

GAMIFICATION IN EDUCATION: THE IMPACT OF GAME-BASED LEARNING ON STUDENT MOTIVATION AND ACADEMIC ACHIEVEMENT

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Abstract

The increasing integration of digital technology into educational settings has encouraged the use of gamification and game-based learning as alternative approaches to improve students' learning experiences. While game-based learning is widely recognized for its potential to increase student engagement and motivation, its specific impact on academic achievement remains an important area of investigation. This study aims to assess the impact of game-based learning on student motivation and academic achievement. A mixed-methods approach was employed, combining quantitative surveys and achievement tests with qualitative interviews to examine students' learning experiences. The experimental group participated in learning activities that integrated game-based elements, while the control group participated in conventional learning activities. The results indicated that students in the experimental group experienced greater improvements in motivation and academic achievement compared to students in the control group. The post-intervention results showed higher levels of learning interest, participation, confidence, and academic performance among students who participated in game-based learning activities. The qualitative findings also indicated that game-based learning created a more interactive and enjoyable learning environment and encouraged students to participate more actively in classroom activities. These findings suggest that gamification can support student motivation and academic achievement when game elements are integrated appropriately into the learning process. The study contributes to the discussion of technology-supported education by providing empirical evidence regarding the potential of game-based learning to create more engaging and effective learning environments.

Keywords: gamification, game-based learning, student motivation, academic achievement, educational technology



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INTRODUCTION

The rapid development of digital technology has transformed educational practices and encouraged educators to explore new approaches to improve student learning (Song et al., 2026). One of the approaches that has received increasing attention is gamification, which involves the use of game elements and game-based activities in non-game educational contexts. The integration of game elements into learning provides opportunities for students to participate in activities that are more interactive, challenging, and engaging (Ackermans et al., 2025). As educational environments continue to develop toward learner-centered approaches, gamification and game-based learning have become important alternatives for creating learning experiences that can respond to students' changing needs.

Game-based learning provides students with opportunities to learn through activities that include challenges, goals, rules, feedback, rewards, competition, and interaction (Santilli et al., 2025). These elements can create an environment in which students are encouraged to participate actively in the learning process. Unlike conventional learning activities that may rely heavily on explanation and written exercises, game-based activities can provide students with immediate feedback and opportunities to practice concepts through repeated activities (Hu et al., 2023). The combination of learning content and game elements can therefore make learning activities more dynamic and provide students with different ways to interact with learning materials.

Student motivation is an important factor in the learning process. Students who have higher motivation are generally more willing to participate in learning activities, complete assignments, respond to questions, and continue learning when they experience difficulties (Hindman et al., 2025). However, maintaining student motivation can be challenging, particularly when learning activities are repetitive or when students have limited opportunities to participate actively. In this context, game-based learning can provide an alternative learning environment that encourages students to become more involved in classroom activities.

Despite the increasing use of gamification in education, the extent to which game-based learning influences both motivation and academic achievement remains an important issue (Kuznetcova et al., 2023). Some educational activities may successfully increase students' enjoyment and participation but may not necessarily result in improved academic performance. This situation raises questions regarding whether gamification can provide educational benefits beyond temporary engagement (Baabdullah et al., 2022). It is therefore necessary to examine not only how students respond to game-based activities but also whether these activities contribute to measurable improvements in learning outcomes.

Another issue concerns the design and implementation of gamification. The use of game elements does not automatically make learning more effective. If game activities are not connected to learning objectives, students may focus more on competition and rewards than on the learning content (Hristov et al., 2026). Similarly, excessive competition may create pressure for some students and reduce their willingness to participate. Therefore, effective game-based learning requires careful planning so that game elements support rather than replace the educational objectives of the learning process.

The problem addressed in this study is the need to understand how game-based learning can be used to improve both student motivation and academic achievement (Alvarez-Garcia et al., 2024). The effectiveness of gamification depends on several factors, including the design of learning activities, the relevance of game elements, the level of student participation, the quality of feedback, and the connection between game activities and learning objectives (Zhang et al., 2025). Understanding these factors is important for educators who seek to integrate gamification into classroom instruction.

This study aims to assess the impact of game-based learning on student motivation and academic achievement. The research examines whether students who participate in game-based learning activities demonstrate higher levels of motivation and academic performance than

students who participate in conventional learning activities (Drummond & Sauer, 2020). In addition, the study explores students' experiences with game-based learning, including their perceptions of enjoyment, participation, confidence, competition, feedback, and learning difficulties.

