

THE INTEGRATION OF WORDWALL GAMIFICATION WITHIN THE TEAM GAMES TOURNAMENT MODEL: ITS IMPACT ON ELEMENTARY STUDENTS' MATHEMATICS LEARNING OUTCOMES

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ABSTRACT

This study aims to examine the effect of integrating Wordwall-based gamification within the Team Games Tournament (TGT) learning model on elementary students' mathematics learning outcomes. The research was motivated by the low mathematics achievement of students, which is often associated with teacher-centered instructional practices and limited student engagement. A quantitative approach with a pre-experimental design, specifically the one-group pretest–posttest design, was employed in this study. The participants consisted of 30 fourth-grade students at SDN Grogol 2, Jombang Regency, selected using a saturated sampling technique. Data were collected through learning achievement tests administered before (pretest) and after (posttest) the implementation of the instructional treatment. The data were analyzed using descriptive statistics and inferential analysis, including the Shapiro–Wilk normality test and paired sample t-test. The results revealed a significant improvement in students' learning outcomes, as indicated by the increase in the mean score from 64.7 in the pretest to 81.46 in the posttest. In addition, the percentage of students achieving mastery learning increased from 13.33% to 90%. The hypothesis testing showed a significance value of 0.000 ($p < 0.05$), indicating a statistically significant difference between pretest and posttest results. These findings demonstrate that the integration of Wordwall gamification within the TGT model effectively enhances students' mathematics learning outcomes. This improvement is supported by increased student engagement, active participation, collaborative learning, and higher motivation fostered through game-based and interactive learning environments. In conclusion, the integration of Wordwall gamification within the Team Games Tournament model can be considered an effective and innovative instructional strategy to improve mathematics learning outcomes in elementary education

Keywords: Wordwall, gamification, team games tournament, mathematics learning outcomes, elementary education

A. Introduction

Mathematics learning outcomes at the elementary school level continue to constitute a critical issue

within the broader landscape of basic education in Indonesia. Despite ongoing curricular reforms and pedagogical innovations, empirical

evidence consistently indicates that students' achievement in mathematics remains relatively low compared to other subject areas. This phenomenon cannot be attributed solely to the inherent complexity of mathematical concepts; rather, it is closely associated with pedagogical practices that have yet to fully facilitate meaningful student engagement. In many classrooms, instructional processes are still dominated by teacher-centered approaches, where knowledge is transmitted in a unidirectional manner and students are positioned as passive recipients of information. Such conditions limit opportunities for learners to actively participate in constructing their understanding, ultimately affecting their learning outcomes (Kamila et al., 2024).

The issue of low mathematics achievement is further compounded by the lack of active student involvement during the learning process. From a pedagogical perspective, meaningful learning occurs when students are cognitively, emotionally, and behaviorally engaged in instructional activities. However, classroom observations frequently reveal that students tend to

rely heavily on teacher explanations without engaging in deeper processes such as questioning, exploring, or problem-solving. This passive mode of learning inhibits the development of conceptual understanding, particularly in mathematical topics that require higher-order thinking skills. Consequently, students often struggle to internalize fundamental concepts, resulting in superficial learning that is easily forgotten and difficult to apply in different contexts.

In the specific context of elementary mathematics instruction, conceptual understanding plays a vital role in determining students' academic success. Topics such as division operations, for instance, require more than procedural knowledge; they demand a solid grasp of underlying concepts and relationships between numbers. However, when instructional practices fail to provide opportunities for exploration and active engagement, students are more likely to experience difficulties in mastering such concepts. This challenge is further exacerbated by the limited use of varied instructional models and learning media that can effectively capture students' interest and attention. As highlighted in previous

research, the lack of diversity in teaching strategies and instructional tools contributes significantly to students' low learning outcomes (Fitria et al., 2024).

Addressing these challenges necessitates the adoption of innovative and student-centered instructional approaches that promote active participation and collaborative learning. One such approach is the cooperative learning model, particularly the Team Games Tournament (TGT) type. The TGT model is designed to foster collaboration among students while incorporating elements of games and academic competition. Through structured group activities, students are encouraged to work together, share knowledge, and support each other in achieving common learning goals. At the same time, the inclusion of competitive elements in the form of tournaments adds an element of excitement and motivation, which can enhance students' engagement in the learning process.

