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From Game Elements to Cognitive Engagement: Examining Gamification in Pakistani Higher Education

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ABSTRACT

The mental effort, strategic thinking, and intentional processing of learning content (cognitive engagement) has not been explored in higher education gamification particularly in developing countries like Pakistan. This study is about the relations between gamification practices and cognitive engagement of university students in Sargodha district, Punjab, Pakistan. In order to explore the relationship, a cross sectional survey design was used and a total of 104 undergraduate students from the Public University of (Sargodha) were selected as participants of the survey. The validated instruments measuring gamification features, cognitive involvement and learning outcomes were used to gather data, which were in Likert scale. In order to test hypothesized relationships, Pearson correlation and hierarchical multiple regression analyses were run. Results showed that demographic variables (Sex, Age, And Institution type) did not affect the significant prediction of cognitive engagement ($\beta = 0.55$, $p < 0.001$) from gamification practices. The gamification that had the strongest associations were the gamified digital tools and the team based challenges. The mean score for question-asking behaviour, which is closely related to cognitive engagement, however, the lowest ($M = 3.21$) indicating that pedagogical and cultural hindrances may be an obstacle for deeper engagement for university students in Pakistan. This research generally supports the limited literature about gamification in the Higher Education in the South Asian region. The results also indicate the potential for increasing the cognitive engagement in learning through proper implementation of gamification and provide insight for university trainers who consider adopting a game approach in higher education.

Introduction

The key challenge of higher education institutions around the world is to shift from conveying knowledge to involving students in becoming cognitive learners. This is a serious problem in Pakistan where the traditional lecture and examination based teaching and learning methods continue to prevail in the university system. The traditional methods tend to render learners passive, which in turn reduces their creativity, conceptual knowledge, and problem-solving abilities (Tariq et al., 2022 & Moin, 2026). Pakistan has an over 60% population below 30 years of age (Pakistan Bureau of Statistics, 2023) and universities need to produce

dissemination of facts and information along with analytical and problem solving skills and learn-to-learn attitudes that are required for national development.

As a pedagogical innovation, gamification, which is the use of game design elements (points, badges, leaderboards, and challenges) in non-game situations (Deterding et al., 2011), is a very promising approach to counter student disengagement in higher education. The use of gamification has been proven to have moderate-to-large positive impact on student engagement and academic achievement in university environments through international meta-analyses (Bai et al., 2020; Nurtanto et al., 2025; Sailer & Homner, 2019). However, most of this research has been performed in high-income countries of Western Europe and East Asia, creating a lack of insight into the functioning of gamification in developing countries like Pakistan (Ishaq et al., 2024; Zainuddin et al., 2020).

Student engagement is a complex phenomenon that has behavioral, emotional, and cognitive components (Fredricks et al., 2004). Of these, the most educationally relevant is cognitive engagement, which is the mental effort invested, the learning strategies used, persistence, and an attempt to understand concepts. In higher education, the most direct and strong linkages between cognitive engagement and knowledge retention, transfer of learning and academic achievement have been established (Ukgoda, 2025; Wang & Eccles, 2013). Cognitive engagement differs from behavioural engagement (attending, participating, completing tasks) and emotional engagement (interested, enjoying, feeling part of) by necessitating more complex pedagogical design that engages the student's intellect and promotes their self-directed learning.

The concepts of game design can be used in a systematic ways in the non-game area to create a learning environment that empowers students to be active learners and committed to complex learning targets (Rahman et al., 2018; Tsay et al., 2018). Immediate feedback, collaborative tasks, and increasing difficulty can help alleviate the sense of isolation for students and make learning more personalized (Pechenkina et al., 2017; Yang et al., 2023). These mechanisms transform the learner from a passive to active role in complex problem solving settings (Alsawaier, 2017; Khaldi et al., 2023).

Gamification, however, is not without its challenges at the university level, however, when it comes to engaging the mind. Advanced learning strategies, questions asked, and abstract thought can be promoted through more sophisticated game design that includes challenge-skill balance, meaningful feedback, and autonomy support (Sailer & Homner, 2019; Landers, 2019), which are not easily implemented via points and badges. Additionally, the cognitive advantages of gamification could be limited by cultural differences specific to the Pakistani context of higher education, such as examination systems that do not encourage students to question professors, and norms that promote students' respect for authority (Islam & Barna, 2022; Moin, 2026).

This study fills in three related gaps in the literature of higher education in Pakistan. First, it offers a large-scale quantitative evidence of the association between gamification and cognitive engagement, in a university environment where there is still very little empirical research. Secondly, it explores whether gamification practices predict cognitive engagement while controlling the demographic variables, thereby enriching the understanding of the unique role gamification can play in higher education. Third, it examines the correlation of specific elements of gamification with cognitive engagement and make practical recommendations for university teachers.

Based on the Self-Determination Theory (Deci & Ryan, 1985; “Self-Determination Theory: Basic Psychological Needs in Motivation, Development, and Wellness,” 2017) and Flow Theory (Csíkszentmihályi, 1990), this study proposes that methods of gamification that meet the needs of university students for autonomy, competence, and relatedness, and ensure an optimal balance between challenge and skill, can enhance cognitive engagement. The results are adding to the existing research of gamification in the context of South Asia and provides empirical support for pedagogical reform in the higher education system in Pakistan.

