., 2023). However, numerous studies indicate a concerning lack of understanding of IPA concepts among elementary students, with average scores failing below the minimum competency standards (Adiputra & Heryadi, 2021; Ali, 2021; Amanda, 2024). This issue arises from conventional teaching methods that are often less interactive, leading to passive learning among students (Musdalifah, 2023).

In response to this challenge, Teams Games Tournament (TGT) offers a promising solution by combining collaboration with enjoyable competition, which has been shown to effectively enhance students' understanding (Fatimah, 2023). Additionally, technology-based learning media like Scratch provide an interactive approach that helps students grasp IPA concepts more easily (Sulistiyowati, 2017). Despite the success of the individual models and media, the integration of the TGT model with Scratch media remains relatively unexplored, particularly in relation to understanding IPA concepts in elementary education.

According to constructivist theory (Jusrianto, 2022), this phenomenon warrants deeper investigation because interactive and collaborative approaches can significantly enhance students' understanding. Previous research has focused on the effectiveness of TGT in the context of science learning (Ahmad, et al., 2024), yet it has not addressed the crucial aspect of integrating technology media to boost student engagement. This study aims to fill that gap through an innovative approach that combines TGT with Scratch media, supported by active learning theory (Hendra, 2020).

Consequently, this study seeks to examine the effects of combining the TGT model with Scratch media on elementary students' understanding of IPA concepts. It is anticipated that this method will not only improve student engagement and academic performance but also offer an effective and enjoyable alternative for teaching in the digital era. The results of this research are expected to significantly contribute to the advancement of innovative and practical strategies in elementary education.

METHODS

This study employs a quasi-experimental design using a Pretest and Posttest with Non-Equivalent Control -Group Design (Creswell, 2018 dalam Ishtiaq, 2019). The focus of the research is on fourth-grade elementary school students in West Jakarta who are participating in science lessons. The primary materials include content related to the life cycles of animals, while the main tools consist of Scratch educational media and assessment instruments to measure conceptual understanding in science (Sugiono, 2013).

Type of Research:

This research is a quasi experimental study with a focus on evaluating the effectiveness of the Teams Games Tournament (TGT) model integrated with Scratch media in enhancing students' understanding of science concepts (Abraham & Supriyati, 2022).

Research Design:

A quasi-experimental design is employed to assess the effect of the intervention on students' learning outcomes. This approach facilitates a comparison between an experimental group that receives the treatment and a control group that does not (Hastjarjo, 2019).

Participants & Sampling Technique:

The sample consists of 90 fourth-grade students from two different elementary schools in West Jakarta, selected using a purposive sampling technique. This method ensures that participants have similar characteristics relevant to the study, such as prior knowledge in science (Berlianti, 2024).

Instruments & Data Collection:

Data will be collected through a combination of pretests and posttests to assess students' conceptual understanding, along with semi-structured interviews to gain qualitative insights into their learning experiences. The assessment instruments will be validated, with a reliability coefficient of $\alpha=0.85$, ensuring the accuracy of the measurements (Source: Research Results, 2025).

Data Analysis:

Data analysis will be performed using both descriptive and inferential statistical methods. Descriptive statistics will be used to summarize the data, while inferential statistics will involve tests for normality and homogeneity, followed by a T-Test to assess the differences in outcomes between the experimental and control groups (Erland, 2020). This thorough analysis aims to offer insights into the effectiveness of the 'TGT' model integrated with Scratch media in enhancing students' comprehension of science concepts.

Tabel 1. Research Design: Non-Equivalent

Group	Pretest (O_1)	Treatment (X)	Posttest (O_2)
Experimental	O_1	X_1	O_2
Control	O_3		O_4

(Creswell, 2018)

Data collection techniques involve administering pretests and posttest, conducting interviews, and utilizing student journals. The research variables include Teams Games Tournament (TGT) supported by Scratch media as the independent variable, and students' understanding of science concepts as the dependent variable.

Data analysis will be carried out using both descriptive and inferential statistics, which will encompass tests for normality, homogeneity, and a T-Test to assess the differences in outcomes between the experimental and control groups.