The effectiveness of the TGT model lies in its ability to create a balanced learning environment that integrates cooperation and competition. Students not only learn

from the teacher but also from their peers, thereby promoting social interaction and collective problem-solving. Furthermore, the use of games within the TGT framework transforms the learning experience into an enjoyable and meaningful activity. Empirical studies have demonstrated that the implementation of TGT significantly improves students' learning outcomes, particularly in mathematics. In comparison to conventional teaching methods, TGT has been shown to produce higher levels of student achievement, with a substantial effect size indicating its strong impact on learning (Wulandari et al., 2025).

In parallel with the growing emphasis on student-centered learning, the integration of digital technology into educational practices has become increasingly important. Digital tools offer new possibilities for enhancing the quality of instruction by providing interactive and engaging learning experiences. One such tool is Wordwall, a web-based platform that enables educators to create and customize various types of educational games. These include interactive quizzes, matching exercises, and puzzle-based activities

that can be tailored to specific learning objectives. The flexibility and accessibility of Wordwall make it a valuable resource for supporting innovative teaching practices in the classroom.

The use of Wordwall in instructional settings has been shown to positively influence student engagement and motivation. By incorporating elements of play into the learning process, Wordwall creates a dynamic and interactive environment that encourages active participation. Students are more likely to engage with the material when it is presented in a format that is both enjoyable and challenging. Moreover, the immediate feedback provided by digital platforms such as Wordwall allows students to monitor their progress and identify areas for improvement. Research findings indicate that the integration of Wordwall into game-based learning significantly enhances students' involvement and contributes to a more positive learning experience (Aguilera et al., 2024).

The concept of gamification provides a theoretical framework for understanding the effectiveness of tools like Wordwall in educational contexts. Gamification involves the

application of game design elements—such as points, levels, challenges, and rewards—into non-game environments to increase motivation and engagement. In education, gamification has been widely recognized as an effective strategy for creating immersive and enjoyable learning experiences. By introducing game-like elements into instructional activities, educators can foster a sense of challenge and achievement that motivates students to actively participate in the learning process. Additionally, gamification has been linked to the development of flow experience, a psychological state characterized by deep concentration and intrinsic enjoyment during task engagement (Oliveira et al., 2021).

In the context of mathematics education, the integration of gamification offers a promising approach to addressing students' negative perceptions of the subject. Mathematics is often perceived as difficult, abstract, and monotonous, which can lead to low motivation and disengagement. By incorporating gamified elements into instruction, educators can transform mathematics learning into an activity that is both stimulating and enjoyable. This shift in

perception is crucial for fostering a positive attitude toward mathematics and encouraging sustained engagement in learning.

The integration of the TGT cooperative learning model with Wordwall-based gamification represents a novel and potentially impactful instructional approach. This combination leverages the strengths of both strategies by promoting collaboration, competition, and interactive digital engagement. Within this integrated framework, students participate in group-based learning activities while also engaging in game-based tournaments facilitated through digital platforms. This multifaceted approach not only enhances cognitive engagement but also supports the development of social and technological skills.

Previous studies have provided empirical support for the effectiveness of combining TGT with digital game-based media such as Wordwall. Findings indicate that students who participate in TGT learning supported by Wordwall demonstrate significantly higher learning outcomes compared to those who experience conventional instruction. The integration of these approaches has been shown to create

a more engaging and effective learning environment, thereby contributing to improved academic performance (Wulandari et al., 2025; Wulandari et al., 2025). These results highlight the potential of gamification-based instructional models to enhance the quality of mathematics education.

Despite these promising findings, there remains a gap in the literature regarding the comprehensive examination of Wordwall-based gamification within the TGT framework, particularly at the elementary school level. Most existing studies tend to focus on either the cooperative learning model or the digital media component in isolation. As a result, there is limited understanding of how these two elements interact and contribute to learning outcomes when implemented simultaneously. This gap underscores the need for further research that explores the combined effects of TGT and gamification in a more integrated and systematic manner.

In response to this gap, the present study aims to analyze the impact of integrating Wordwall-based gamification into the Team Games Tournament learning model on elementary students' mathematics

learning outcomes. By examining this integration, the study seeks to provide both theoretical and practical contributions to the field of education. Theoretically, it aims to enrich the existing body of knowledge on gamification and cooperative learning by offering insights into their combined application. Practically, it is expected to provide educators with evidence-based guidance for designing more innovative, engaging, and effective mathematics instruction that aligns with the needs of contemporary learners.

B. Research methods

This study employed a quantitative approach grounded in the positivist paradigm, aiming to empirically examine the effect of integrating Wordwall gamification within the Team Games Tournament (TGT) learning model on elementary students' mathematics learning outcomes. A quantitative approach was selected as it enables objective measurement of variables through numerical data and systematic statistical analysis, allowing the findings to be generalized.