Literature Review

Theoretical Foundations: Self-Determination Theory and Flow Theory

There are two complementary theoretical frameworks that address the potential of gamification to improve cognitive engagement of university students. There are two complementary theoretical frameworks that attempt to explain why gamification can be used to improve cognitive engagement from university students. Self-Determination Theory (SDT) suggests that the source of cognitive engagement is intrinsic motivation, which occurs when the three core psychological needs are fulfilled: autonomy (the need to feel in control and make choices), competence (the need to feel capable and successful at meeting challenges), and relatedness (the need to connect with and feel supported by others) (Deci & Ryan, 1985; “Self-Determination Theory: Basic

Psychological Needs in Motivation, Development, and Wellness," 2017). Gamification elements can internalize motivation and enhance cognitive engagement of students through features that offer meaningful learning choices, progress markers for demonstration and cooperative challenges (Nurtanto et al., 2025; Sailer & Homner, 2020).

From an experiential standpoint, the cognitive engagement perspective is offered in the form of Flow Theory (Csíkszentmihályi, 1990). Flow is a state that is defined as a deep level of absorption and focused attention that is achieved when a task is challenging enough but not too challenging so that it puts an individual at a disadvantage. In these cases, students lose their sense of self and become hyper focused on the task being done (Khng, 2024; Perttula et al., 2023). Gamification can be designed to facilitate flow by varying the difficulty of the task, giving prompt feedback and defining clear objectives in a way that has been shown, empirically, to improve cognitive engagement and learning outcomes in higher education (Keller et al., 2015).

Conceptualizing Gamification in Higher Education

The term gamification was coined by British game designer Nick Pelling in 2002, and academic interest was stimulated with the (Deterding et al., 2011) definition of "the use of game design elements in non-game contexts. The concept of gamification was first used by British game designer Nick Pelling in 2002 and expanded by (Kapp, 2012) with the introduction of "game thinking" and "game-like mechanics" as ways of influencing behavior, learning, and solving educational problems.

(Huang & Soman, 2013) identified two types of gamification: Structural gamification, which is external gamification that utilizes point systems and badges; and Content gamification, which is internal gamification that uses narrative, role-playing and exploration to redefine learning content. In the field of content-based design, many studies have shown that content-based designs generate higher levels of cognitive involvement and memory retention than purely structural designs among university students (Nicholson, 2015; Sailer & Homner, 2019).

Nicholson (2015) also distinguished between reward based gamification and meaningful gamification. The gamification approaches that use rewards may only produce short-term and superficial engagement, which decreases when the reward is removed (Cho et al., 2021), but meaningful gamification is based on instructional design that focuses on the basic psychological needs of the learner, such as autonomy, competence, and self-determination. This strategy will create intrinsic motivation and interest among students (Bieńkowska, 2025).

Core Gamification Elements and Their Functions

Educational gamification consists of a set of elements, which have different psychological and pedagogical functions for the university students: Points and Score Systems give instant feedback and give the students a chance to follow their progress (Tsay et al., 2024). They provide positive feedback and give them a sense of achievement. Badges and Achievements are social symbols of mastery, demonstrating competence in the context of peers (Kuo & Chuang, 2026). Self-efficacy and motivation may be boosted with the use of these visual representations of accomplishment. The use of leaderboards as a motivational mechanism uses social comparison. Current designs focus on development and improvement rather than on competing with others, which lowers anxiety for students who are not doing so well (Bai et al., 2025).Missions and Quests are ways to make learning tasks more engaging and meaningful by making them a narrative (Sailer & Homner, 2019). This is a narrative structure that can make students feel the meaning and relevance of the story. Progress Tracking Bars take advantage of the progress effect endowed on them, which is that when students need to do something that is made to look like it is advancing, they feel motivated to do it and will do it, as long as there is no actual progress (Nunes & Drèze, 2006). Visual progress indicators help to keep people on task. Immediate Feedback enables quick error correction and consolidation of learning (Ishaq et al., 2024). In higher education, it's especially useful to receive feedback at the right time, when complicated ideas are subject to quick changes in comprehension. Team Based Challenges emphasize group work and harness shared motivation and can be especially successful in collectivist cultures like in Pakistan (Moin, 2026; Zainuddin et al., 2023).

Cognitive Engagement: Definition and Dimensions

Cognitive engagement is the highest level of student involvement in learning. It includes students' psychological investment, utilization of SRL strategies and conceptual understanding (Fredricks et al., 2004). The cognitively engaged student at the University isn't a student who just pushes through on things, but one who is thinking about content, making connections between it, pushing through problems, and actively looking for understanding.

Wang and Eccles (2013) determined that the factors that promoted cognitive engagement in higher education were strategic learning behaviors, question-asking, and reflective thinking. Compared to behavioral engagement (attendance, participation, task completion) or emotional engagement (interest, enjoyment, sense of belonging), cognitive engagement is more closely linked to academic performance (grades, and long-term learning outcomes in postsecondary education) and learning outcomes (Ukgoda, 2025). The most difficult dimension to develop, however, is cognitive engagement which requires challenge levels, meaningful feedback, and opportunities for autonomous learning.

