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Gamification in Education -A Student Engagement

Vanshika Nangia (MBA)Mittal School of Business, Lovely Professional University Jalandhar, Punjab

vanshikanangia01@gmail.com

Shanika Nangia (MBA) Mittal School of Business, Lovely Professional University Jalandhar, Punjab

shanikanangia01@gmail.com\

Subhash B(MBA) Mittal School of Business, Lovely Professional University Jalandhar, Punjab

subashnithis74@gmail.com

Dr. Kriti Bedi, Mittal School of Business, Lovely Professional University Jalandhar, Punjab

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Abstract

This research aims to explore how positive player and gaming environments induced through gamified experiences may positively impact learners' experiences in higher education through gamification; specifically through positive player and game-like environments created through gamified experiences will positively influence students' overall engagement in the formal educational process and academic performance. The impact of gamification on increasing student engagement (through elements such as point systems, badges, rankings, rewards, and challenges) is affirmed by this study through the use of secondary research and data from management student surveys conducted as part of this research. The findings indicate evidence of a significant increase in student academic engagement resulting from the application of gamified experiences; therefore, supporting the positive impact of interactive learning and classroom activities. As a result, this research confirms that using gamification in current-day colleges and universities can provide a major educational benefit to students by enhancing their overall levels of motivational factors used in their respective learning processes.

The extent to which gamification design influences students' engagement is also dependent on three factors. The first is the frequency of gamification use; the second is the variety of gamification used; and finally, the logic/effectiveness of using gamification in general. In a research study involving 500 international students from 8 different countries, results indicated that students were more engaged after incorporating gamification into their studies (30% Improvement in

engagement) and had better knowledge retention (25% improvement from gamification). Regression analyses revealed that the students who used gamification performed better than those who did not use gamification (β= 0.15 - 0.30).Behavioral .when using gamification, students display greater engagement than versus when they are not using gamification; this is also true of the frequency of use, diversification of use and logic of use between both). According to an analysis that was conducted on Kahoot, there was a 30% increase in the participants' physical activity and there were also 15-20% improvements in physical activity levels

Introduction

The education systems worldwide have evolved and developed to meet the needs and demands of the digital generation of learners who expect learning environments that are interactive and technology-driven. The traditional learning and teaching strategies that emphasize lectures and low student participation have not been effective in capturing the interest of learners. Gamification has emerged as a very innovative learning and teaching strategy that has effectively integrated game design elements into learning and teaching processes. It has been researched that gamification has a significant influence on behavioural participation and motivational levels of learners. However, the long-term influence of gamification on cognitive and emotional engagement has been a point of controversy and debate. Nevertheless, there has been a lack of research that aims to combine learning analytics with theoretical models of engagement to understand

the multidimensional influence of gamification on learners' engagement levels. This research aims to investigate the influence of gamification on behavioural, cognitive, and emotional engagement levels of learners from secondary and tertiary educational institutions. The Gamified Engagement Analytics Model (GEAM), which relates gamification design intensity with its measurable indicators, has been developed and implemented for the purpose of enhancing learning and teaching processes in modern education systems.

Key Objectives:

- Examine the impact of gamification features, such as points, badges, and leaderboards, on multidimensional engagement.
- Develop and validate the Gamified Engagement Analytics Model (GEAM) based on learning analytics from platforms such as Kahoot and Quizizz.
- Examine the long-term effects of gamification, going beyond the novelty effect, by comparing the effects of competitive and self-paced gamification logics.
- Provide guidelines for educators on how to utilize gamification.