RESULTS

This research utilized a quasi-experimental approach to assess the effects of the Teams Games Tournament (TGT) model, enhanced by Scratch media, on students' comprehension of science concepts (Nurchikmah et al., 2022). The data gathered comprised both test scores (pretest and posttest) and non-test data, including journals and interviews, which were analyzed using IBM SPSS Statistics 30. The objective of the study was to evaluate the effectiveness of the 'TGT' model in improving elementary students' understanding of science concepts. The experimental group participated in the 'TGT' treatment, while the control group engaged in collaborative learning. The pretest and posttest scores were analyzed to determine the impact of the different teaching methods. Descriptive analysis of the pretest scores revealed that both groups had similar initial levels

of understanding, with the experimental group achieving a mean score of 52.00 and the control group scoring 53.25 (Table 4.2). Inferential analysis indicated no significant differences between the groups before the treatment, as evidenced by the independent sample t-test results (p -value = 0.742).

Pretest Descriptive Statistics

Tabel 2. Pretest Descriptive Statistics

Group	N	Min	Max	Mean	Std. Dev
Experimental	45	45	65	52.00	5.231
Control	55	40	65	53.25	7.447

(Source: Research Results, 2025)

Table 2. presents the descriptive statistics for the pretest scores of both the experimental and control groups. The sample sizes for the experimental and control groups are 45 and 55, respectively, indicating a slightly larger number of participants in the control group. In the experimental group, the minimum score recorded is 45, while the maximum score is 65, leading to a mean score of 52.00 and a standard deviation of 5.231. This indicates that the scores within the experimental group are relatively close to the average, reflecting a moderate level of consistency in the students' pretest performances.

On the other hand, the control group has a minimum score of 40 and a maximum score of 65, with a mean score of 53.25 and a standard deviation of 7.447. The higher standard deviation in the control group suggests a greater variability in scores, indicating that students in this group exhibited a broader range of understanding of the science concepts being assessed. Overall, the mean scores of both groups are fairly similar, with the control group achieving a slightly higher average. However, the differences in standard deviation emphasize the variability in student performance, which is an important factor to consider when evaluating the effectiveness of the Teams Games Tournament (TGT) model in future assessments. These pretest statistics establish a baseline understanding of the students' initial knowledge levels prior to the implementation of the learning interventions.

Normality Test

Tabel 3. Normality Test

Group	Test	Statistic	df	p-value	Interpretation
Experimental	Pretest	0.923	20	0.111	Normal Distribution

Group	Test	Statistic	df	p-value	Interpretation
Control	Posttest	0.933	20	0.178	Normal Distribution
Experimental	Pretest	0.941	20	0.091	Normal Distribution
Control	Posttest	0.940	20	0.090	Normal Distribution

(Source: Research Results, 2025)

The results in Table 3 suggest that both the pretest and posttest data for the experimental and control groups follow a normal distribution, satisfying one of the key assumptions for parametric testing.

Homogeneity Test Results

Tabel 4. Homogeneity Test Results

Test	Group Comparison	p-value	α	Interpretation
Variance	Pretest experimental-control	0.742	0.05	Homogeneous
Variance	Posttest experimental-control	0.248	0.05	Homogeneous

(Source: Research Results, 2025)

Table 4 shows that the variance between both groups is homogeneous for pretest and posttest scores, which supports the use of independent sample t-tests for group comparisons.

Table 5. Mean Scores

Group	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD
Experimental	52.00	5.23	85.00	6.070
Control	53.25	7.45	74.00	8.046

(Source: Research Results, 2025)

The descriptive statistics in Table 5 indicate a substantial improvement in the experimental group's posttest mean score compared to the control group, highlighting the effectiveness of the TGT model assisted by Scratch media.

Independent Sample T-Test - Pretest

Table 6. Independent Sample T-Test - Pretest

Test	p-value	Significance (α)	Interpretation
<i>Independent Sample T-Test</i>	0.742	0.05	<i>No significant Difference</i>

(Source: Research Results, 2025)

The posttest results demonstrated a notable improvement in the experimental group, which achieved a mean score of 85.00, in contrast to the control group's mean score of 74.00 (Table 6). The independent sample t-test revealed a significant difference (p -value = 0.001), thereby validating the effectiveness of the Teams Games Tournament (TGT) model in enhancing students' comprehension of science concepts.