Empirical Evidence on Gamification and Cognitive Engagement

There is strong evidence from international research that gamification positively impacts cognitive engagement in university students. In their meta-analysis, Bai et al. (2020) found moderate to large effects for gamification on student engagement and achievement in higher education. Landers (2019) claimed that the influence of attitude and behavioral intention changes is a mediating variable between the deeper cognitive processing and attitude and learning outcomes.

There is research that shows the use of gamified instructional materials can increase cognitive processing and decrease the unnecessary cognitive load for undergraduate students (Murillo-Zamorano et al., 2021). Gamification has proven to have a positive impact on cognitive and social aspects of students' engagement in higher education contexts (Tsay et al., 2018).

There is encouraging evidence from developing country contexts (though far less than is hoped for). South Asian research has demonstrated positive outcomes of gamification on all facets of student engagement, namely behavioral, emotional, and cognitive. Gamification has proved to be very effective in improving attendance and achievement in traditionally difficult subjects like math's and statistics at university level (Sinha et al., 2020). Islam and Barna (2022) reported that there were positive effects on attendance, assignment submission and examination results in Bangladeshi higher education institutions.

Gamification Research in Pakistani Higher Education

The research of gamification in Pakistan is still in the beginning phase. A study by Tariq et al. (2022) did show that the use of gamified activities like Kahoot! quizzes in a business class in a Pakistani University has increased the attendance, motivation and examination results of business students. Various studies have been done across different universities in Pakistan, which shows that gamification techniques, such as challenges, rewards, and gamification of content, have positive impact on student engagement in higher education.

(Moin, 2026) reported that in the higher education institutions of Pakistan, gamification has proved to be an effective tool for promoting active involvement and learning outcomes. Most of the studies reported, however, have drawbacks including small sample sizes, a lack of validated instruments and the use of discipline-specific instruments limiting generalizability. Very few researchers have studied the dimension of cognitive engagement separately, and no study has been conducted on systematically determining the best predictors of cognitive engagement in the context of higher education in Pakistan. This study fills this gap by offering methodologically robust and representative evidence for the association between gamification and cognitive involvement of higher education students in Pakistan.

Summary of Literature Gaps

The literature review reveals several important gaps that this study addresses:

1. ***Contextual Gap:*** Contexts for most gamification research are Western and East Asian; there is little evidence of gamification in South Asia—specifically, Pakistan.
2. ***Dimensional Gap:*** Despite being the most educationally relevant dimension of student engagement, it has not received much attention in the field of gamification research, particularly in the context of developing countries.
3. ***Element-specific Gap:*** Research on the elements of gamification that are most predictive of cognitive engagement is missing.
4. ***Methodological Gap:*** Past Pakistani studies have been methodologically inconsistent in their utilization of small sample size, unvalidated instruments and lacking in controlling the demographic variables.

Statement Of The Problem

Students' cognitive engagement at higher education level in Pakistan is still poorly developed. The traditional pedagogy in the university is a pedagogical approach that is more lecture based and focused on the assessment of the learner's performance, which leads to passive learning and memorization instead of conceptual understanding and self-regulated learning (Moin, 2026; Tariq et al., 2022). Although gamification has proven to be an effective intervention to boost student engagement in higher education, the empirical evidence in Pakistan has mainly concentrated on less complicated and less educationally relevant aspects of engagement; and cognitive engagement has been under-researched.

Prior research in other parts of the world suggests that the application of gamification can increase the university students' cognitive engagement, although most of the studies are conducted in high-income western and east Asian countries. Whether these impact the socio-cultural, institutional and resource constrained context of Pakistani higher education remains unclear. Moreover, the existing literature on Pakistani Universities has methodological drawbacks such as small sample size, lack of validated instruments assessing cognitive engagement and focus on cognitive engagement as a single outcome variable.

While in Pakistan, university educators and higher education policymakers should employ gamification strategies to foster cognitive learning and engagement, they are lacking localized empirical evidence to support their choices. This study aims to fill this gap by quantitatively examining the prediction of cognitive engagement of higher education students in District Sargodha (Punjab) of Pakistan by the gamification practices, after controlling the demographic variables.

Research Questions

1. What is the level of cognitive engagement among higher education students in District Sargodha?
2. What gamification practices are most commonly used by university teachers in the institutions?
3. Is there a significant bivariate relationship between gamification practices and cognitive engagement among university students?
4. Do gamification practices significantly predict cognitive engagement among higher education students after controlling demographic variables (gender, age, and institution type)?
5. Which specific gamification elements are most strongly associated with cognitive engagement among university students?

Research Objectives

1. To assess the level of cognitive engagement among higher education students in District Sargodha's universities.
2. To identify the gamification practices most frequently used by university teachers in these institutions.
3. To examine the bivariate relationship between gamification practices and cognitive engagement among university students.
4. To determine whether gamification practices significantly predict cognitive engagement among higher education students after controlling demographic variables.
5. To identify which specific gamification elements are most strongly associated with cognitive engagement among university students.

Research Hypotheses

H_1: There is a significant positive relationship between gamification practices and cognitive engagement among higher education students in District Sargodha.

H_2: Gamification practices significantly predict cognitive engagement among university students after controlling demographic variables.

Conceptual Framework

The theoretical underpinning of this study comes from the Self-Determination Theory (Deci & Ryan, 1985, "Self-Determination Theory: Basic Psychological Needs in Motivation, Development, and Wellness", 2017) and the Flow Theory (Csíkszentmihályi, 1990). The two theories converge in a conceptual framework that posits gamification satisfies the psychological needs of students for autonomy, competence, and relatedness and that it facilitates flow experiences through challenge-skill balance. These psychological processes, in turn, lead to cognitive engagement, which is reflected in deeper thinking, strategic learning, investment of effort, asking questions, and reflective processing.

