

## **An empirical study of gamification in educational sector**

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### **Abstract**

Gamification is the practice of game layout characteristics in non-game circumstances. A sample of one hundred high school students, ages fifteen to seventeen, participate in the quasi-experimental study, which compares gamified and conventional learning strategies. Gamification can meet the needs of students for independence, competency, and connection while promoting active learning, according to the theoretical structure of the research, which is based on the study's findings regarding how gaming affects pupil enthusiasm, cooperation, and procurement of information. Evaluations, empirical checklists, and initial and final tests were employed in the data collection procedure to assess academic achievement, motivation, and engagement. The results suggest that gamified learning activities significantly improved academic achievement when compared to traditional ways ( $p < 0.001$ ). There were noteworthy beneficial relationships between academic achievement and motivation ( $r = 0.60-0.68$ ,  $p < 0.01$ ). All of these characteristics showed positive associations with users' perceptions of how simple it is to use gamified activities ( $r = 0.45-0.55$ ,  $p < 0.01$ ). These results support the introduction of gamified elements into educational courses to create more engaging and effective instructional settings. However, constraints such as study duration and sample size suggest that more research needs to be conducted to look at long-term effects and suitability for a variety of people and age groups. The study increases the body of evidence that indicates gamification is a viable tactic for enhancing student interactions and educational outcomes in today's technological world [2], [6].

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## 1. Introduction

Gamification is a design approach that uses a playful layout in various contexts to evoke gaming-like experiences and promote a range of behaviours [18]. It emerged renowned at the start of the 2010s and has continued to be a popular subject for study and business [2]. Gamification is becoming more and more popular, particularly in educational settings. The long-standing practice of gamifying learning and education has a clear basis. This is due to the fact that learning theories and game design theories are primarily reinforced by the same psychological assumptions [4].

By introducing creative game aspects into non-gaming situations, the game design method seeks for improved user inspiration, involvement, and general educational experience.

The enormous rise in the use of digital games over the past few decades has made them nearly indispensable in today's learning environments [7],[16]. Gamification has shown promise in increasing student involvement in both visual and verbal learning activities through the inclusion of competitive elements such clear rules, enticements, and difficulties [6]. Sheldon was one of the first teachers to use gamification in the classroom by establishing parallels between coursework and gaming elements. He used phrases like "battling monsters" to describe exams and "completing objectives" to describe presentations, for instance [4]. This strategy aims to change the language and viewpoint surrounding educational accomplishment such that success receives praise rather than failure is punished.

Despite its potential, there are still a lot of issues with student education, including as low motivation, difficulty recalling numbers and information, and a lack of opportunities for hands-on learning. Long reading materials, a lack of communication between educators and pupils, and outside distractions can all be factors in the absence of motivation that prevents students from learning [5]. Moreover, pupils usually trouble with remembering numbers and facts, which can hinder their capacity for logical and creative thought [10].

### 1.1 Objectives of the Study

- To study gamification and investigate the influence of gamified learning activities in the education sector.
- To analyze how gamified learning activities impact student motivation, engagement, and overall learning outcomes.

The Study aims to provide empirical evidence on the effectiveness of gamification in enhancing learning and to offer insights into future applications of gamification technology in educational settings.

## 2. Conceptual and Theoretical Framework

### 2.1 *Conceptual Framework*

The foundation of this research's conceptual framework is gamification theory and its application to learning environments. By Deterding et al. [5], The manner of implementing game elements—like leaderboards, badges, and points—into non-gaming settings is referred to as “gamification.” in order to increase user motivation and engagement. Gamification in the classroom seeks to make the learning environment more dynamic and interesting, which can enhance student motivation and learning outcomes.

The intent of the investigation is to determine how gamified learning activities affect three important factors: motivation, engagement, and perceived ease of use. These aspects have been chosen because they are pertinent to learning objectives and have the potential to benefit from gamification.

The conceptual framework posits that gamified learning activities can enhance students' academic performance by making the learning process more fascinating and engaging, thereby fostering a more positive attitude towards learning.

### 2.2 *Theoretical Framework*

The theoretical foundation of this study is primarily based on two well-established theories: Self-Determination Theory (SDT) and Constructivist Learning Theory.

***Self-Determination Theory (SDT):*** According to SDT, which was developed by Ryan and Deci [13], relatedness, competence, and autonomy are what motivate people. In order to meet these needs, gamified learning activities give students a feeling of autonomy over their education, chances to demonstrate and attain competence, and a forum for social engagement and teamwork (relatedness). [19] SDT states that when these requirements are satisfied, people are more likely to show signs of intrinsic motivation, which improves learning outcomes and increases engagement [13].

