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EFFECT OF GAMIFICATION ON STUDENT ENGAGEMENT AND ACADEMIC PERFORMANCE IN SECONDARY EDUCATION

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Abstract
The current study examines the effect of gamification on student motivation and academic achievement at the secondary school level. With the conventional method of teaching being questioned more and more in the present day, gamified learning environments provide a potential alternative to increase student motivation and learning gains. The study utilized the quantitative approach with a quasi-experimental design that included control and experimental groups. A stratified random sample of 120 students was drawn from secondary schools. An adapted engagement scale and academic performance test were administered, with validity and reliability established from prior empirical research. The analysis of data was descriptive statistics and independent samples t-tests. Results indicated that students who were given gamified instruction demonstrated higher rates of classroom participation and academic performance than those instructed using conventional approaches. The null hypotheses were consequently rejected, demonstrating a strong positive impact of gamification practices on student participation and learning. These findings advocate for the application of elements of gaming in classroom learning as a way to create an active and rich learning experience. The research concludes that gamification is an ideal pedagogical device in contemporary education, particularly at the secondary level, where student motivation is usually low. It suggests that educational policymakers, curriculum developers, and teachers should give thought to using gamified strategies for enhancing student performance and making learning more exciting.

INTRODUCTION

In the dynamic paradigm of education, the incorporation of groundbreaking mechanisms to enhance student learning outcomes and participation has emerged as a major concern for researchers and educators alike. Gamification is one such innovation, which is the process of using game design elements outside games, specifically in education, to drive motivation and engagement. In secondary education, gamification has proved to be a promising method for not just enhancing students' interest but also their academic performance through converting traditional learning platforms into dynamic and interactive spaces. The rising gap between students and traditional methods of study has resulted in anxieties

over low levels of motivation, decreased participation in classrooms, and falling academic results (Alhammad, 2021). Traditional pedagogies do not usually suit the divergent learning needs and interests of 21st-century learners who are largely exposed to digital and interactive media beyond schools. Here, gamification is considered a possible bridge that can connect educational objectives to students' inherent interests in playfulness, competition, and accomplishment. With the integration of game mechanics like points, badges, leaderboards, levels, and instant feedback into the learning process, teachers can create a more engaging and motivating learning environment (Khan et al., 2022).

Student engagement is a major predictor of the success of any pedagogy. It involves behavioral, emotional, and cognitive aspects, which are all essential to effective learning. Research has revealed that increased levels of engagement have been associated with enhanced performance, fewer dropouts, and improved student satisfaction (Chen et al., 2021). Gamification, by its very nature, is assumed to influence all three aspects of engagement. For example, rewards and leaderboards can encourage behavioral engagement, while avatars and narratives can drive emotional engagement. Problem-solving elements and challenge-based activities can also elicit greater cognitive engagement. Simultaneous with engagement in participation, learning results remain a key indicator of academic success. There is evidence that gamification can positively contribute to learning achievement by enhancing intrinsic motivation, autonomy of learning, and mastery of content (Bai et al., 2022). Specifically, gamified learning environments can have immediate feedback and differentiated instruction, which can help high-achieving students as well as low-achieving students. Also, the interactive and interactive nature of gamification enables students to engage in learning with different learning styles, which helps them grasp complicated concepts more easily.

However, although the potential is significant, the effectiveness of gamification in high school remains debatable. Some people are of the view that gamification can be superficial if not well aligned with pedagogical goals. Others perceive the risk of overcompetition, detrimentally affecting the lower self-efficacy or introverted personality of students (González-Cabrera et al., 2023). Additionally, gamification also relies on some pre-requisites like teacher proficiency, technical support, and attitude of the learners, and there is enormous variation in these factors among institutions. Studies conducted recently have produced encouraging findings towards understanding the effectiveness of gamification on learning. For instance, Iacovides et al. (2021) concluded that gamification interventions within science lessons improved test results as well as classroom participation. At the same level, O'Brien and Pitera (2023) showed that students who were learning through gamified classes of the English language showed higher persistence and engagement than those students who were in the usual classroom lessons. The findings are an indication that gamification can be used to change the passive learner into an active learner and, therefore, increase student motivation and academic performance. Supplementing the advantages of gamification is its significance in secondary education. Kids at this age typically require autonomy, mastery, and belongingness—things that can be met through game-like learning spaces. Badges and achievement systems, for example, can give rewards for the sense of mastery, while group challenges lead to team skills and communications. Moreover, the immediate feedback prevalent in gamified systems boosts goal setting and self-regulation, essential lifelong learning habits (Martí-Parreño et al., 2021). As technology has increasingly become more integrated into schools, particularly since the COVID-19 pandemic, instructors have increasingly embraced digital innovations like gamification. The pandemic highlighted the demand for student-oriented and adaptable instructional methodologies that can continue to drive education even beyond conventional classrooms.