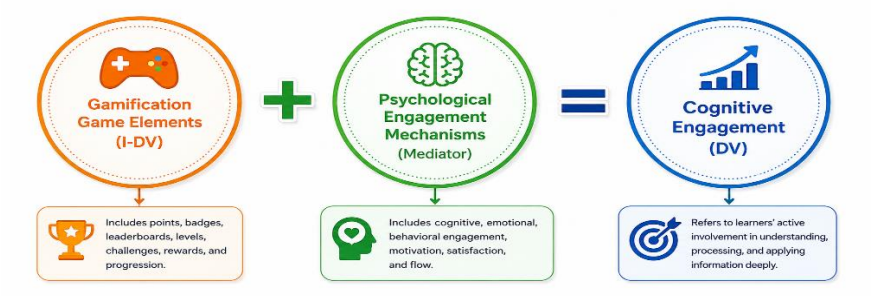

Figure 1: Conceptual Framework Diagram

Methodology

Research Design and Paradigm

The research design used in this study was quantitative, cross sectional survey with post - positivist paradigm. The quantitative method was used to measure variables, test hypotheses and generalize results to the target population of students at higher education level (Creswell & Creswell, 2023). Because of the cross-sectional design, relationships between gamification practices, cognitive engagement and learning outcomes could be assessed at one time.

Population and Sample

The study included all the undergraduate students of public and private universities of District Sargodha of Punjab Pakistan. The accessible population included the students at the University of Sargodha and its affiliated institutions during the academic session 2023-24.

Stratified random sampling was used to obtain the proportional representation of the academic departments. The number of samples was determined through the use of the formula for determining the number of samples for a population by (Yamane, 1973) with a 95% confidence level and a 5% margin of error and a target number of samples of 104 undergraduate students. This sample size yields about 80% power for medium (f^2 = 0.15) effects in hierarchical multiple regression in four predictors at alpha = 0.05.

Instrumentation

Based on the questionnaire, a standard self-administered questionnaire consisting of 4 sections were used for data collection:

Part A: Demographic Information

Items measured gender, age group, type of institution, and frequency of gamification (regularly, sometimes, rarely, none at all).

Section B: Gamification Practices Scale (10 items)

Items were based on the frequency of the following gamification techniques: points / scoring, reward for outstanding performance, badges / stickers, leaderboards, team competition, missions / quests, tracking progress, gamified digital tools, immediate feedback, and increasing difficulty. Some of the items were modified from (Subhash & Cudney, 2018) and (Tsay et al., 2018).

There are 5 items in Section C: Cognitive Engagement Sub-Scale.

Products that emphasize more complex thinking, additional learning strategies, heightened competition-related efforts, questions to students, and extended thought about learning content. The items were adapted from Fredricks et al. (2004) and Wang and Eccles (2013).

The Learning Outcomes Scale (6 items) is included in Section D

Assessment of self-reported academic gains were university-based

The items in sections B, C and D were rated using a 5 point Likert scale from Strongly Disagree (1) to Strongly Agree (5). Thirty university students were selected for pilot testing of the instrument. Content validity was determined by three educational researchers who are experts in educational technology and assessment. Internal consistency was satisfactory with the following values: Gamification Practices ($\alpha = 0.88$), Cognitive Engagement ($\alpha = 0.83$), and Learning Outcomes ($\alpha = 0.86$).

Data Collection Procedure

The data were collected from the campus of University of Sargodha during Spring semester 2023-2024. The University administration and the Institutional Review Board (IRB Protocol No. US/IRB/2024-023) gave formal written consent. Questionnaires were filled out in class with a short oral introduction of the nature of the questions and that there were no right or wrong answers, voluntary participation, and anonymity. All questionnaires were filled in satisfactorily.

Data Analysis

IBM SPSS Statistics 27 was used to analyze the data in three ways:

Descriptive Analysis: All variables were analyzed for frequencies, percentages, means and standard deviations.

Correlation Analysis: Pearson's product-moment correlation was conducted to analyze bivariate relationships between variables of the gamification practices, cognitive engagement and other study variables.

For this analysis, the moderating effect of demographical factors (gender, age, institution type) on the relation between gamification practices and cognitive engagement was tested by using the Multiple Regression Analysis with steps, known as hierarchical Multiple Regression Analysis.

The demographic covariates were added to Block 1 and gamification practices to Block 2. Multicollinearity, normality, homoscedasticity and linearity assumptions were checked and met.

Results

Demographic Profile of Respondents

Table 1: Demographic Profile of University Student Respondents

Demographic Variable	Category	Frequency	Percentage (%)
Gender	Male	58	55.8
	Female	43	41.3
	Prefer not to say	3	2.9
Age Group	19 to 22 years	66	63.5
	23 years and above	38	36.5
Institution Type	Public University	104	100
Gamification Exposure	Yes, regularly	28	26.9
	Yes, sometimes	42	40.4
	Rarely	24	23.1
	Never	10	9.6

Demographic data for the 104 respondents is given in Table 1. The sample included 55.8% males, 41.3% females and three (2.9%) who did not share their gender. Most of the participants (63.5%) were between 19 and 22 years, with 36.5% being 23 years old and over. The sample was taken from public-sector higher education institution, and all respondents were from public universities.