The research design used in this study was a pre-experimental design, specifically the one-group pretest–posttest design. This design allows the researcher to compare students' initial and final conditions after the implementation of the treatment. In this context, the initial measurement (pretest) was conducted prior to the intervention, followed by the implementation of the TGT model integrated with Wordwall gamification, and concluded with a final measurement (posttest). Through this design, changes in learning outcomes can be identified as a result of the applied instructional treatment, although no control group was involved.

The study was conducted at SDN Grogol 2, Jombang Regency, East Java, during the 2025/2026 academic year. The selection of this research site was based on preliminary observations indicating that mathematics instruction was still predominantly teacher-centered, resulting in low student engagement and suboptimal learning outcomes. Therefore, this context was considered appropriate for examining the effectiveness of innovative,

gamification-based instructional approaches.

The population of this study consisted of all fourth-grade students at SDN Grogol 2. The sampling technique employed was saturated sampling, in which all members of the population were included as research participants. Additionally, purposive considerations were applied to ensure that the selected class was relevant to the research objectives, particularly regarding the instructional material being studied. The total number of participants in this study was 30 students.

This study involved two main variables, namely the independent variable and the dependent variable. The independent variable was the integration of Wordwall gamification within the Team Games Tournament (TGT) model, which represents an instructional innovation combining cooperative learning, educational games, and academic competition supported by digital technology. The dependent variable was students' mathematics learning outcomes, particularly within the cognitive domain, focusing on division material.

Operationally, the integration of Wordwall gamification within the TGT

model was implemented through several instructional stages, including material presentation, group formation, game-based learning activities using the Wordwall platform, and academic tournaments among students. This approach was designed to enhance students' active participation, social interaction, and learning motivation by providing engaging and interactive learning experiences.

Meanwhile, mathematics learning outcomes were measured based on students' understanding of division concepts, accuracy in problem-solving, and improvement in scores from pretest to posttest.

The research instrument used in this study was a learning achievement test consisting of multiple-choice and essay questions. The test was designed to comprehensively measure students' cognitive abilities in accordance with the predetermined learning indicators. Prior to its implementation, the instrument was developed based on a test blueprint aligned with the basic competencies to ensure content relevance and validity.

Data were collected using test and documentation techniques. The test method was employed to obtain

quantitative data in the form of pretest and posttest scores. The pretest was administered before the treatment to identify students' initial abilities, while the posttest was conducted after the treatment to determine improvements in learning outcomes. Documentation was used as a supporting technique to collect additional data, including student records, learning activities, and evidence of the research implementation.

The collected data were analyzed using both descriptive and inferential statistical techniques. Descriptive analysis was used to describe the characteristics of the data, including mean scores, percentage of learning mastery, and score distribution. Learning mastery was determined based on the Minimum Completeness Criteria (KKM) of 75, with classical mastery achieved when at least 75% of students reached this criterion.

Prior to hypothesis testing, prerequisite analysis was conducted through a normality test to determine whether the data were normally distributed. The normality test was performed using the Shapiro–Wilk test with the assistance of SPSS software. If the data were normally distributed,

hypothesis testing was then conducted using a paired sample t-test to examine whether there was a significant difference between pretest and posttest scores. The decision-making criterion was based on the significance value, where a significance level of less than 0.05 indicated that the alternative hypothesis was accepted, meaning that the implementation of the instructional model had a significant effect on students' learning outcomes.

The research procedure was carried out in three main stages: preparation, implementation, and completion. The preparation stage included developing lesson plans, designing Wordwall-based learning media, and preparing research instruments. The implementation stage involved administering the pretest, conducting the learning process using the TGT model integrated with Wordwall gamification, and administering the posttest. The final stage included data analysis, interpretation of findings, and drawing conclusions.

C. Research Results and Discussion

The results of this study indicate that the integration of Wordwall gamification within the Team Games Tournament (TGT) model has a significant impact on elementary students' mathematics learning outcomes, particularly on division material. The findings are based on the comparison between pre-test and post-test scores obtained from 30 fourth-grade students.

Prior to the implementation of the treatment, a pre-test was conducted to measure students' initial abilities. The results showed that the average score was 64.7, which is below the Minimum Mastery Criterion (KKM) set at 75. Only 13.33% of students achieved mastery learning, while the majority, 86.67%, did not meet the expected standard. These findings indicate that students' initial understanding of division concepts was relatively low. This condition is in line with previous studies suggesting that low learning outcomes are often associated with conventional teaching methods that are less engaging and do not actively involve students in the learning process (Fitria et al., 2025).