***Constructivist Learning Theory:*** Supported by academics such as Piaget and Vygotsky, The way that students actively create their

perspectives and understandings through encounters and relationships with their surroundings receives considerable attention for acquiring theory. This hypothesis is supported by gamified learning activities, which offer immersive, interactive experiences that promote exploration and active engagement. [20] Students learn more deeply and acquire critical thinking and problem-solving abilities thanks to this practical approach [17],[11].

2.3 Hypotheses

Based on the conceptual and theoretical frameworks, the following hypotheses are proposed:

- 1. Hypothesis 1 (H1): Gamified learning activities significantly enhance academic performance compared to traditional methods.
- 2. Hypothesis 2 (H2): Gamified learning activities significantly increase engagement and motivation levels.
- 3. Hypothesis 3 (H3): Perceived simplicity of use positively correlates with engagement, motivation, and academic performance in gamified learning activities.
- 4. Hypothesis 4 (H4): Engagement in gamified learning activities positively correlates with motivation and academic performance.
- 5. Hypothesis 5 (H5): Motivation mediates the relationship between engagement and academic performance in gamified learning activities.

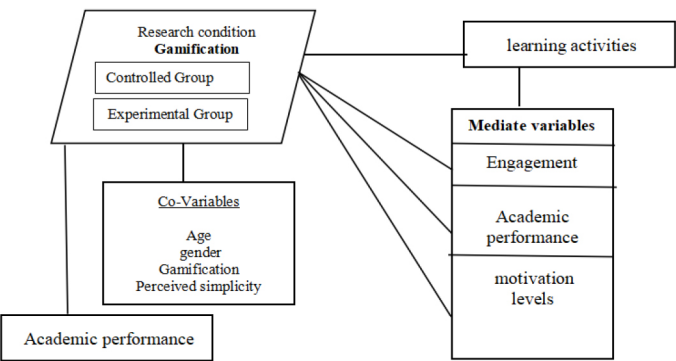


Figure 1  
Research Framework

### 3. Research Methodologies

Using a quasi-experimental technique to assess learning outcomes and engagement between a control group and an experimental group, this study compares the effects of gamified learning activities in education using a quantitative design [12]. In order to assure equitable gender distribution and reduce bias, the sample consists of 100 students, ages 15 to 17, from a nearby high school. There are 60 males and 40 females in the control group and the experimental group is randomly assigned [14]. Pre- and post-tests are used to evaluate academic performance; questionnaires are used to determine student motivation and engagement; and observational checklists are used to record participation and interaction during events. These techniques offer a thorough understanding of gamified learning's efficacy [9].

#### 3.1 Research Method

##### 3.1.1 Characteristics Investigated

The study focuses on three main characteristics: perceived simplicity of use, engagement, and motivation. These dimensions are crucial for understanding the overall impact of gamified learning activities. Participants rate their agreement with various statements related to these characteristics using a Likert scale with five points ranging from strongly opposing to strongly supporting [12].

**Table 1**  
**Gender and Age Distribution**

| Based on gender | Respondents | Percentage |
|-----------------|-------------|------------|
| Male            | 60          | 60%        |
| Female          | 40          | 40%        |
| Total           | 100         | 100%       |

**Table 2**  
**Gender and age distribution**

| Gender | Respondent | Percentage |
|--------|------------|------------|
| 15     | 40         | 40%        |
| 16-17  | 60         | 60%        |
| Total  | 100        | 100%       |

The sample includes an equal distribution of males and females, with participants aged between fifteen and seventeen years. Tables 1 and 2 illustrate the gender and age distribution, respectively, ensuring demographic representation and balance in the study.

### 3.1.2 Data Analysis

The study looks into the impact of the gamified learning activity using perceived ease of use, motivation, and engagement. On a five-point Likert scale, participants indicated how much they agreed with the following statements about these traits: strongly disagree, disagree, neither agree nor disagree, agree, and highly agree. Next, a thorough analysis of the outcomes for every dimension was conducted [12].

#### a. Enjoyment

One of the most important effects of gamification is that it makes the learning experience more enjoyable, which can lead to improved learning outcomes. Table 3 presents statements pertaining to enjoyment. [14].

**Table 3**  
**Statements Related to Students' Enjoyment**

| No | Description                                                            |
|----|------------------------------------------------------------------------|
| 1  | Being truly enjoyable                                                  |
| 2  | Having fun while participating in the game`                            |
| 3  | When you're feeling it's a terrific way to pass the time while working |
| 4  | Playing it, I was worn out.                                            |
| 5  | Playing it and feeling terrible                                        |

#### b. Engagement

Gamification attracts students' attention and encourages them to engage deeply with the subject matter. Statements related to active participation are provided in Table 4 [9].