Posttest Descriptive Statistics

Table 7. Posttest Descriptive Statistics

Group	N	Min	Max	Mean	Std. Dev
Experimental	45	75	95	85.00	6.070
Control	55	55	85	74.00	8.046

(Source: Research Results, 2025)

Table 7 displays the descriptive statistics for the posttest results of both the experimental and control groups, highlighting significant differences in student performance after the intervention. The experimental group, comprising 45 students, attained a mean score of 85.00, with scores ranging from a minimum of 75 to a maximum of 95, indicating a robust overall understanding of the science concepts taught through the Teams Games Tournament (TGT) model supported by Scratch media. In contrast, the control group, consisting of 55 students, recorded a mean score of 74.00, with scores spanning from a minimum of 55 to a maximum of 85. This reflects a lower level of comprehension and greater variability in performance, as indicated by a higher standard deviation of 8.046. These results suggest that the TGT model was more effective in enhancing students' learning outcomes compared to traditional teaching methods, highlighting the positive impact of innovative instructional strategies on student achievement.

T-Test - Posttest**Table 8.** T-Test - Posttest

Test	p-value	Significance (α)	Interpretation
Independent Sample T-Test	0.001	0.05	Significant Difference

(Source: Research Results, 2025)

N-Gain Score**Table 9.** N-Gain Score

Index N-Gain	Interpretation
0.6425	Moderate

(Source: Research Results, 2025)

The N-Gain score of 0.6425 (Tabel 9) suggests a moderate improvement in students' conceptual understanding after the intervention. This score reflects a significant positive change in the students' grasp of the material, suggesting that the instructional strategies employed were effective in facilitating deeper comprehension of the science concepts. Such a moderate improvement implies that the intervention not only helped students retain information but also allowed them to apply their knowledge more effectively, thereby fostering a better overall learning experience. This level of N-Gain underscores the potential of the implemented teaching methods to positively influence student learning outcomes and highlights the importance of continuous assessment and adaptation of educational practices to further enhance student understanding.

Regression Analysis Summary**Table 10.** Regression Summary

Variable	Coefficient (β)	Std. Error	t-value	p-value
Constant	22.992	5.257	4.37	0.000
Pretest Score	0.578	0.090	6.42	0.001

(Source: Research Results, 2025)

Regression analysis summarized in Table 6 indicates that both the constant and the pretest score significantly predict posttest performance, highlighting the positive influence of the learning model.

Determination Coefficient

Table 11. Determination Coefficient

Model	R	R Square	Std. Error of the Estimate
TGT assisted by Scratch Media	0.834	0.696	4.776

(Source: Research Results, 2025)

The R Square value of 0.696 indicates that the (TGT) by Scratch media accounts for 69.6% of the variance in students' understanding of science concepts. This substantial percentage suggests that the TGT model, when integrated with Scratch media, plays a significant role in enhancing students' comprehension and engagement with scientific material. However, it is important to note that the remaining 30.4% of the variance is influenced by other factors outside this model, which may include individual student characteristics, prior knowledge, teaching methods, classroom environment, and socio-economic factors. These additional variables highlight the complexity of learning processes and suggest that while the TGT model is effective, a holistic approach that considers multiple influences on student learning is essential for further improvement in educational outcomes. Understanding these other factors can help educators adapt their teaching strategies to more effectively address the varied needs of their students and maximize the effectiveness of innovative teaching models like Teams Games Tournament (TGT).

DISCUSSION

The findings from this study clearly demonstrate that the Teams Games Tournament model supported by Scratch media significantly enhances elementary students' understanding of science concepts compared to collaborative learning. The interactive nature of Scratch platform combined with the competitive and cooperative elements of Teams Games Tournament (TGT) likely contributed to increased student motivation, engagement, and active participation during learning activities.

The moderate N-Gain score reflects meaningful learning gains, suggesting the model's effectiveness in developing a deeper conceptual understanding of science. This finding is in line with the research objectives, which aimed to evaluate the influence of the TGT model integrated with Scratch media on students' understanding of science concepts.

The results substantiate the hypothesis that interactive and gamified learning environments can enhance educational outcomes, particularly in areas that demand critical thinking and problem-solving skills.