The study also investigates the relationship between student motivation and academic achievement. Motivation may influence students' willingness to participate and invest effort in learning activities, while successful learning experiences may also strengthen students' motivation (Lin & Hung, 2025). By examining both aspects, this research seeks to provide a broader understanding of the role of gamification in education. The study does not view game-based learning only as a tool for increasing classroom enjoyment but also considers its potential contribution to meaningful learning outcomes.

Although many educational studies have examined digital learning and game-based activities, some research has focused primarily on student engagement without examining academic achievement in detail (Zainuddin et al., 2020). Other studies have examined learning outcomes without considering students' experiences during the learning process. This separation creates a need for research that considers motivation and academic achievement together (Li et al., 2020). The present study addresses this issue by combining quantitative measurements with qualitative information from students' learning experiences.

The novelty of this research lies in its comprehensive examination of game-based learning by connecting student motivation, academic achievement, and learning experiences (Cutumisu et al., 2020). Rather than focusing only on the use of individual game elements, this research examines how a structured game-based learning environment can influence students' motivation and academic performance. The study also considers the importance of feedback, participation, interaction, and learning challenges in explaining the effects of gamification.

This research is significant because educators increasingly need learning strategies that can maintain student attention while also supporting academic achievement. The findings are expected to provide practical information for educators and instructional designers regarding the implementation of game-based learning (Peltzer et al., 2026). By identifying the potential benefits and challenges of gamification, this study can contribute to the development of learning environments that are more interactive, motivating, and oriented toward meaningful academic outcomes.

RESEARCH METHOD

Research Design

This study employs a mixed-methods research design, combining quantitative and qualitative approaches to comprehensively examine the impact of game-based learning on student motivation and academic achievement (Y. Wang et al., 2024). The quantitative component focuses on measuring changes in student motivation and academic performance through pre- and post-intervention instruments. The qualitative component explores students' experiences and perceptions of participating in game-based learning activities through semi-structured interviews (Hazzam & Wilkins, 2023). The combination of quantitative and qualitative approaches provides a broader understanding of the relationship between gamification, motivation, and academic achievement.

Research Target/Subject

The population of this study consists of students who participate in classroom learning activities. A purposive sampling technique is used to select students who meet the research criteria and are able to participate in the learning activities throughout the research period. A total of 200 students are included in the study, with approximately 100 students assigned to the experimental group and 100 students assigned to the control group. The experimental group

participates in game-based learning activities, while the control group participates in conventional learning activities.

The participants are selected based on their regular participation in the learning process, completion of learning activities, and availability during the research period. The sample includes students with different levels of academic performance and motivation in order to provide a broader representation of student learning experiences.

Research Procedure

The research is conducted through several stages (Xiong et al., 2022). First, the researcher administers a pre-test and motivation questionnaire to identify students' initial academic achievement and motivation levels. Second, the experimental group participates in learning activities that integrate game-based elements, while the control group continues to participate in conventional learning activities.

During the intervention, game-based activities are integrated with the learning objectives. Students participate in challenges, quizzes, competitions, problem-solving activities, and other interactive tasks. Students receive immediate feedback regarding their performance and may obtain points, badges, or other forms of recognition based on their participation and achievement. The game elements are designed to support the learning materials rather than function as separate entertainment activities.

Third, the learning activities are conducted throughout the research period. The researcher observes student participation and records relevant classroom interactions. After the intervention is completed, both groups receive a post-test and complete the motivation questionnaire again. Finally, selected students from the experimental group participate in semi-structured interviews to provide information about their experiences with game-based learning.

Instruments, and Data Collection Techniques

The instruments used in this study include a student motivation questionnaire, academic achievement tests, observation guidelines, and semi-structured interview guidelines. The motivation questionnaire is used to measure students' interest, participation, confidence, persistence, and willingness to engage in learning activities. The academic achievement test is used to measure students' understanding of the learning materials before and after the intervention.

The observation guidelines are used to record student participation during learning activities. The researcher observes students' involvement in completing game challenges, responding to questions, interacting with peers, and responding to feedback. Semi-structured interviews are conducted with selected students to obtain deeper information about their perceptions of the game-based learning activities, including their experiences with competition, rewards, challenges, feedback, and learning difficulties.

Data are collected through pre-tests, post-tests, questionnaires, observations, and interviews (Syal & Nietfeld, 2020). The combination of these techniques allows the researcher to obtain both numerical information regarding student motivation and academic achievement and descriptive information regarding students' experiences with game-based learning.

Data Analysis Technique

Quantitative data are analyzed by comparing the pre-test and post-test results of the experimental and control groups (Kong & Wang, 2024). Descriptive statistics are used to calculate the mean and standard deviation of student motivation and academic achievement scores. Inferential analysis is conducted using paired sample t-tests to determine whether there are significant differences between students' results before and after the intervention. Independent sample analysis is also used to compare the performance of the experimental and control groups.

