

The Impact of Gamification-based Platforms on Improving the Need for Cognition Among Higher Education Students

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Abstract

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Gamified learning platforms enhance university education methodologies through diverse motivational techniques and fostering more engaging learning patterns than conventional methods. The need for cognition is regarded as a significant cognitive variable in higher education, as it embodies the learner's inclination to investigate, contemplate, and engage thoroughly in information processing. This study aims at evaluating the effect of a gamified educational platform on enhancing the need for cognition among university students, by contrasting its efficacy with that of a comparable platform devoid of gamification elements. The research employed a quasi-experimental design including two groups of university students, comprising a total of (63) participants, who were randomly allocated. The initial experimental group, that includes 31 students, engaged with a platform augmented with gamification elements (points, badges, levels, and leaderboards), whereas the subsequent experimental group that includes 32 students, accessed the identical content via the platform without the activation of the gamification features. The Cognition Need Scale, validated for reliability, was employed to assess the influence of gamification on augmenting cognitive engagement among students. The results indicated that the group utilizing the gamified platform surpassed the others in the post-assessment, accompanied by a substantial effect size that substantiates the efficacy of gamification aspects in fostering the need for cognition and augmenting cognitive engagement. The study results demonstrate that the incorporation of gamification into university digital platforms signifies a favourable development in higher education, as it fosters the creation of engaging and more motivating learning environments.

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Introduction

Gamification-based Platforms

Gamification entails the use of elements sourced from digital games, including points, badges, leaderboards, progress bars, and other game-related features, in non-gaming educational contexts to stimulate and engage learners in the completion of educational tasks (Deterding et al., 2011; Leclercq et al., 2020). Creating educational programs utilizing gamification entails incorporating learning objectives, content, procedures, strategies, and activities that engage learners and encourage completion solely through these motivating elements within a framework of organized, non-game-based processes (Mitchell et al., 2020). This indicates that while learners endeavour to meet the program's objectives and fulfil each task, they are connected to established motivational factors that are awarded immediately following work completion, based on explicit criteria that ascertain the learner's eligibility for the incentive. The scores awarded to each learner fluctuate according to their degree of task completion (Zainuddin et al., 2020). It is essential to underscore that gamification is not synonymous with a game-based learning approach. Game-based learning fulfils its content and educational objectives through a primary game or multiple games that serve as the central focus of the educational context. In contrast, motivation-based learning does not rely on a specific game but incorporates various game elements and principles within educational activities and tasks to motivate learners and provide rewards, thereby sustaining a high and continuous level of motivation (de-Marcos et al., 2016).

The growing popularity of utilizing gamification in educational settings arises from its direct influence on learner outcomes (Leclercq et al., 2020). Gamification is an educational strategy that promotes learning, increases student engagement and interaction with educational material, and encourages learners, resulting in augmented cognition and improved cognitive skills (Ding, 2019; Sanchez et al., 2020). Moreover, the implementation of gamification substantially enhances social interaction among learners and promotes electronic feedback on digital learning materials (Chen et al., 2020; Hassan et al., 2019). The modular design of digital motivators enhances learner performance and boosts motivation to accomplish educational tasks, thereby elevating achievement levels (Groening & Binnewies, 2019). Gamification can positively influence engagement (Alzahrani et al., 2022), ambition (Alrashedi, Alsulami, et al., 2024; Alrashedi, Najmi, et al., 2024), passion (Alsuhaime et al., 2026), motivation (Al-Hafdi & Alhalafawy, 2024), self-regulated learning (Alhalafawy & Zaki, 2022), and psychological well-being (Alhalafawy & Zaki, 2019).

The spread of gamification has led to the advent of various digital platforms that permit the administration of educational contexts through incentive mechanisms, enabling educators to track student performance and confer digital rewards based on their achievements on the platform. Furthermore, several platforms autonomously administer gamification, contingent upon the learner's satisfaction of designated criteria, hence automatically conferring points, badges, and other motivational components (Alla & Nafil, 2019; Chen et al., 2020; Sanchez et al., 2020). Digital platforms provide an advantageous setting for disseminating educational content in nontraditional contexts through various incentive mechanisms incorporated within these platforms. Students on digital platforms can earn points or badges and may appear on leaderboards; thus, it is essential to analyse the framework of digital incentives across platforms and ascertain the mechanisms for their presentation and

management to maximize benefits from these platforms. This necessity is underscored by various studies indicating that the application of gamification techniques and tools in digital contexts necessitates further investigation (Alshammary & Alhalafawy, 2023; Alzahrani & Alhalafawy, 2023).

Need for Cognition

The need for cognition is a crucial factor for university students, acting as an indicator of learning due to its association with cognitive development. This is regarded as a desirable learning outcome (Goodman, 2011). A correlation exists between the necessity for information and academic achievement; individuals with elevated cognitive needs utilize comprehensive and profound learning procedures, resulting in enhanced comprehension and, subsequently, improved performance on educational tasks (Coutinho, 2006). The extent of cognition requirement affects a learner's participation in educational activities and assignments (Soubelet & Salthouse, 2017). Individuals with a high need for cognition typically organize, analyse, and evaluate the information they receive, exhibit greater engagement in problem-solving tasks, and are more focused on cognitive processes that demand increased effort, in contrast to individuals with a low need for cognition (Luong et al., 2017). Consequently, learners will participate in various learning contexts to the degree that these contexts are crafted to provoke their thirst for cognition and fulfil their intellectual aspirations (Strobel et al., 2017). The traits of individuals with a pronounced desire for cognition indicate the potential for investigating the connection between digital motivation platforms and this desire, due to their significant association with motivation to engage in the learning process, the development of learning experiences, and their effect on enhancing learner engagement rates across diverse educational activities and tasks (Bruinsma & Crutzen, 2018; Ding, 2019).