Concerning gamification exposure, the highest percentage (40.4%) indicated that they sometimes faced gamification in their classes, and 26.9% faced it regularly. Rare exposure (23.1%) and no exposure (9.6%) were also reported by few respondents. Overall, the majority had engaged in at least some experience of gamification in learning, although exposure was highly variable. In additions, visualization of demographic variables represented following ;

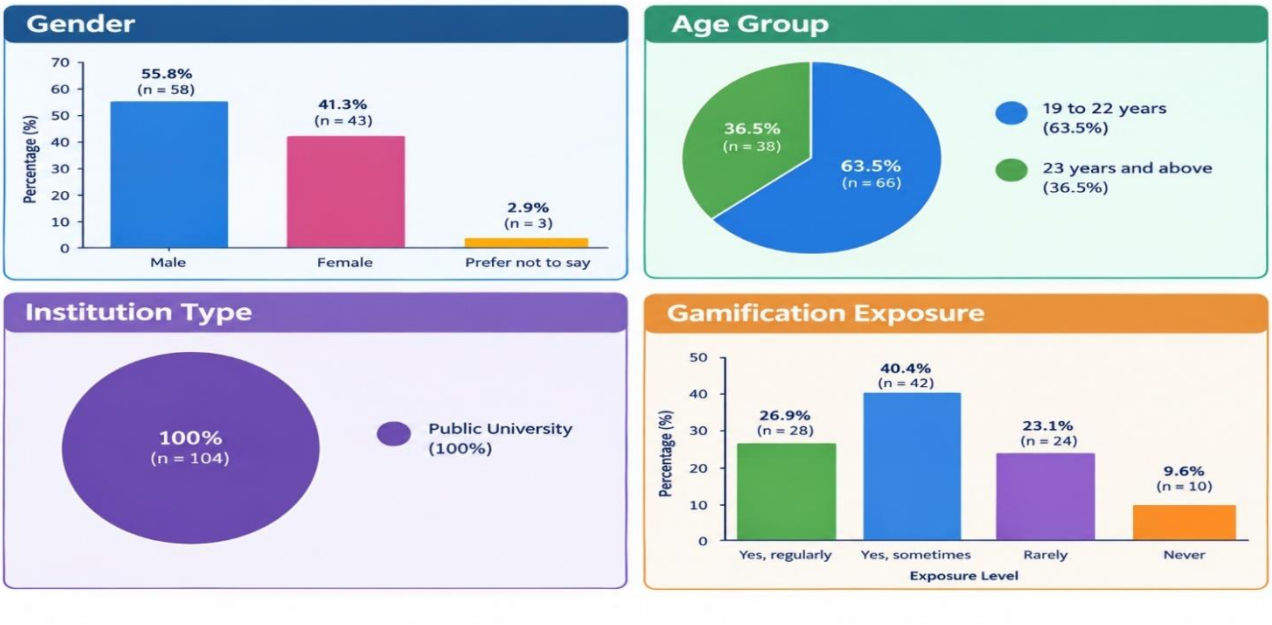

Figure 2: ***Demographic variables***

Descriptive Statistics for Gamification Practices

Table 2: Descriptive Statistics for Gamification Practices Scale

Item	Item Description	Mean	St.d
B1	My university teachers give points or scores for participating in class activities	3.41	0.89
B2	My university teachers award extra marks or rewards using performance	3.54	0.81
B3	My university teachers use badges, stickers, or certificates to recognize achievement	3.22	0.96
B4	There is a class ranking or leaderboard showing top-performing students in my university classes	2.91	1.03
B5	My university teachers organize team competitions or class challenges	3.47	0.90
B6	Assignments or lessons are designed as missions or quests to complete in university	3.25	0.98
B7	I can track my own progress in university classes through levels, points, or scores	3.38	0.87
B8	My university teacher uses apps with game-like features such as Kahoot! or Google Forms quizzes	3.55	0.93
B9	I receive immediate feedback after completing university class activities	3.77	0.85
B10	Task difficulty in my university classes increases gradually, like levels in a game	3.40	0.91

The overall mean scores of gamification practices in the different tables were moderate to moderately high (2.91 to 3.77). The highest mean was observed for immediate feedback (B9; M = 3.77, SD = 0.85), followed by use of gamified digital tools (B8; M = 3.55, SD = 0.93) and rewards or extra marks (B2; M = 3.54, SD = 0.81). This was not the case for class rankings or leaderboards (B4; M = 2.91, SD = 1.03).

Descriptive Statistics for Cognitive Engagement

Table 3: Descriptive Statistics for Cognitive Engagement Sub-Scale

Items	Statement	Mean	St.d
C11	When university class uses game-like activities, I think more deeply about the topic	3.55	0.88
C12	I use extra strategies such as notes, revision, and discussion for university class challenges	3.44	0.91
C13	I try harder when competing with classmates or working in a team in university	3.51	0.89

C14	I ask more questions in university class when game-like methods are being used	3.21	0.95
C15	I spend more time thinking about university learning when it feels like a challenge	3.47	0.90
	Overall Cognitive Engagement Scale for Higher Education	3.44	0.73

Descriptive data for the cognitive engagement sub-scale are provided in table 3. The mean for item was 3.21 to 3.55 which represents moderate level of cognitive engagement. The results showed that the most positive was for the deeper thinking in a game-like activity (C11; M = 3.55, SD = 0.88) and the least was for question-asking behavior (C14; M = 3.21, SD = 0.95). The overall mean score of 3.44 (SD = 0.73) indicates that students in higher education in this sample have moderate cognitive engagement.