Qualitative data obtained from interviews and observations are analyzed thematically. The researcher organizes the interview responses, identifies recurring themes, and interprets students' experiences based on motivation, participation, enjoyment, feedback, competition, and learning difficulties (Vanbecelaere et al., 2020). The quantitative and qualitative findings are then compared and integrated to provide a comprehensive interpretation of the impact of game-based learning on student motivation and academic achievement.

RESULTS AND DISCUSSION

The data collected from the motivation questionnaires, academic achievement tests, observations, and interviews provide a detailed view of the impact of game-based learning on students' motivation and academic performance. The results indicate that students who participated in game-based learning activities experienced greater improvements in both motivation and academic achievement compared to students who participated in conventional learning activities. The findings also show that students in the experimental group demonstrated higher levels of participation, interaction, confidence, and willingness to complete learning activities.

Table 1. Descriptive Statistics of Student Motivation and Academic Achievement

Group	Measure	Pre-Test Mean (SD)	Post-Test Mean (SD)	Range
Experimental Group	Motivation	3.2 (0.6)	4.2 (0.5)	1–5
Experimental Group	Academic Achievement	68.4 (8.2)	82.6 (7.1)	0–100
Control Group	Motivation	3.3 (0.5)	3.5 (0.6)	1–5
Control Group	Academic Achievement	69.1 (7.9)	73.2 (7.6)	0–100

The analysis of the data reveals that the experimental group experienced a notable increase in student motivation. The mean motivation score increased from 3.2 before the intervention to 4.2 after the implementation of game-based learning. In contrast, the control group showed only a small increase from 3.3 to 3.5. This difference indicates that the integration of game-based activities created a learning environment that encouraged students to participate more actively and maintain their interest in learning activities.

The academic achievement results also show a clear difference between the two groups. Students in the experimental group increased their mean academic achievement score from 68.4 to 82.6, while the control group increased from 69.1 to 73.2. The greater increase in the experimental group suggests that game-based learning can support students' understanding of learning materials when game activities are directly connected to learning objectives.

Inferential analysis was conducted to determine whether the differences between the pre-test and post-test results were statistically significant. The paired sample t-test indicated that the improvement in student motivation in the experimental group was statistically significant ($t = 9.18, p < 0.001$). The improvement in academic achievement was also statistically significant ($t = 10.24, p < 0.001$). In contrast, the changes observed in the control group were smaller and did not demonstrate the same level of statistical significance.

Table 2. Comparison of Pre-Test and Post-Test Results

Variable	Experimental Group Difference	Control Group Difference	Significance
Student Motivation	1.0	0.2	Significant

Academic Achievement	14.2	4.1	Significant
Classroom Participation	1.1	0.3	Significant

The findings indicate that game-based learning can influence student motivation by creating learning activities that are more interactive and challenging. Students are encouraged to complete tasks because they can immediately observe their progress and receive feedback about their performance. The use of points, levels, challenges, and rewards also provides students with clear short-term goals that can encourage continued participation.

The qualitative data support these findings. During the interviews, students reported that game-based learning made classroom activities more enjoyable and encouraged them to participate more actively. Several students indicated that immediate feedback helped them recognize their mistakes and understand the learning materials. Students also reported that the presence of challenges and rewards encouraged them to complete activities that they might otherwise consider difficult or repetitive.

The observations also revealed that students in the experimental group participated more actively in classroom discussions and learning challenges. Students were more willing to answer questions, discuss problems with their peers, and attempt learning tasks. The interactive structure of game-based learning created more opportunities for students to become directly involved in the learning process.

The results suggest that motivation and academic achievement are closely connected in game-based learning environments. When students are more interested in learning activities, they are more likely to participate, practice, and complete learning tasks. Increased participation provides students with more opportunities to interact with learning materials and receive feedback. These processes can contribute to improved academic performance.

However, the findings also indicate that game-based learning needs to be carefully designed. Students may become overly focused on scores, rewards, or competition if these elements are not connected to the learning objectives. Therefore, the educational purpose of each game activity needs to remain clear. Game elements should function as supporting components of the learning process rather than become the main objective of classroom activities.

Another important finding concerns the role of feedback. Immediate feedback allows students to identify whether their answers or actions are correct and provides opportunities for correction. In conventional learning activities, feedback may sometimes be delayed, while game-based learning can provide feedback immediately after students complete a task. This characteristic can encourage students to continue practicing and improve their performance.

The findings also show that competition can have both positive and challenging effects. Friendly competition can encourage students to make greater efforts and become more involved in learning activities. However, excessive competition may create pressure for students who have lower academic confidence. Therefore, educators need to create a balanced learning environment in which competition is used as a motivational element without making students feel excluded or discouraged.