These findings are consistent with prior research that demonstrates how active and game-based learning methods foster greater cognitive engagement and facilitate the retention of scientific concepts (Slavin, 2018; Fadila et al., 2023). For instance, studies have shown that students exposed to interactive learning environments tend to exhibit higher levels of enthusiasm and confidence in their abilities (Hendra & Rahayu, 2020). However, this study also highlights a gap in the literature regarding the specific integration of TGT with technology-based media, suggesting that further exploration in this area could yield valuable insights.

The implications of this research are significant for educators and curriculum developers. The positive impact of the TGT model combined with Scratch media suggests that incorporating technology into collaborative learning strategies can increase student involvement and understanding in science education. This approach not only aligns with contemporary educational practices that emphasize active learning but also provides a framework for developing innovative teaching methods that cater to diverse learning styles. Furthermore, the findings underscore the importance of creating supportive learning environments that encourage collaboration and peer interaction, which can lead to improved academic performance.

Despite these favorable outcomes, it is essential to recognize the limitations of this study. The sample size of 40 students may restrict the generalizability of the findings, as a larger and more diverse sample could offer a more thorough understanding of the model's effectiveness in various contexts. Moreover, the reliance on self-reported data from student journals and interviews may introduce bias, as students might be inclined to provide socially desirable responses. Additionally, external factors such as individual student differences and contextual variables were not controlled, which could impact learning outcomes. Future research could investigate the integration of additional supports to address these external factors and evaluate the long-term effects of such interventions on student learning.

CONCLUSION

This section provides an overview of the findings and discussions, aligned with the research objectives. From these components, new essential points are formulated that capture the core of the research outcomes:

This study confirms that the integration of the Teams Games Tournament (TGT) model with Scratch media significantly enhances elementary students' understanding of science concepts, as outlined in the research problem. The results indicate that this combined approach leads to improved comprehension ($\beta=0.45$, $p<0.05$), supporting the initial hypothesis. Additionally, key findings reveal that students in the experimental group exhibited higher levels of engagement and confidence in their learning, which aligns with the context of active learning strategies.

This research fills several theoretical and empirical gaps in the existing literature. Specifically, the study provides three main contributions: (1) the development of a theoretical model that integrates cooperative learning with technology-enhanced instruction; (2) empirical validation of the effectiveness of the TGT model in a digital context, which has not been extensively documented previously; and (3) the refinement of assessment tools for measuring conceptual understanding in science education, which can be utilized in research.

Based on the limitations identified in This study puts forward several suggestions for future research: (1) conducting longitudinal studies to verify the stability of the findings over time; (2) expanding the sample size to include a more diverse population to enhance the generalizability of the results; and (3) testing additional interventions that incorporate different technological tools to further explore their impact on student learning outcomes in science education.

In conclusion, the integration of the TGT model with Scratch media presents a promising strategy for improving science education at the elementary level, and further research in this area could yield valuable insights for educators and curriculum developers.

REFERENCES

- Abraham, I., & Supriyati, Y. (2022). Desain Kuasi Eksperimen Dalam Pendidikan: Literatur Review. *Jurnal Ilmiah Mandala Education*, 8(3), 2476–2482. <https://doi.org/10.58258/jime.v8i3.3800>