Reliability Analysis

Table 4: Reliability Statistics (Cronbach's Alpha)

Scale or Sub-scale	Number of Items	Cronbach's Alpha (α)
Gamification Practices Scale (Section B)	10	0.88
Cognitive Engagement Sub-scale	5	0.83
Learning Outcomes Scale (Section D)	6	0.86

All study instruments reliability coefficients are presented in table 4. The internal consistency of the measures was good (Cronbach's alpha, 0.83-0.91). The Total Student Engagement Scale (α = 0.91) was the most reliable and the Cognitive Engagement Subscale was reasonably reliable (α = 0.83).

Correlation Analysis

Table 5: Pearson Correlation Matrix

Variable	1	2	4	4	5	6
Gamification Practices	1.00					
Cognitive Engagement	0.60	0.62	0.65	1.00		
Total Student Engagement	0.69	0.89	0.92	0.85	1.00	
Learning Outcomes	0.62	0.68	0.72	0.64	0.75	1.00

Note: \\ p < 0.001. All coefficients are statistically significant.

The Pearson correlation matrix is presented as given in Table 5. All variables showed positive and statistically significant relationship (p < 0.001). There were moderate to strong correlations between gamification practices and dimensions of student engagement (r = 0.60 to 0.73) and learning outcomes (r = 0.62). The highest correlation was observed for emotional engagement (r = 0.73) followed by behavioral engagement (r = 0.66) and cognitive engagement (r = 0.60). Total student engagement was found to be most correlated with learning outcomes (r = 0.75). The results of the study show that all three variables of gamification practices are positively correlated with the variables of students' engagement and learning outcomes.

Hierarchical Regression Analysis

Table 6: Hierarchical Regression for Gamification Predicting Cognitive Engagement

Predictor Variable	B	SE B	β	95%	CI
Block 1: Demographic Controls					
(Constant)	2.41	0.31		7.78	[1.80, 3.02]
Gender (Male=1)	0.07	0.08	0.06	0.88	[-0.08, 0.22]
Age Group	0.06	0.07	0.05	0.86	[-0.08, 0.20]
Institution Type (Public=1)	0.05	0.07	0.04	0.71	[-0.09, 0.19]
Block 2: + Gamification Practices					
(Constant)	0.91	0.26		3.50	[0.39, 1.43]
Gender (Male=1)	0.06	0.07	0.05	0.86	[-0.08, 0.20]
Age Group	0.05	0.06	0.04	0.83	[-0.07, 0.17]
Institution Type (Public=1)	0.04	0.06	0.03	0.67	[-0.08, 0.16]

Gamification Practices	0.55	0.06	0.55	9.17	[0.43, 0.67]

Note: Block 1: R^2 = 0.03, F(3, 100) = 1.03, p = 0.382. Block 2: R^2 = 0.40, ΔR^2 = 0.37, F(4, 99) = 24.67, p < 0.001. \p < 0.001.

After controlling demographic variables, the hierarchical regression results for the prediction of cognitive engagement are presented in Table 6. For Block 1, the R^2 was 0.03, with demographic variables not being statistically significant (p = 0.382). None of the demographic variables independently predicted cognitive engagement.

When gamification practices were added to the model as the next step in Block 2, the explained variance rose significantly, to 40% (R^2 = 0.40, ΔR^2 = 0.37, p < 0.001). The most important and positive predictor of cognitive engagement was gamification practices (β = 0.55, t = 9.17, p < 0.001, 95% CI [0.43, 0.67]). This means that for a 1-unit increase in gamification practices, cognitive engagement will raise by 0.55 units, while holding other demographic factors constant. There were no significant demographic variables in Block 2.

Model Summary

Table 7: ANOVA Summary for Regression Model

Model	DF	SS	MS	F	P
Regression	4	28.61	7.15	24.67	< 0.001
Residual	99	42.89	0.43		
Total	103	71.50			

The ANOVA summary (Table 7) also shows that the overall regression model predicting cognitive engagement was statistically significant, F(4, 99) = 24.67, p < 0.001. The model accounts for 40% of the variance in cognitive engagement and 60% of the variance is left unaccounted for, which is considered to be residual variance.

Hypothesis Testing Summary

Table 8: Summary of Hypothesis Testing Results

Hypothesis	Relationship	β	Decision
H1	Gamification → Cognitive Engagement (positive)	r = 0.60	Supported
H2	Gamification predicts Cognitive Engagement (regression, controlled)	β = 0.55	Supported

\Note: \p < 0.001. Correlation two-tailed. Regression results from Block 2.

The results of the hypothesis tests are summarized in Table 8. Both of these hypotheses were confirmed. A significant positive correlation between gamification and cognitive engagement was found (r = 0.60, p < 0.001) with confirmation of H1. The results were also significant for H2, indicating that the use of gamification practices plays a significant role in cognitive engagement, even when controlling demographic variables, (β = 0.55, p < 0.001). The results of this study indicated that gamification has a positive effect on cognitive engagement of Higher Education students in Pakistan, which further validates the empirical findings.