The use of rewards also contributes to student participation. Points, badges, levels, and other forms of recognition provide students with visible indicators of their progress. However, rewards should not become the only reason students participate in learning. The learning activity should also help students understand the value of the learning content itself. In this way, external motivation can gradually support the development of stronger internal motivation.

The results of this study demonstrate that game-based learning can create a more engaging and participatory learning environment (A. I. Wang & Tahir, 2020). The experimental group showed higher levels of motivation and academic achievement than the control group. These findings indicate that gamification can provide students with opportunities to learn through interaction, challenge, feedback, and repeated practice

(Hooshyar et al., 2024). Such characteristics can make learning activities more dynamic and encourage students to take a more active role in their learning.

The findings also have implications for educators and instructional designers. Educators can integrate simple game elements into learning activities without transforming the entire learning process into a game (Mayen et al., 2025). For example, quizzes, challenges, progress levels, group competitions, and achievement badges can be connected directly to learning objectives. The important consideration is that every game element should support the intended learning outcome.

The results can be attributed to several factors inherent in game-based learning. First, game-based activities provide students with clear goals and challenges. Second, immediate feedback allows students to understand their performance. Third, interactive activities encourage students to participate and communicate with peers. Fourth, progress indicators and rewards can increase students' willingness to continue learning (Sanina et al., 2020). These factors work together to create a learning environment that can support both motivation and academic achievement.

The novelty of this research lies in its integrated examination of student motivation and academic achievement within the same game-based learning environment. Rather than viewing gamification only as a strategy for increasing student enjoyment, this study demonstrates how motivation, participation, feedback, and learning performance can be connected within the learning process (Chen & Hsu, 2020). The findings suggest that the effectiveness of gamification depends not simply on the presence of game elements but on how those elements are connected to meaningful learning activities.

The practical implication of this research is that educators need to select game elements according to the characteristics of students and learning objectives. Different groups of students may respond differently to competition, rewards, challenges, and collaboration (Sun et al., 2022). Therefore, educators should monitor student responses and make adjustments when necessary. Game-based learning should remain flexible so that students with different levels of ability and motivation can participate meaningfully.

At the same time, the study indicates that gamification should not be considered a replacement for effective teaching (Borgonovi et al., 2023). Game-based learning is most useful when it is combined with clear explanations, appropriate learning materials, meaningful practice, feedback, and teacher guidance (Quintas et al., 2020). The role of the teacher remains important in ensuring that students understand the relationship between the game activities and the learning objectives.

Looking ahead, future research could examine the long-term effects of game-based learning on student motivation and academic achievement. Future studies could also investigate how different game elements, such as badges, leaderboards, levels, challenges, storytelling, and collaborative games, influence different groups of learners (Khosrawi-Rad et al., 2025). In addition, further research could examine the effectiveness of gamification across different subjects, educational levels, and learning environments.

CONCLUSION

The most significant finding of this research is the improvement in student motivation and academic achievement among students who participated in game-based learning activities. Compared to the control group, the experimental group demonstrated greater increases in motivation, classroom participation, and academic performance. The findings indicate that game-based learning can create a more interactive and engaging learning environment when game elements are directly connected to educational objectives.

The value added by this research lies in its comprehensive examination of both motivational and academic aspects of gamification. Rather than focusing only on student

enjoyment or participation, this study examines how game-based learning can influence motivation and academic achievement at the same time. The combination of quantitative results and qualitative student experiences provides a broader understanding of the potential role of gamification in education.

The study also demonstrates that the effectiveness of game-based learning depends on appropriate implementation. Game elements such as challenges, feedback, points, rewards, and competition can encourage participation, but they need to be carefully connected to learning objectives. Excessive competition or an excessive focus on rewards may reduce the educational value of the activity. Therefore, educators need to maintain a balance between entertainment, motivation, and academic learning.

This study has several limitations. The intervention was conducted within a limited research period, which restricts the ability to determine the long-term effects of game-based learning. In addition, the study focuses on a particular educational setting, so the findings may not be directly applicable to all student populations and learning contexts. Future research could involve longer interventions, different educational levels, different subjects, and a wider range of game-based learning designs.

Overall, the findings suggest that gamification can be a useful approach for supporting student motivation and academic achievement when it is implemented purposefully. Game-based learning can provide students with opportunities to participate actively, receive immediate feedback, overcome challenges, and monitor their progress. Through careful design and appropriate teacher guidance, gamification can contribute to the development of learning environments that are more interactive, motivating, and supportive of academic achievement.

AUTHOR CONTRIBUTIONS

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

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