**Table 4**  
**Statements Related to Active Participation**

| No | Description                                                                         |
|----|-------------------------------------------------------------------------------------|
| 1  | Due to the difficulty of the situation, we wanted to investigate every possibility. |
| 2  | We sensed that time went by swiftly.                                                |
| 3  | Our goal was to finish the game.                                                    |
| 4  | It didn't matter to us how the game finished.                                       |
| 5  | When we play it, we become bored.                                                   |

#### c. Motivation

Motivation is crucial in the learning process, influencing emotional components, critical thinking, learning approaches, and success. Statements related to motivation are provided in Table 5 [15].

**Table 5**  
**Statements on the Motivation of Pupils**

| No | Description                                                         |
|----|---------------------------------------------------------------------|
| 1  | It was crucial to my success on this assignment.                    |
| 2  | This is a rather fascinating exercise, in our opinion.              |
| 3  | We made a great effort with this task                               |
| 4  | We didn't put much effort into performing effectively in this task. |
| 5  | We didn't spend a lot of effort on this.                            |

It provides a summary of the responses from the students, indicating that the majority found the gamified learning scenario to be fun, engaging, and motivating. This suggests that gaming may be an effective tool for enhancing student learning experiences and results [12],[15].

Research Paper: Analysis and Interpretation of Gamified Learning Activities

#### 4. Analysis and Interpretation

This section provides a detailed assessment and understanding of the gathered data, supporting the hypotheses outlined in the study.

#### 4.1 Descriptive Statistics

**Table 1**  
**Scores from the Pre- and Post-test using descriptive statistical methods**

| Group              | Mean (Pre-test) | Median (Pre-test) | SD (Pre-test) | Mean (Post-test) | Median (Post-test) | SD (Post-test) |
|--------------------|-----------------|-------------------|---------------|------------------|--------------------|----------------|
| Control Group      | 70.4            | 71.0              | 6.5           | 72.1             | 72.0               | 6.7            |
| Experimental Group | 69.8            | 70.0              | 6.3           | 78.5             | 79.0               | 5.8            |

Interpretation: The control group's mean pre-test score was 70.4 (SD = 6.5), and after traditional learning activities, the mean post-test score increased slightly to 72.1. The experimental group had a mean pre-test score of 69.8 (SD = 6.3), and after gamified learning activities, the mean post-test score significantly rose to 78.5, demonstrating a substantial improvement in academic performance. These findings support Hypothesis 1 (H1) that gamified learning activities significantly enhance academic performance compared to traditional methods.

#### 4.2 Inferential Statistics

##### 4.2.1 T-test Analysis

**Table 2**  
**T-test Results for Pre-test and Post-test Scores**

| Group              | Mean Difference | t-value | p-value |
|--------------------|-----------------|---------|---------|
| Control Group      | 1.7             | 1.45    | .15     |
| Experimental Group | 8.7             | 7.92    | <0.001  |

**Interpretation:** The control group's t-test revealed that the mean difference between pre-test and post-test scores (1.7) was not statistically significant ( $p = 0.15$ ). Conversely, the experimental group's t-test showed a significant improvement (mean difference = 8.7,  $p < 0.001$ ), indicating that gamified learning activities positively impacted academic performance. These results further support Hypothesis 1 (H1) that gamified learning activities significantly enhance academic performance compared to traditional methods.



### 4.3 ANOVA Analysis

**Table 3**  
**ANOVA Results for Engagement and Motivation Levels**

| Source         | SS    | df | MS    | F-value | p-value |
|----------------|-------|----|-------|---------|---------|
| Between Groups | 150.5 | 1  | 150.5 | 25.76   | <0.001  |
| Within Groups  | 580.3 | 98 | 5.9   |         |         |
| Total          | 730.8 | 99 |       |         |         |

**Interpretation:** The ANOVA results show a significant difference in engagement and motivation levels between the control and experimental groups ( $F(1, 98) = 25.76$ ,  $p < 0.001$ ), indicating that gamified learning activities significantly enhanced student engagement and motivation. These findings support Hypothesis 2 (H2) that gamified learning activities significantly increase engagement and motivation levels.