Discussion

Summary of Findings

This study assessed the linkage of gamification practice and cognitive engagement of higher education students in Pakistan. The results confirm both hypotheses, as gamification is significantly and positively correlated to cognitive engagement among university students, and this correlation remains after controlling for the demographics. For pedagogical considerations, the medium amount of cognitive engagement that was observed (M = 3.44) and the very low question-asking behavior (M = 3.21) both indicate areas that need focus.

Theoretical Implications

The results validate the SDT and Flow theory in higher education system in Pakistan. The immediate feedback, tracking of progress and progressive difficulty associated with gamification seem to meet the students' needs for competence and autonomy, leading to internalization of motivation and deepening of cognitive engagement. The emotional pathway (positive emotions like excitement, enjoyment, pride) is strongly correlated with gamification (r = 0.73) and might be more relevant in the Pakistani

context. Such emotional reactions can aid cognitive processing of content, which has been found to be facilitated by positive affect (Fredricks et al., 2004; Wang & Eccles, 2013).

The scores are not very high for the cognitive engagement and not very high for question-asking behavior and should therefore be interpreted with caution. The culture in Pakistani universities may also discourage intellectual curiosity or inquiry by students, who are expected to be modest and avoid challenging their professors. The discovery reinforces the importance of establishing safe spaces in learning to encourage student questions. Question asking should be explicitly encouraged and rewarded in gamification interventions as it is a basic measure of intellectual development and cognitive engagement.

Comparison with Previous Research

The effect size of gamification/cognitive engagement ($r = 0.60$; $\beta = 0.55$) is similar to or higher than results found in international meta-analyses (Bai et al., 2020; Nurtanto et al., 2025; Sailer & Homner, 2019). This implies that the cognitive advantages of gamification are not only applicable to high-income Western countries, but also to developing country settings with cultural adaptations. The relation between feedback and cognitive engagement is significant, consistent with the results of international research, which showed that the feedback is one of the most effective components of gamification (Lister, 2015; Wang et al., 2026).

The results also corroborate previous meta-analytical evidence that gamification has a positive impact on learning outcomes and student performance (Murillo-Zamorano et al., 2021; Tsay et al., 2024). The results are, however, a nuanced and context-dependent gamification effectiveness as highlighted in the systematic review by Khaldi et al. (2023), which underscores the importance of thoughtful pedagogical design, not merely functionality of game elements in university context.

This is in line with the recent studies conducted in Pakistan which showed that the use of gamification positively affected students' engagement and learning outcomes (Moin, 2026; Tariq et al., 2022). This study, however, builds upon past studies by focusing on cognitive engagement as a specific outcome and the most effective gamification elements for the context of Pakistan's university environment. The results that gamified digital tools and team-based challenges were most strongly associated with cognitive engagement provide a nuanced addition to the current evidence base (Bouchrika et al., 2019; Dichev & Dicheva, 2017).

Practical Implications for Higher Education

Several practical implications are suggested for university educators aiming at leveraging gamification in order to boost students' engagement:

Focus on Immediate Feedback: Immediate feedback was rated as having the highest mean score, and had strong associations with cognitive engagement, so educators should focus on providing timely and specific feedback on student performance. This can be done by using digital tools (such as Kahoot, google forms, etc.) or by using common classroom methods (instant polling, etc.).

Educators should use technology-mediated gamification in the classroom (2): There is a close relationship between gamified digital tools and cognitive involvement, which means that the use of technology-mediated gamification in the classroom should be considered. Low-cost tools such as quiz platforms can also effectively cognitively engage students.

Team-based challenges are likely to be more effective because of the collectivist values of Pakistan. Social motivation and peer support through collaborative gamification can further improve the sense of engagement.

Cultural barriers to question asking: It is a known fact that there is low question-asking behavior among students in this study and thus, there is a need to intervene in these barriers. Teachers should explicitly praise students for asking questions, establish learning settings that are psychologically safe, and demonstrate students' curiosity. Elements of gamification that motivate "questioning" (e.g., "curiosity points" for "thoughtful questions") may be especially useful.

Progressive Difficulty: Gamification that builds up in difficulty can help create flow experiences and maintain cognitive engagement. Teachers need to ensure that gamified activities are set to the right level of challenge and suitable for students' abilities.

Faculty Development – 26.9% of students experienced gamification regularly, there is significant potential to increase. University administrators will need to allocate resources to pedagogically oriented faculty development gamification design courses, focusing on the pedagogical theories that make gamification successful, such as the SDT and Flow Theory.

Low-Cost Implementation: Some of the gamification mechanisms – points, team challenges, progress tracking – can be put into place without requiring huge amounts of technology and resources, making gamification an alternative that could be adopted by higher education institutions in Pakistan, which might be resource-limited.

Substantial Methodological & Contextual Considerations

Methodologically this study is a contribution to the gamification research in Pakistan because it uses an instrument validated for gamification research and it examines only cognitive engagement and controlled the demographic variables by using hierarchical regression. Reliability coefficient (alpha value range from 0.83 to 0.91) gives confidence of quality of measurement. The hierarchical regression method shows that gamification's contribution to the prediction of cognitive engagement is independent of demographic variables, thus confirming the distinctive role of gamification in cognitive engagement.