Following the implementation of the TGT model integrated with Wordwall, a post-test was administered to measure students' final learning outcomes. The results revealed a substantial improvement, with the average score increasing to 81.46, exceeding the KKM. In addition, 90% of students successfully achieved mastery learning, while only 10% remained below the standard. This significant improvement demonstrates that the integration of gamification through Wordwall into the cooperative learning model effectively enhances students' understanding of mathematical concepts. These findings are supported by previous research which states that Wordwall-based gamification can significantly improve both student engagement and academic achievement (Panis et al., 2025).

Furthermore, the comparison between pre-test and post-test results shows a clear increase in students' performance, with a mean difference of 16.76 points. This improvement confirms that the applied learning model has a positive effect on students' learning outcomes. Similar results were reported by Munandar et al. (2025), who found that the

integration of TGT and Wordwall significantly improves students' learning outcomes, as evidenced by statistically significant results.

To strengthen these findings, hypothesis testing was conducted using the paired sample t-test. The analysis showed a significance value of 0.000, which is lower than the significance level of 0.05. This indicates that there is a statistically significant difference between students' pre-test and post-test scores. Therefore, the alternative hypothesis (H_a) is accepted, confirming that the integration of Wordwall gamification within the TGT model significantly affects students' mathematics learning outcomes. This result is consistent with previous findings which also reported a significant effect of TGT combined with Wordwall on students' academic performance (Ningsih et al., 2025).

The findings of this study clearly demonstrate that the integration of Wordwall gamification within the Team Games Tournament model contributes significantly to improving students' mathematics learning outcomes. The improvement can be observed not only in the increase of average scores but also in the

percentage of students achieving mastery learning.

Before the implementation of the treatment, students tended to show low engagement and limited understanding of division concepts. This condition may be attributed to the use of conventional teaching approaches that emphasize teacher-centered instruction, resulting in passive learning environments. As a consequence, students had fewer opportunities to actively construct their understanding, which led to lower learning outcomes.

However, after the implementation of the TGT model integrated with Wordwall, students showed a remarkable improvement in both engagement and performance. The TGT model encourages students to work collaboratively in teams and participate in academic games, fostering active involvement in the learning process. The integration of Wordwall as a gamification tool further enhances this process by providing interactive and visually engaging learning activities. This combination creates a more dynamic and enjoyable learning environment, allowing students to better understand

abstract mathematical concepts through concrete experiences.

The findings of this study demonstrate that the integration of Wordwall gamification within the Team Games Tournament (TGT) model has a significant impact on elementary students' mathematics learning outcomes, particularly in division material. This conclusion is supported by the substantial difference between pre-test and post-test results, as well as reinforced by theoretical perspectives in educational psychology and learning theory.

Prior to the implementation of the treatment, the pre-test results indicated that students' initial abilities were relatively low, with an average score below the Minimum Mastery Criterion (KKM). From a theoretical standpoint, this condition reflects limited cognitive engagement and insufficient conceptual understanding. According to Jean Piaget (1972), learning is an active process in which students construct knowledge through assimilation and accommodation. The low pre-test scores suggest that students had not yet developed adequate cognitive structures to understand division concepts, likely due to the lack of meaningful and

concrete learning experiences in prior instruction.

In addition, the dominance of teacher-centered approaches in conventional classrooms often results in passive learning environments. As explained by Robert E. Slavin (2018), passive instructional methods limit students' opportunities to actively process and internalize information, which ultimately leads to lower academic achievement. This is further supported by the cognitive theory proposed by Richard E. Mayer (2014), which emphasizes that meaningful learning occurs when students actively engage in selecting, organizing, and integrating information. Without the support of interactive and engaging media, students may struggle to process abstract mathematical concepts effectively.

However, after the implementation of the TGT model integrated with Wordwall gamification, a significant improvement in students' learning outcomes was observed. The post-test results showed that the average score increased substantially and exceeded the KKM, indicating that most students were able to achieve mastery learning. This improvement

can be explained through several theoretical perspectives.

From a constructivist viewpoint, the use of Wordwall provides interactive and concrete learning experiences that facilitate knowledge construction. Piaget (1972) argues that elementary school students are in the concrete operational stage, where they learn best through direct interaction with tangible and visual learning materials. The integration of Wordwall allows students to engage with mathematical concepts through interactive games and visual representations, thereby enhancing their conceptual understanding.