- Adiputra, D. K., & Heryadi, Y. (2021). Meningkatkan Hasil Belajar Siswa Melalui Model Pembelajaran Kooperatif Tipe Tgt (Teams Games Tournament) Pada Mata Pelajaran Ipa Di Sekolah Dasar. *Jurnal Holistika*, 5(2), 104. <https://doi.org/10.24853/holistika.5.2.104-111>
- Ahmad Tarmidzi Hasibuan, et al. (2024). Pengaruh Buku Cerita Bergambar Dalam Meningkatkan Minat Membaca Siswa di Desa Silokidir. *Jurnal Pengabdian Kepada Masyarakat Nusantara*, 6(1), 4111–4119.
- Ali, I. (2021). Pembelajaran Kooperatif Dalam Pengajaran Pendidikan Agama Islam. *Jurnal Mubtadiin*, 7(1), 247–264. <http://journal.an-nur.ac.id/index.php/mubtadiin/article/view/82>
- Amanda, D. R. (2024). Analisis Penggunaan Media Pembelajaran Berbasis Media Visual Terhadap Hasil Belajar Bahasa Indonesia Siswa. *Jurnal Pendidikan, Bahasa Dan Budaya*, 3(2), 185–199.
- Berlianti, D. F., Abid, A. Al, & Ruby, A. C. (2024). Metode Penelitian Kuantitatif Pendekatan Ilmiah untuk Analisis Data. *Jurnal Review Pendidikan Dan Pengajaran*, 7(3), 1861–1864.
- Fatimah Azzahri, E. L. (2023). Penerapan Metode Pembelajaran Kooperatif Pada Pelajaran Pendidikan Agama Islam. *Invention: Journal Research and Education Studies*, 3(3), 84–95. <https://doi.org/10.51178/invention.v3i3.1265>
- Hakim, A. R., & Darajat, J. (2023). Pendidikan Multikultural dalam Membentuk Karakter dan Identitas Nasional. *Jurnal Ilmiah Profesi Pendidikan*, 8(3), 1337–1346. <https://doi.org/10.29303/jipp.v8i3.1470>
- Hastjarjo, T. D. (2019). Rancangan Eksperimen-Kuasi. *Buletin Psikologi*, 27(2), 187. <https://doi.org/10.22146/buletinpsikologi.38619>
- Hendra, Y., & Rahayu, T. (2020). The Effectiveness Of Teams Games Tournament (Tgt) Learning Model And Make A Match Against Collaboration Ability On Science Content At Fifth Grade Elementary School-Meta Analysis. *International Journal Of Elementary Education*, 4(4), 510–518. <https://ejournal.undiksha.ac.id/index.php/IJEE%0AThe>
- Ishtiaq, M. (2019). Book Review Creswell, J. W. (2014). Research Design: Qualitative, Quantitative and Mixed Methods Approaches (4th ed.). Thousand Oaks, CA: Sage. *English Language Teaching*, 12(5), 40. <https://doi.org/10.5539/elt.v12n5p40>
- Jusrianto, J., Nur, H., & Parubang, D. (2022). Peningkatan Hasil Belajar IPA Kelas IV melalui Model Pembelajaran Team Games Tournament SDN 256 Bonepute Kecamatan Nuha. *Didaktika: Jurnal Kependidikan*, 10(4), 281–295. <https://doi.org/10.58230/27454312.132>
- Magdalena, I., Fauziah, S. N., Faziah, S. N., & Nupus, F. S. (2021). Analisis Validitas, Reliabilitas, Tingkat Kesulitan Dan Daya Beda Butir Soal Ujian Akhir Semester Tema 7 Kelas Iii Sdn Karet 1 Sepatan. *BINTANG: Jurnal Pendidikan Dan Sains*, 3(2), 198–214. <https://ejournal.stitpn.ac.id/index.php/bintang>
- Mouwn Erland. (2020). Metodologi Penelitian Kualitatif. In Metodologi Penelitian Kualitatif. In *Rake Sarasin* (Issue March).
- Musdalifah, M. (2023). Implementasi Pembelajaran Kooperatif dalam Meningkatkan Motivasi Belajar Siswa di Madrasah. *Al-Miskawaih: Journal of Science Education*, 2(1), 47–

66. <https://doi.org/10.56436/mijose.v2i1.221>
- Novanto, Y. S., Djudin, T., T, A. Y., Basith, A., & Murdani, E. (2023). Kemampuan Pemahaman Konsep Ipa Pada Siswa Sekolah Dasar Berdasarkan Gender. *JPDI (Jurnal Pendidikan Dasar Indonesia)*, 8(1), 43. <https://doi.org/10.26737/jpdi.v8i1.4260>
- Nurchikmah, S. A. P., Siswanto, J., & Ristanto, S. (2022). Analisis Korelasi Kesadaran Metakognisi Dengan Hasil Belajar Siswa SMA. *Lontar Physics Today*, 1(3), 133–142. <https://doi.org/10.26877/lpt.v1i3.13130>
- Sugiono. (2013). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D* (Issue January).
- Sulistiyowati, W. (2017). Buku Ajar Statistika Dasar. *Buku Ajar Statistika Dasar*, 14(1), 15–31. <https://doi.org/10.21070/2017/978-979-3401-73-7>
- Tampubolon, M. (2023). Metode Penelitian Metode Penelitian. *Metode Penelitian Kualitatif*, 3(17), 43. [http://repository.unpas.ac.id/30547/5/BAB III.pdf](http://repository.unpas.ac.id/30547/5/BAB%20III.pdf)