### 4.4 Detailed Correlation Analysis

**Table 4**  
**Correlation Analysis between Factors**

| Variable                    | Perceived Simplicity of Use | Engagement | Motivation | Academic Performance |
|-----------------------------|-----------------------------|------------|------------|----------------------|
| Perceived Simplicity of Use | 1.00                        | 0.55       | 0.50       | 0.45                 |
| Engagement                  | 0.55                        | 1.00       | 0.60       | 0.68                 |
| Motivation                  | 0.50                        | 0.60       | 1.00       | 0.58                 |
| Academic Performance        | 0.45                        | 0.68       | 0.58       | 1.00                 |

$p < 0.01$

#### **Interpretation:**

*Perceived Simplicity of Use:* The study found a moderate positive correlation between perceived simplicity of use and engagement ( $r = 0.55$ ,  $p < 0.01$ ), indicating that There's a higher chance of involvement among pupils when they find gamified activities simple to use. Similarly, there is a moderate positive correlation between perceived simplicity of use and motivation ( $r = 0.50$ ,  $p < 0.01$ ), suggesting that easier-to-use gamified

activities enhance student motivation. Additionally, a moderate positive correlation was observed between perceived simplicity of use and educational performance ( $r = 0.45$ ,  $p < 0.01$ ), implying that simplicity of use can positively impact academic outcomes. These correlations support Hypothesis 3 (H3) that perceived simplicity of use positively correlates with engagement, motivation, and academic performance in gamified learning activities.

*Engagement:* The study identified a strong positive correlation between engagement and motivation ( $r = 0.60$ ,  $p < 0.01$ ), indicating that increased engagement in gamified activities corresponds to higher levels of motivation among students. Additionally, a strong positive correlation was determined between engagement and educational performance ( $r = 0.68$ ,  $p < 0.01$ ), suggesting that students who exhibit higher engagement levels in gamified learning activities tend to achieve better academic outcomes. These correlations robustly support **Hypothesis 4 (H4)** that engagement in gamified learning activities positively correlates with both motivation and academic performance.

*Academic Performance:* There is a moderate to strong positive correlation ( $r = 0.58$ ,  $p < 0.01$ ) between motivation and academic performance, indicating that motivated students tend to achieve better academic results. These correlations, along with the earlier findings, support Hypothesis 5 (H5).

The outcome of this and interpretation reflect that gamified learning activities have a beneficial effect on academic achievement, motivation, engagement, and perceived ease of use. These results align with the theoretical underpinnings of constructivist learning theory [11], [17] and self-determination theory [13]. Strong evidence for the effectiveness of gamified learning in educational contexts is shown by the favourable correlations and notable gains in academic achievement and engagement indicators.

## 5. Conclusion

Strong evidence supporting the effectiveness of gamification in educational contexts is provided by this empirical investigation. The results show that when gamified learning activities are used instead of traditional techniques, academic performance is greatly improved [4],[7]. The premise that gamification enhances learning outcomes is supported by the experimental group's significant improvement in post-test scores. According to Caponetto et al. [2], the study also showed that gamified

activities greatly raise student enthusiasm and engagement levels. Engagement, motivation, and academic success have substantial positive relationships that highlight how intertwined these aspects are in the learning process [13]. Furthermore, it was discovered that academic performance, motivation, and engagement were all positively correlated with perceived ease of use, underscoring the significance of user-friendly design in educational gamification [5].

According to these findings, gamification meets students' requirements for relatedness, competence, and autonomy while offering engaging experiences that promote deeper learning in line with constructivist learning theory and self-determination theory [11],[17]. The study's conclusions back up the addition of gamified components to curricula in order to improve learning environments' effectiveness, motivation, and engagement. Future studies should examine how gamification affects learning results over the long term and whether it can be applied to a variety of disciplines and age groups. Gamification offers a promising strategy to improve student learning outcomes and experiences in the digital era as educational technology continues to advance [3],[23],[8],[1],[6].

## **6. Limitations and Future Research:**

Though there have been some intriguing discoveries from this effort, there are a number of restrictions that should be noted. The results may not be as broadly applicable as they could be due to the tiny sample size from a single high school. The study's short duration may have limited its ability to adequately capture the long-term effects of gaming on academic results, and its concentration on a single subject area may have obscured the effectiveness of gamification across a range of disciplines. To improve generalizability, future research should broaden the sample size and diversity and undertake longitudinal studies to evaluate the Consequences over time of gamification on learning.

A more thorough understanding would also come from examining the efficacy of gamification in a range of subjects and age groups as well as the part that individual differences play in the influence of gamification on learning [21],[22]. Researchers should look into any potential drawbacks of gamification, like heightened competition or a reliance on outside incentives, as well as the best ways to include gamification components into curriculum design. These lines of inquiry will advance our understanding of the potential and constraints of gamification in

educational environments, leading to more comprehensive and nuanced implementation techniques and pedagogical practices. Future research can expand on the current findings and deepen our understanding of gamification in education by tackling these areas.

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