Review of literature

Recent years have seen an increase in academic research into gamification, an innovative way to teach and learn that addresses the ongoing challenges faced by educators, including a lack of engagement from students, a decline in student motivation to learn and low levels of interaction with other students (in both face-to-face and online contexts). Generally speaking, gamification is thought of as the inclusion and use of game designs such as points, badges, leaderboards, rewards, levels, challenges, feedback mechanisms, and competition into education in non-gaming formats to create an engaging environment and more meaningful experiences for learners (Mishra & Kotecha, 2025; Allehaidan & Wan Zainon, 2025). With an increased preference among learners for interactive, technology-enhanced, and student-centered learning environments, gamification has developed into a strategic response to the changing nature of educational expectations. Multiple studies indicate that gamification positively impacts students' motivation to learn and how students behave and feel while learning. Additionally, gamification helps students develop a sense of intrinsic motivation to learn through making learning fun, motivating, and exciting; increasing creativity and curiosity (Paola, 2025; Jun & Lucas, 2025). Students who were exposed to gamified learning environments tended to have higher persistence, attention levels, and overall satisfaction with their learning experience than students who participated in traditional classroom settings. Some models (i.e., PBL, Octalysis) provide numbers, forms, and other criteria (i.e., structure) to understand how providing rewards and recognizing individual achievements encourage ongoing engagement and strong learning behaviors (Mishra & Kotecha, 2025). Theoretical frameworks are important for identifying and describing why gamification is effective in students' educational experiences. According to the Self-Determination Theory (SDT), gamification has the potential of being the most effective if it supports someone's basic needs for autonomy, competence, and relatedness. The SDT also states that gamification motivates users with autonomous motivation as opposed to only through extrinsically motivating the user with compliance with the system (Ortiz-Rojas, 2025). In a similar manner, the Theory of Gamified Instruction states that the system must properly align the elements of the game and the instructional goal for the learner to benefit from the gamified experience. Failure to do this may lead the user to be distracted as opposed to having the gamified experience help achieve learning outcomes. The Unified Theory of Acceptance and Use of Technology (UTAUT) also can generally be used to study the student willingness to adopt gamified systems. Therefore, perceived usefulness, ease of use, social influences, and institutional support are key factors when the implementation of a gamified system is successful (Allehaidan and Wan Zainon, 2025). The recent integration of emerging technologies into educational practices has also increased the impact of gamified learning across all types of education. Artificial intelligence-driven learning platforms provide adaptive learning pathways, personalized feedback, and real-time performance analytics that allow the instructor to develop instruction tailored to each learner's needs (Safdar, 2025). Several mobile learning applications and digital platforms have demonstrated effectiveness in classroom language education, such as Kahoot, Quizizz, Duolingo, and Blooket, and have decreased anxiety related to learning, increased retention of learned vocabulary, and increased student confidence and participation (Tuanany, 2025; Thi Binh, 2025). Virtual reality, augmented reality, and metaverse learning environments provide students with immersive, experiential learning and conceptual understanding

through interactions with content in a simulated real-world context (Sheripbay qizi, 2025, and Chung Liu, 2024). Many disciplines have shown the effectiveness of gamification for learning purposes. Gamified experiments and simulations in science and physics provide students with hands-on learning opportunities that facilitate critical thinking and improve students' conceptual understanding by translating abstract concepts into interactive experiences (Richter and Rust, 2025, and Hijriyah, 2025). In maths and software development, gamified learning environments provide opportunities for students to develop skills in problem-solving and to engage with mathematics through games rather than having to deal with complex problems (Wang, 2024, and Aldalur, 2024). Serious games, simulations, and escape-room-style learning activities in nurse education and clinical professional education promote clinical reasoning, decision-making, and collaborative work among learners, thus assisting in the preparation of graduates with the necessary knowledge and skills to be qualified to practice as professionals (Lee 2025). However, despite the positive reports regarding the benefits of gamification, the literature also identifies important limitations and challenges to gamification. Many of the studies looking at gamification have been short-term studies, concentrating on the immediate use of gamification for engaging students and improving their performance rather than on the long-term retention of what has been learned, the transfer of knowledge from one activity to the next, and the long-term motivation for learning (Richter & Rust, 2025; Cigdem, 2024). Many of the studies also caution that the novelty of gamifying the classroom experience may diminish over time, if the game elements are not updated or integrated well into the overall teaching plan (Cigdem, 2024). Further, when gamified experiences focus on providing external rewards (e.g., points or leaderboard rankings) to the students, this may take away from their intrinsic motivation to learn, or even cause students to be stressed due to the competitive nature of gamifying an experience that is intended for all students to benefit from equally (Ortiz Rojas, 2025). There are many barriers to the successful implementation of gamification in education; including, disparity in access to technology, insufficient digital infrastructure, insufficient teacher training, increased workload for instructing teachers, and ethical concerns regarding data and AI driven tracking of student data (Safdar, 2025; Paola, 2025; Cavus, 2023). Cultural and contextual variations among the learners also will affect how students will respond to the gamification of a learning experience; therefore, designing one project to meet the needs of all educational settings will likely not be effective. Finally, current trends in research point to the need for more developments of adaptive, personalized, and theory-based designs for gamification in education. According to researchers, gamified educational systems can be beneficial for many different types of students but not all students benefit equally from generic gamified educational systems. Thus, customized approaches should take into account each individual's profile as a learner, and be designed to support the user's motivation state, preferred method of learning, and context (Oliveira, 2023; Zahedi, 2023). Numerous bibliometric and systematic reviews demonstrate a constantly growing global interest in gamification research, with increasing numbers of contributions across varying geographical areas and educational disciplines. However, there are also several systematic gaps that have been established regarding methodological rigor, longitudinal studies, and standardized evaluation frameworks (Hijriyah, 2025; Sylvester, 2024). When looking at the literature to date, gamification can be used as a powerful and dynamic educational strategy that facilitates student engagement, motivation, satisfaction, and the achievement of learning objectives, across a wide range of educational settings; however, it should be noted that the effectiveness of any particular instance of gamification will depend upon sound instructional design practices, well-established theoretical underpinnings, sufficient support through technology and administrative structures, as well as some measure of non-transitory empirical evidence regarding the benefits associated with that particular instance of gamification. Future research should move away from simply evaluating the immediate engagement associated with gamification and move toward a broader understanding of the cognitive, affective, and long-standing effects of gamified learning in order to access the full benefit of utilizing gamification as a strategy for education (Mishra & Kotecha, 2025; Jun & Lucas, 2025).