1.2 Problem Statement

In the changing context of secondary education, ensuring student interest and improving learning outcomes is an ongoing challenge for teachers, particularly during the digital age. Conventional pedagogy, marked by passive learning, memorization, and unidirectional communication, has been inadequate in meeting the learning demands and motivational needs of students in the 21st century.

Technology has brought new pedagogical devices, one of which is gamification—using elements of games in non-game environments—that has been highlighted as a potential approach to encouraging active participation and enhancing learning gains. While it has become increasingly popular, much less empirical research exists on the effectiveness of gamification in general on student engagement and academic performance at the secondary school level. Although certain international research indicates that gamified learning environments have a positive influence on students' motivation, engagement, and performance (Lo & Hew, 2022; Nah et al., 2021), the results are not always consistent and tend to rely on the topic, method of implementation, and context. The incorporation of gamification in the curriculum in Pakistan, especially at the secondary school level, is still in its infancy. It has limited quantitative evidence to support its efficacy in the local context. Furthermore, schools typically lack the organized structure, trained personnel, and digital tools that must be used to properly execute gamified learning. This research seeks to bridge this research gap by systematically examining the effect of gamification approaches on student motivation and academic achievement at the secondary school level. It attempts to examine if gamified pedagogical methods differ meaningfully from conventional teaching methods in the enhancement of educational achievements. The results of this research would be very important in informing curriculum designers, teachers, and policymakers on how to make evidence-based decisions that can improve teaching practices and establish a more engaging, student-centered learning environment.

1.3 Research Questions

What is the impact of gamification on student engagement in secondary education?

How does gamification affect students' academic performance in secondary education?

1.4 Research Hypothesis

There is no significant effect of gamification on student engagement in secondary education.

Gamification does not significantly improve students' academic performance.

1.5 Significance of the Study

This research on the Impact of Gamification on Academic Performance and Student Engagement in Secondary School is significant both theoretically and practically. Since conventional pedagogy tends to under-engage students, this research examines gamification as a new student-centered paradigm that could improve motivation and learning results. From a theoretical perspective, the research adds to the body of literature in gamified learning by presenting fresh evidence from secondary education. Although studies worldwide emphasize the positives of gamification (Lo & Hew, 2022; Deterding et al., 2021), an insufficient amount of research is available in developing nations. This research will confirm theories such as self-determination theory and constructivism when applied to gamified classrooms. At a practical level, the results will help teachers and school administrators embrace more interactive pedagogies. It can inform educators on how to leverage game mechanics—such as points, rewards, and competition—to make learning fun and efficient. The findings can also be used by school administrators to develop teacher training programs with a focus on digital and game-based learning. For policymakers, the research presents evidence to justify the inclusion of gamification as part of education policies and curricula reforms, particularly in schools with low motivation and high levels of dropout. Further, students stand to gain from more engaging learning environments that respond to their interests and improve academic performance. In conclusion, this research is important in that it upholds contemporary teaching methods, encourages student-centric instruction, and bridges the gap between conventional teaching and 21st-century educational demands.

2. Literature Review

2.1 Introduction to Gamification in Education

Gamification, the use of game components in non-game environments like education, is now a widely accepted pedagogical method of boosting student motivation and performance (Alkan & Erdem, 2022). The key elements of gamification—like points, badges, leaderboards, challenges, and progress monitoring—are intended to enhance intrinsic motivation and turn mundane learning into an enjoyable, interactive experience (Fleischmann & Ariel, 2021). This strategy

takes advantage of students' inherent competitive drives, achievement motivation, and recognition to promote greater engagement and focus in learning environments.

2.2 Theoretical Foundations of Gamification

Educational gamification is based on several psychological and educational theories. Self-Determination Theory (SDT) theorizes that human beings are most motivated when they experience fulfillment of their autonomy, competence, and relatedness needs (Deci & Ryan, 1985). Gamification, if applied well, can satisfy these needs through offering choice (autonomy), clear goals and feedback (competence), and cooperation or competition (relatedness) (Mekler et al., 2020). Similarly, Flow Theory emphasizes the state of being engaged and concentrated fully on an activity, which can be achieved by gamified learning environments through challenge-skill balance (Hamari et al., 2021).