Moreover, the cooperative learning principles embedded in the TGT model also play a crucial role in improving learning outcomes. Slavin (2018) states that cooperative learning promotes academic achievement through peer interaction, discussion, and shared responsibility. In this study, students worked collaboratively in teams and participated in academic tournaments, which encouraged active participation and knowledge exchange. This social interaction not only enhanced understanding but also fostered a supportive learning

environment where students could learn from one another.

Another important factor contributing to the improvement is the role of motivation. According to Dale H. Schunk et al. (2014), motivation is a key determinant of learning success, as it influences students' effort, persistence, and engagement. The gamification elements integrated into Wordwall, such as points, challenges, and immediate feedback, create a more enjoyable and stimulating learning experience. As a result, students become more motivated to participate actively in the learning process, which ultimately leads to better learning outcomes.

Furthermore, from the perspective of multimedia learning theory, Mayer (2014) highlights that the combination of visual and interactive elements can enhance cognitive processing and reduce cognitive load. Wordwall, as a digital gamification tool, integrates visual stimuli, interactive tasks, and instant feedback, which support students in understanding abstract mathematical concepts more effectively. This explains why students were able to demonstrate better performance in the post-test compared to the pre-test.

The results of the paired sample t-test further confirm that the improvement in students' learning outcomes is statistically significant. This indicates that the integration of Wordwall gamification within the TGT model is not only pedagogically effective but also empirically supported. The findings of this study are consistent with previous research, which reported that the combination of cooperative learning models and gamification-based media significantly enhances students' engagement, motivation, and academic achievement.

Overall, the findings suggest that the effectiveness of this instructional approach lies in the integration of cognitive, social, and motivational aspects of learning. The use of interactive media supports cognitive development, the cooperative structure of TGT enhances social interaction, and the gamification elements increase motivation. This combination creates a comprehensive and meaningful learning experience that enables students to better understand and apply mathematical concepts.

Therefore, the integration of Wordwall gamification within the Team

Games Tournament model can be considered an effective and innovative instructional strategy for improving elementary students' mathematics learning outcomes. In addition to enhancing academic performance, this approach also fosters active learning, collaboration, and positive attitudes toward mathematics, which are essential for long-term learning success.

In addition, gamification elements embedded in Wordwall contribute to increasing students' motivation and interest in learning. The use of game-based activities makes learning more enjoyable and reduces students' anxiety toward mathematics. As a result, students become more enthusiastic and actively participate in solving problems. This finding is supported by Rambe and Nuh (2024), who stated that gamification significantly improves students' motivation and learning outcomes.

Moreover, the cooperative nature of the TGT model allows students to learn from their peers through discussion and teamwork. This interaction not only enhances understanding but also develops students' critical thinking and problem-

solving skills. Previous studies have also confirmed that the integration of cooperative learning models with digital media such as Wordwall can significantly improve students' academic achievement and engagement (Noviana et al., 2025).

Overall, the results of this study confirm that the integration of Wordwall gamification within the Team Games Tournament model is an effective instructional strategy for improving elementary students' mathematics learning outcomes. This approach not only enhances academic performance but also fosters active learning, motivation, and meaningful learning experiences.

D. Conclusions

This study concludes that the integration of Wordwall gamification within the Team Games Tournament (TGT) learning model has a significant and positive impact on elementary students' mathematics learning outcomes. The findings indicate a substantial improvement in students' performance, as evidenced by the increase in the average post-test scores compared to the pre-test results, as well as the significant rise

in the percentage of students achieving learning mastery.

The effectiveness of this instructional approach is supported by statistical analysis using the paired sample t-test, which confirms that the difference between pre-test and post-test scores is statistically significant ($p < 0.05$). This demonstrates that the applied learning model is not only pedagogically meaningful but also empirically validated.

The improvement in learning outcomes can be attributed to the synergistic integration of three key aspects: cognitive engagement, social interaction, and learning motivation. The TGT model facilitates collaborative learning and peer interaction, enabling students to actively construct their understanding through discussion and teamwork. Meanwhile, the incorporation of Wordwall gamification introduces interactive, game-based elements that enhance students' motivation, engagement, and enjoyment in learning mathematics.

Furthermore, the use of digital gamification tools such as Wordwall provides immediate feedback, visual stimulation, and interactive challenges that support students in understanding

abstract mathematical concepts more concretely. This aligns with constructivist learning principles, where knowledge is actively constructed through meaningful experiences.

In conclusion, the integration of Wordwall gamification within the TGT model can be considered an effective, innovative, and student-centered instructional strategy for improving mathematics learning outcomes in elementary education. This approach not only enhances academic achievement but also fosters active participation, collaboration, and positive attitudes toward learning mathematics.

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