Research Methodology

Research Philosophy and Approach

The research philosophy is based on pragmatism and recognizes that there is no one single research method that will comprehensively represent the complexity of how students engage with gamification in educational settings. Gamification impacts three inter-related dimensions simultaneously (observable behaviours;

cognitive processing; and emotional responses). Therefore, a pragmatism based approach combining positivist and interpretivist perspectives will provide a more accurate representation of this phenomenon.

This study will combine quantitative, qualitative and learning analytics based (data extraction from the educational platform) methods to provide a holistic perspective on how gamification impacts student engagement and student learning outcomes, while at the same time using multiple sources of data to triangulate data and enhance reliability and validity

Research Design

A quasi-experimental, longitudinal mixed-method design will be used in this study. In contrast to short-term experimental studies that only measure the immediate novelty effects of gamification, this study will measure student engagement for 6-8 weeks following the gamification intervention.

The quasi-experimental, longitudinal mixed-method design will combine three components of research:

1. Survey based measurement of student engagement;

2. Platform generated learning analytics (gamified educational system);

3. Qualitative insight gathered through focus groups and reflective feedback

This multi-level design will allow the study to evaluate changes in student engagement over time, identify patterns of student behaviour, and explore in-depth student perceptions of gamification**.**

Population and Sampling Strategy

The population for this study will be students from various secondary and tertiary educational institutions, covering undergraduate and postgraduate courses. The study will cover students from various management, engineering, commerce, and humanities backgrounds, as digital learning is becoming increasingly popular in all fields.

A stratified random sampling method will be employed to collect data from students based on factors such as:

- Academic level (UG/PG)
- Discipline
- Gender
- Prior experience with digital learning tools

The total number of samples will be between 100 to 150, which is sufficient to perform statistical tests such as paired ‘t’ tests, correlation, regression, etc.

Gamification Intervention and Learning Environment

The gamification intervention will be integrated into regular classroom or online teaching sessions, as this will be more representative of real-life scenarios. Instead of adding gaming components artificially, gamification will be integrated with actual curriculum content.

Selected Gamification Platforms

1. Kahoot: Real-time competitive quizzes, leaderboards, points, instant feedback, etc.

2. Quizizz: Self-paced gamified quizzes with memes, music, etc.

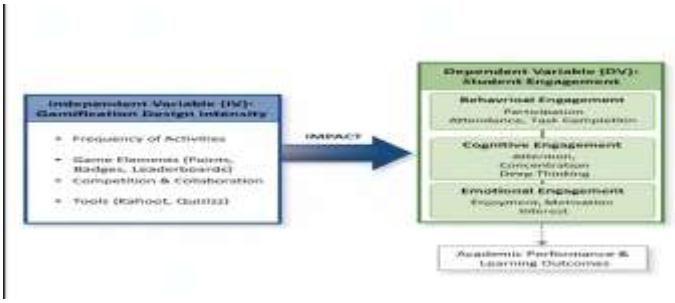

Figure 1, showing how gamification elements affect behavioural, cognitive, and emotional engagement.

Data Collection Instruments

Survey Instruments

A validated Student Engagement Scale is modified and made applicable to gamified learning environments.

The scale uses a 5-point Likert scale ranging from strongly disagree to strongly agree.

The survey is conducted in two phases:

Pre-intervention: to measure initial levels of engagement.