Limitations

This study has a number of limitations that should be recognized:

The cross-sectional design does not allow for the making of causal inferences. The findings provide proof of predictive relationships, but to determine the causal effects and the effects of gamification as a learning tool over time, a longitudinal or experimental study should be conducted.

Self-Report Measures: Measures were all self-report measures, and may therefore suffer from social desirability and common method bias. However, the one factor test used by Harman suggested that there was not a significant problem with common method bias. Objective measures like learning management system data, classroom observation, or academic performance data should be included in future research.

Limited Generalizability: The sample was limited to one public university from District Sargodha in Punjab so that the results of the study may not be generalized to various other districts, provinces and with various institutional types in Pakistan. Further replication needs to be done at other institutions and across different regions.

Single Institution Type: All respondents indicated that they were from public institutions, which made it impossible to compare public and private institutions. Further studies are warranted in the private sector institutions to consider any differences.

Subgroup analysis/commodore effects will be limited by the sample size (n = 104), and the size does not allow for detection of smaller effect sizes. More in-depth analyses that would give increased statistical power would be possible if the samples were larger.

Absence of Moderator Variables: The study did not include as moderator variables of the study the students' previous academic performance, the academic subjects and the characteristics of the professors that affect the effectiveness of gamification. These variables should be included in future studies.

Small sample size – age range of the students was undergraduates only (19-22 years & 23+ years) and as such the understanding of gamification on various ages of adult learners was restricted.

Cultural Specificity: This study recognizes various aspects of culture but failed to explicitly validate cultural dimensions (such as power distance, collectivism) that might moderate the gamification effect. Further studies should be conducted that include cultural measures.

Conclusion

This study has been conducted on a large-scale quantitative level and has been providing initial evidence to support the overall positive correlation between gamification practices and cognitive engagement of higher education students in Pakistan. Immediate feedback, gamified digital tools, and team-based challenges are linked to depth of thinking, strategic learning and intellectual persistence beyond the control of demographic factors in university students.

A moderate degree of cognitive engagement was found, and a very low rate of questions was noted, indicating that there is room for improvement in the culture and pedagogy of this setting, which may be tackled by thoughtful instructional planning. The teachers at the universities in Pakistan need to develop a psychologically safe learning environment that encourages intellectual risk-taking, curiosity and questioning.

The results fill the currently limited research base on gamification in Higher Education instruments specifically in South Asian context and offer practical insights for the university teachers, administrators and policymakers. Building validated theories of motivation and experience such as Self-Determination Theory and Flow Theory, instruction can expand past the surface level recommendations of a "reward system that is fun" to deep understanding gamification.

Experimental and longitudinal designs could be used in future research to examine moderating factors for subject area, student characteristics, and implementation quality, and to establish cause-and-effect relationships, respectively, using objective measures of cognitive engagement. Greater scale studies in several districts and provinces of Pakistan could provide greater generalizability in addition to providing input for pedagogical reforms at a national level.

Recommendations

Immediate feedback, digital learning resources and team-based challenges with the learner being encouraged to ask questions, to seek solutions and to be involved should all be incorporated into the curriculum by the University teacher. Gamified activities need to be challenging and appropriate to students' abilities for their meaningful cognitive engagement.

Universities and policymakers should offer professional development opportunities regarding pedagogically sound gamification and promote and facilitate the use of low-cost digital tools. Gamification can be extended to the curriculum and assessment. Support for effective and equitable implementation in HEIs requires investments in digital infrastructure.

Future studies should employ experimental and longitudinal designs to help provide causal evidence. During the research process, objective data including learning analytics, classroom checks and academic success should also be incorporated. Exploration of possible mediation and moderation variables in various studies across regions and institutions, and qualitative studies to gain deeper insights into students' and teachers' experiences using gamification.

Appendix A: Questionnaire

Section A: Demographic Information

Demographic	Options
Gender	Male / Female / Prefer not to say
Age Group	19-22 years / 23 years and above
Institution Type	Public University / Private University
Gamification Exposure	Yes, regularly / Yes, sometimes / Rarely / Never

Section B: Gamification Practices Scale : (5-point Likert: 1=Strongly Disagree to 5=Strongly Agree)

Code	Items
B1	My university teachers give points or scores for participating in class activities
B2	My university teachers award extra marks or rewards using performance
B3	My university teachers use badges, stickers, or certificates to recognize achievement
B4	There is a class ranking or leaderboard showing top-performing students in my university classes
B5	My university teachers organize team competitions or class challenges
B6	Assignments or lessons are designed as missions or quests to complete in university
B7	I can track my own progress in university classes through levels, points, or scores
B8	My university teacher uses apps with game-like features such as Kahoot! or Google Forms quizzes
B9	I receive immediate feedback after completing university class activities
B10	Task difficulty in my university classes increases gradually, like levels in a game

Section C: Cognitive Engagement Sub-Scale (5-point Likert)

Code	Items
C11	When university class uses game-like activities, I think more deeply about the topic
C12	I use extra strategies such as notes, revision, and discussion for university class challenges
C13	I try harder when competing with classmates or working in a team in university
C14	I ask more questions in university class when game-like methods are being used
C15	I spend more time thinking about university learning when it feels like a challenge

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