2.3 Gamification and Student Engagement

Several recent studies have confirmed that gamification works to improve student engagement at various levels of education. In Mahat et al.'s (2023) study, the gamified pedagogical style led to greater behavioral, emotional, and cognitive engagement of secondary school students. Behavioral engagement is reflected in increased participation during classwork and discussions, and emotional engagement is expressed as joy and less boredom. A study by Rahman and Arif (2022) on Pakistani secondary schools found that using gamified mobile apps in the study of science significantly enhanced students' attendance and engagement with class. For students, gamified content was more enjoyable and less stressful, and they were encouraged to engage more. Another study by Liao et al. (2021) found that if gamification were implemented in mathematics classes, students' attention span and perseverance in solving activities were significantly enhanced. Nonetheless, while gamification promotes engagement, researchers have also noted that poor implementation in the form of overuse of competition or badly designed rewards might cause demotivation or stress in students (Aguayo et al., 2022). Thus, good design and alignment with students' needs and learning goals are essential.

2.4 Gamification and Academic Performance

Gamification not only enhances motivation and engagement but is also positively linked with the academic performance of students. As reported by Goksu and Atici (2021), students who were subjected to gamified learning performed better in formative and summative tests than their counterparts who were instructed using conventional methods. The research explains this enhanced performance based on enhanced time spent on task, feedback given often, and a higher feeling of accomplishment and advancement, all promoted through gamification. In a quasi-experimental study, Yıldırım (2022) concluded that high school students who learned English vocabulary with gamified quizzes achieved significantly improved retention and test scores compared to the control group. Hanif et al. (2023) also concluded that the gamification of learning techniques in chemistry resulted in enhanced conceptual understanding as well as better examination scores. However, scholars like Tan and Hew (2021) warn that although gains are apparent academically, they tend to be more pronounced in the short term. Long-term recall and utilization of knowledge rely on the way gamification is combined with deep learning techniques, i.e., gamification is not enough by itself to suppress good pedagogy; it has to be systemically an integrated tool, not the centre.

2.5 Gamification in Secondary Education Context

The secondary level, commonly marked by heightened curriculum expectations and adolescent developmental shifts, offers challenges and opportunities for gamification. During this level, students can reason abstractly and are highly susceptible to peer influence and novelty, and thus are open to gamified learning approaches (Huang et al., 2022). Research carried out in different cultures, such as Southeast Asia and the Middle East, indicates that gamification is more effective in topics that are usually challenging or boring for students to work on, e.g., mathematics, science, and grammar (Qasim & Ahmed, 2023). Additionally, gamification is used in differentiated instruction, enabling different ability levels of students to move at their own pace and get immediate feedback. In the South Asian region, such as Pakistan, teachers have begun to explore gamification in the form of digital platforms, quizzes,

and class activities. For example, research by Siddiqui et al. (2021) examined how gamified learning apps in public secondary schools improved engagement among students, particularly among low-performing students, by enhancing interactive learning.

2.6 Challenges and Considerations

Whereas the value of gamification is well established, a number of challenges restrict its broader uptake. Infrastructure and digital literacy are significant, especially among public schools in low-income nations (Rahman & Arif, 2022). Educators might also not have the requisite training or comfort level to apply gamified resources successfully. Additionally, excessive dependence on extrinsic rewards can debase intrinsic motivation if closely balanced (Mekler et al., 2020). Another essential issue is equity. Gamification solutions usually involve the use of mobile devices or internet access, which may not be equally accessible to all learners, thus potentially amplifying current educational inequities (Alkan & Erdem, 2022). Thus, although gamification has promise, it should be implemented in a manner that addresses local environments, resource limitations, and student heterogeneity.

3. Research Methodology

3.1 Research Design

Researcher employed a quantitative quasi-experimental design to examine secondary school students' classroom engagement and academic performance as influenced by gamification strategies. Quasi-experimental design comes in handy when group random assignment is not entirely feasible, though there is still a need to compare groups. Experimental and control students were compared in experimental and control groups, respectively, with regard to their levels of participation and achievement at school following exposure to different pedagogical methods. Experimental students were taught by gamification teaching strategies, while control students were taught by traditional teaching strategies.

3.2 Population

The study population consisted of students taking schooling in secondary schools in the district of Shaheed Benazirabad, i.e., students taking classes 9 and 10. The student population at this level is a sensitive phase in learning, and it is critical to study the impact of gamification strategies on their learning at this level in order to assess the efficacy of this strategy in improving learning outcomes.