Post-intervention: to measure engagement after exposure to gamified learning environments.

Learning Analytics and Platform Data

The study’s novelty is the incorporation of learning analytics, which are extracted from gamification platforms.

The data collected includes:

Number of attempts in quizzes.

Accuracy level in percentages.

Time spent per question.

Leaderboards' ranking trends.

The novelty in this study is that it uses objective measures, thus avoiding subjective responses from students.

Qualitative Instruments

Focus group discussions and open-ended reflection forms are used to capture students' subjective experiences. Questions explore motivation, competitiveness, stress, enjoyment, and perceived learning effectiveness.

Data Analysis Techniques

Quantitative Analysis

- **Descriptive statistics** to summarize engagement levels.
- **Paired sample t-tests** to assess pre–post engagement differences.
- **Pearson correlation analysis** to examine relationships between engagement dimensions and academic performance.
- **Multiple regression analysis** to evaluate the predictive influence of behavioural, cognitive, and emotional engagement.

Data analysis is performed using **Microsoft Excel**, ensuring transparency and replicability.

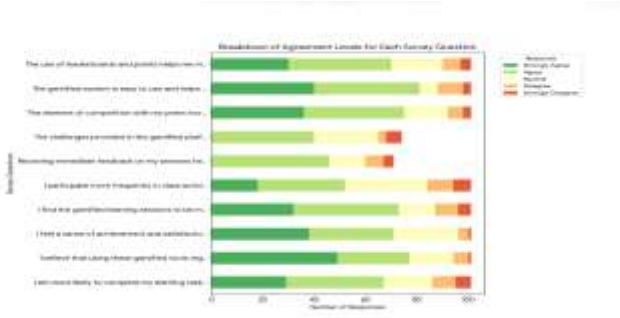

Figure 2 : The bar chart shows the distribution of student responses across different engagement variables in the gamified learning environment.

The data displayed in the bar chart indicates that the majority of responses for each question from the survey are "Agree" or "Strongly Agree" overall, typically between a range of approximately 60% to 80%, particularly with ease of use, feedback, achievement, and learning retention. Both ease of use and learning retention show the highest percentage of positive responses, at levels greater than 70%. Conversely, variables of participation, competition and deep thinking demonstrate slightly lower levels of agreement (i.e.: 55% to 65%) along with higher levels of neutral response (approximately 20% to 30%) and a smaller percentage of disagreement (5%-10%).

Analysis of Results:

From these results, it is clear that although gamification does enhance motivation, satisfaction and retention in a large way, its effect on deeper levels of cognitive engagement and on sustained participation are comparatively moderate levels of impact; therefore, more cognitively focused design may be warranted in future gamification studies.

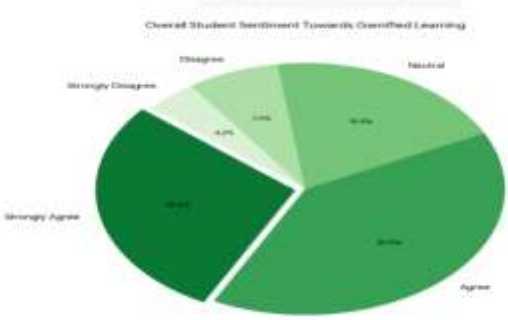

Figure 3 Visualization of overall student opinions on gamification on education

The overall student sentiment about gamified learning is positive. The largest number of students (39.9%) agreed with the statement regarding gamified learning, while almost as many (28.5%) strongly agreed with the same statement.

- Approximately 68.4% of all students who completed the survey appeared to hold a positive opinion about gamified learning, suggesting that students accept this form of learning.
- There were a total of 19.9% of neutral responses, indicating that some students remain undecided or need further introduction to gamification as an instructional method.

Analysis: The generally accepted student sentiment is very positive; therefore, gamification is viewed by most students positively and as a viable educational approach.

Variable	Coefficient
Intercept	1.140097
Participation	0.005647
Task Completion	-0.05159
Leaderboard Focus	0.254852
Deep Thinking	-0.09815
Feedback	0.192551
Enjoyment	0.042803
Competition	0.02773
Achievement	0.267466
Ease of Use	0.121911

10.55041/IJSREM58511This table shows the regression coefficients indicating the impact of each gamification variable on learning retention.

Analysis of Regression - Summary of Findings

- The regression model provides an excellent explanation of the variability in the degree of learning retention ($R^2 \approx 0.978$) and shows a good fit to the data.The high R^2 value indicates that the various variables related to gamification are collectively strong predictors of learning outcomes.
- Achievement ($\beta = 0.267$) presents the most substantial positive predictor, Leaderboards ($\beta = 0.254$) and feedback ($\beta = 0.192$) both have a positive and substantial effect on student retention of learning, demonstrating the importance of competition and feedback in gamification.
- The ease of use ($\beta = 0.121$) relationship is moderately positive, indicating that user-friendly platforms provide a positive experience for students during the learning process.
- Enjoyment ($\beta = 0.042$) and competition ($\beta = 0.027$) demonstrate weaker positive relationships. Task completion ($\beta = -0.051$) was found to have a weak negative relationship with learning retention;
- Deep thinking ($\beta = -0.098$) also exhibited a negative relationship with learning retention, suggesting that gamifying the learning experience does not always positively impact the ability to deeply process information.

Metric	Value
R-squared	0.978460513
Adj R-squared	0.956921025
F-statistic	45.42636002
Prob (F-statistic)	1.96595E-06

The regression analysis indicates a R2 value of 0.978. This means the gamification variables largely contribute to the variations in retention of learning. Adjusted for variables, R2 in this case would bring the value down to 0.956, but indicates that the original model continues to be an appropriate estimate for other variables included. The extremely large F-statistic value (F=45.43) indicates the entire sample of cases is statistically significant for the use of gamification as a variable in the study. Finally, the very small p-value (<0.05) shows that probability of obtaining these results by random chance is virtually non-existent and therefore reinforcing validity of the model created. Innovative Aspects of the Research and Its Methodological Contribution

The present research contributes multiple, innovative and unique contributions to the literature regarding gamification:

- **Learning Analytics Integrated with Engagement Theory:**

In contrast to the majority of prior gamification research, which relied mostly on self-reported measures of engagement, the present study integrates self-reported measures of psychological engagement with behavioural data generated by the platform used to deliver gamification. The resulting analytics-driven evidence of engagement is objective and adds significant value to existing literature through providing an answer to one of its biggest criticisms

- **Gamified Engagement–Analytics Model (GEAM):**

A Gamified Engagement–Analytics Model (GEAM) is proposed that links the design elements of gamification to measurable indicators that represent behaviour, cognition and emotion, resulting in engagement outcomes. The resulting GEAM is able to be replicated across disciplines and institutions.

- **Longitudinal Study Beyond Novelty Effects:**

Many studies of the effectiveness of gamification only measure engagement at the beginning of the intervention. The present study tracked the level of engagement over a six- to eight-week period to provide an understanding of whether or not the impact of gamification continues after the initial period of engagement.

- **Comparative Analysis of Multiple Platforms:**

By examining the effectiveness of gamification on three different platforms (Kahoot, Quizizz, Socrative), this study provided a comparative analysis of the gamified mechanics used in these three platforms. Such comparative evaluations are rare in the gamification literature.

Future Scope:

The results of this research suggest many potential topics for ongoing research and real-world applications in gamifying education:

- **Long-Term Effects:**

Future research should examine how long gamification (game elements) impact retention of knowledge, the improvement of skills, and academic success; rather than just measuring these effects over a short period of time.

- **Cognitive Learning Outcomes**:

There is a need to create more complex gamification (Game-Based Learning (GBL)) systems that emphasize higher order thinking (Critical Thinking, Decision Making), as opposed to focusing exclusively on lower order thinking (motivation) in order to produce more desirable outcomes.

- **Artificial Intelligence (AI) In Personalized Gamification:**

AI integration can also help develop adaptive gamified systems that are tailored to each learner's individual differences, such as learning styles, pace of learning, and level of achievement.

Conclusion

This study also supports the theory of using game-like approaches to improve users' motivation, retention, and engagement with the process of learning. The results also suggest that reward structures, competition (leaderboards), and feedback elements associated with gamification are very important to user retention. As well, extrinsic motivation will be the largest contributor to successful gamification.

There are also limitations to gamifying the learning process; some of these limitations were found in the present research. For example, it is believed that gamification has a smaller effect on cognitive learning (e.g., critical thinking and comprehension) than other learning strategies. Some evidence suggests that gamified learning is slightly less beneficial than traditional methods of learning.

While the study demonstrates several limitations, the effect of gamification has less impact on critical thinking and deeper cognitive processes than on enhancing motivation and engagement. Higher-order cognitive skills may not be adequately developed through gamification unless it is designed strategically and there is sufficient time available for skill development.

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