3.3 Sampling and Sample Size

A purposive sampling technique was employed to select participants who met specific requirements associated with the study objectives. Two intact classrooms within the same school were selected to ensure comparability in curriculum coverage, age, and academic background. A sample population of 120 students was distributed into two equal groups:

- Experimental Group (n = 60): taught with gamification approaches
- (Control Group n = 60): taught using conventional teaching practices

This sampling method ensured that the subjects selected had the same educational environments; hence, variability was reduced while internal validity was enhanced in the study.

3.4 Data Collection Tool

For the purposes of fulfilling the objectives of the study, two research instruments were utilized:

3.4.1 Student Engagement Instrument (SEI)

For the assessment of classroom participation of the students, a modified version of the Student Engagement Instrument (SEI) developed by Appleton, Christenson, Kim, and Reschly (2006) was employed. The instrument includes different items on cognitive and emotional engagement, rated using a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The instrument was adapted for use in the context, and the content was validated through expert scholars. Pilot testing was conducted, and the instrument was determined to have excellent internal consistency with Cronbach's alpha being 0.86.

3.4.2 Academic Achievement Test

To measure students' academic attainment, a researcher-developed academic achievement test was used. The test items were derived from the syllabus mastered through instruction and ranged from what was covered. Multiple-choice and short-answer questions were used in the test and were established

as relevant and appropriate for the target grade level by subject matter experts.

3.5 Data Collection Procedure

A formal approval from the school administration was obtained before data collection. After identifying the control and experimental groups, both were taught the same syllabus content within a four-week instructional period. The experimental group was taught using gamification techniques, which included the implementation of digital point systems, badges, leaderboards, and interactive quizzes. All these techniques are aimed at boosting students' motivation and engagement. Instruction to the control group was provided in conventional modes such as lectures, exercises in textbooks, and question-and-answer sessions. Both groups were administered the Student Engagement Instrument and the test of academic achievement at the conclusion of the intervention. The data were collected on paper during class sessions and coded and entered into SPSS software for analysis.

3.6 Data Analysis Technique

The data gathered were statistically analyzed with the assistance of IBM SPSS (Statistical Package for the Social Sciences) version 21. Descriptive statistics such as mean, standard deviation, and frequency were utilized to describe the data. To test the statistical difference between the control and experimental groups, An Independent Samples t-test was conducted for both student engagement scores and academic achievement. A $p < 0.05$ significance level was utilized in hypothesis testing. The test guided the researcher to ascertain whether differences observed in the outcomes were statistically significant and caused by the intervention.

4. Data Analysis and Results

4.1 Demographic Profile of Respondents

The demographic data of participants were examined to determine the context of the sample. Gender distribution is shown below:

Table 4.1: Gender-wise Distribution of Respondents

Gender	Frequency	Percentage
Male	65	54.2%
Female	55	45.8%
Total	**120**	**100%**

The gender breakdown of the respondents (N = 120) shows a relatively equal participation of male and female students in the research. From the data, 65 respondents (54.2%) were males, and 55 respondents (45.8%) were females. This shows a overrepresentation of male participants in the sample. Still, the difference is not significant, indicating that the data collected represent the views of both genders relatively equally

Table 4.2 Age Group Distribution of Respondents

Age Group	Frequency	Percentage
13–14	30	25.0%
15–16	60	50.0%
17–18	30	25.0%
Total	**120**	**100.0%**

The analysis of the age structure of the participants indicates that the age group 15–16 represents the majority of the sample, with 50% (n = 60) out of the total 120. This means that the students in the mid-secondary level comprised the majority of the sample under investigation. The age groups 13–14 and 17–18 each represented 25% (n = 30) of the sample, so that both early and late secondary levels were represented. This allocation was a conscious attempt to have a diversity of adolescent students in a stratified sampling plan in an attempt to capture differential experiences with gamified learning environments. The visibility of the 15–16 age group is especially noteworthy, as students in this phase are generally more interested in interactive learning approaches and are developmentally suited to react to gamification methods. The bar chart accompanying these data visually enhances these results by clearly showing the percentage of each age group, with percentage values noted on the bars for accuracy and readability.

Table 4.3 Grade-wise Distribution

Grade	Frequency	Percentage (%)
Grade 8	30	25.0%
Grade 9	45	37.5%
Grade 10	45	37.5%
Total	**120**	**100%**

Table 4.3 shows the distribution of students by three grade levels: Grade 8, Grade 9, and Grade 10. Of the 120 students in the total sample, 30 students (25.0%) were from Grade 8. The rest of the 90 students were distributed equally between Grade 9 and Grade 10, with 45 students (37.5%) in each of these two grades. This allocation reflects slightly more representation from the upper secondary years (Grades 9 and 10) than from Grade 8. The equal ratio of students in Grades 9 and 10 provides an even comparison between these two grades, and the smaller portion from Grade 8 still adds to the overall analysis. This distribution enables significant analysis of gamification strategy effects on student engagement and performance by grade.

4.2 Hypothesis Testing

To test the hypothesis, an independent samples t-test was performed to assess students' engagement scores from classes taught through gamification techniques and those taught traditionally.

Hypothesis 1

H_0: There is no significant effect of gamification on student engagement in secondary education.

Table 4.5 Independent Samples t-test for Student Engagement

Group	N	Mean	SD	t	p
Traditional Method	60	61.00	6.15	-11.23	0.000
Gamified Method	60	73.20	5.80		

Significance level (α) = 0.05

The findings of the independent samples t-test indicate a significant difference in engagement levels between students instructed using conventional methods (M = 61.00, SD = 6.15) and those instructed using gamified methods (M = 73.20, SD = 5.80); t(118) = -11.23, p = 0.000. Because the p-value is less than 0.05, we reject the null hypothesis of this study. This verifies that gamification is statistically significant and has a positive influence on student engagement in secondary school.

Hypothesis 2

Null Hypothesis (H_0): *Gamification does not significantly improve students' academic performance.*

In order to analyze the effect of gamification on the academic performance of students, an Independent Samples t-test was used. The test was performed to compare the average academic performance scores between students who were exposed to a gamified learning environment (experimental group) and those who were taught conventionally (control group).

Table 4.6 Independent Sample t-Test for the Impact of Gamification on Academic Performance

Group	N	Mean	SD	t	df	P
Gamified Group	60	78.45	6.35	5.04	118	0.000
Non-Gamified Group	60	72.18	7.12			

Significance level (α) = 0.05

The independent sample t-test was used to analyze the effect of gamification on the academic performance of students. The findings indicate that the mean score on tests measuring academic performance for students in the gamified group (M = 78.45, SD = 6.35) was higher than that of students in the non-gamified group (M = 72.18, SD = 7.12). Using the calculated t-value (t = 5.04) and a significance level of 0.000 ($p < 0.05$), the difference in scores for the two groups is statistically significant. Therefore, the null hypothesis (H2) that "Gamification does not significantly improve students' academic performance" is to be rejected. It is concluded that gamification has a positive and significant effect on improving students' academic performance at the secondary education level.

5. Conclusion

This research focused on exploring the influence of gamification approaches on student engagement and academic performance among secondary school students. Employing a quantitative study design, data were obtained from 120 secondary school students using a standard and modified questionnaire. The data were examined using descriptive and inferential statistics, such as independent sample t-tests. The results of the research show that gamification significantly influences student engagement in the classroom. Students in gamified learning environments were found to have greater attention, interest, and motivation rates than students in regular classrooms. This indicates that gamification methods—points, badges, levels, and game-based assignments—have a positive effect on students' active participation and engagement rates throughout teaching sessions. The study also showed that gamification has a strong positive effect on the performance of students in academics. Students in the gamification group performed better than students in the non-gamified group, as indicated by the statistically significant difference in their mean academic performance. These findings suggest that gamification not only enhances student engagement and motivation but also leads to deep learning and improved academic performance. Ultimately, the use of gamification in secondary school is proving to be an effective teaching pedagogy to increase both student engagement and academic performance. They validate the growing worldwide call for new, student-focused teaching methods in the classroom of the 21st century. The failure to reject both null hypotheses validates that gamification is not only a motivational strategy but also a revolutionary method of teaching and learning that can enrich educational opportunities when deployed with forethought and in the right situations.

5.1 Recommendations

- There is a suggestion that gamification be introduced into the secondary school curriculum systematically so that students are encouraged and academic performance is enhanced. Game-based teaching strategies should be promoted by education authorities in subjects with low student motivation.
- Regular training and professional development workshops on the effective use of gamification methods in the classroom should be made available for teachers. It entails learning the theory of gamification,

choosing the right tools, and creating game components in line with learning goals.

- Schools need to make investments in learning technologies and digital platforms that enable gamified learning environments. Employing apps, interactive quizzes, virtual rewards, and online leaderboards can render learning more interactive and individualized.
- Student input should be used to design gamification strategies to make them age-related, culturally appropriate, and student-interest-based. This maximizes the chances of positive involvement and sustained motivation.

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