Examining the influence of gamification-based platforms on the enhancement of cognitive acquisition is therefore crucial, considering gamification's direct effect on educational outcomes. While gamification functions as an educational strategy to enhance certain learning outcomes, the need for cognition represents a vital factor associated with cognitive development and the capacity to utilize profound understanding techniques. This connection is especially important considering university students' necessity for intellectually challenging learning environments that promote the organization and evaluation of cognition and the exertion of effort in problem-solving. This corresponds with gamification's capacity to enhance various factors, including motivation (Al-Hafdi & Alhalafawy, 2024), passion (Alsuheimi et al., 2026), and psychological well-being (Alhalafawy & Zaki, 2019). Thus, analysing the correlation between gamification-based platforms and the need for cognition aids in comprehending how to construct educational environments fulfil learners' cognitive requirements and enhance academic performance by fostering social interaction and engagement with intricate learning tasks.

Statement of Problem and Rationale

Due to the increasing prevalence of educational research investigating the effects of gamification on various learning outcomes (Bai et al., 2020), including academic achievement (Alomair & Hammami, 2024), engagement and motivation (Alsawaier, 2018), academic performance (Arufe Giráldez et al., 2022), test performance (Attali & Arieli-Attali, 2015), and cognitive attention and dissemination (Capatina et al., 2024), it is noted that despite

this rich body of research, there is a scarcity of studies addressing the relationship between gamification-based platforms and the variable of need for cognition. This research gap is underscored, given the essential role of the need for cognition as a psychological and cognitive variable that influences a person's willingness to participate in intricate cognitive processes and apply mental effort. In addition, this study is crucial as the need for cognition is a fundamental indicator of learning and cognitive development, particularly pertinent to higher education students who encounter academic tasks necessitating profound comprehension, analysis, and evaluation of information. Considering that a university student's reaction to educational contexts is contingent upon the degree to which those contexts engage and fulfil their cognitive requirements, it is essential to investigate how gamification might do this via digital platforms.

Moreover, recognizing the need for cognition and striving to cultivate it in the learner is deemed essential; as the greater the learner's need for cognition, the more substantial the efforts invested in the learning process, alongside a profound enjoyment of all educational activities (Maloney & Retanal, 2020). This is undoubtedly the objective of any educational institution, that is, to encourage learners to expend maximum effort in a stimulating and enjoyable environment. The desire for information serves as an inherent motivator to participate in more effortful cognitive processes. An individual motivated by internal factors discovers that the action encompasses intrinsic rewards. Consequently, individuals persist in this activity without external incentives due to their intrinsic motivation, pleasure, and enthusiasm. The emotional dimension of the need for information explains why learners with a pronounced need for cognition perceive thinking as a joyful endeavour (Coutinho, 2006; He et al., 2019). This is undoubtedly a primary incentive for investigating the correlation between gamified platforms and the need for cognition.

Study Objective and Questions

The primary aim of this study is to investigate the influence of gamified educational platforms on raising the level of the need for cognition among higher education students. This involves identifying the necessary design elements for these platforms and assessing their efficacy in fostering the need for cognition. The inquiries of this study centre on:

- 1- How can gamified learning platforms be designed to ensure that they enhance the need for cognition among higher education students?
- 2- How effective are gamified learning platforms in improving the need for cognition among higher education students?

Study Hypotheses

Drawing upon a multitude of investigations that have concentrated on the concept of gamification and its proven efficacy in enhancing various educational outcomes, including academic performance (Groening & Binnewies, 2019) and self-regulated learning (Alhalafawy & Zaki, 2022), alongside findings that highlight its positive impact on psychological factors such as psychological well-being (Cheng et al., 2019) and ambition (Alrashedi, Alsulami, et al., 2024; Alrashedi, Najmi, et al., 2024), the hypothesis for this research was articulated as follows:

- A statistically significant difference exists at the level ≤ 0.05 among the mean scores of the first experimental group (gamification-based platform), the second experimental group (non-gamified platform), and the control group (traditional method) in the post-measurement of the need for cognition. This difference is attributed to the influence of digital stimuli in favour of the first experimental group utilizing the gamification-based platform.

Theoretical Framework

A set of factors is responsible for the intrinsic motivation and enjoyment of any activity, as per the Basic Psychological Needs Theory (BPNT); these factors include autonomy, competence, and relatedness (Ryan & Deci, 2000). The digital motivation systems support autonomy by providing learners with a sense of will and freedom in task execution, stimulating competence by allowing learners to feel effective in completing tasks and influencing their environment, and finally encouraging relatedness, which is derived from learners establishing social relationships with peers within the learning environment and feeling a sense of belonging to the groups formed during task execution (Sailer et al., 2017; Suh et al., 2015).

The Behaviourism Theory (BT) is regarded as a significant framework that underpins the integration of gamification via digital platforms to foster the need for cognition. The behaviourist theory conceptualizes behaviour as a series of responses elicited by stimuli present in the immediate external environment. These responses may receive reinforcement, thereby enhancing their future occurrence, or they may lack support, leading to a diminished likelihood of their recurrence. The process of learning is fundamentally grounded in the support and reinforcement of performance that is closely aligned with the desired behaviour. This approach emphasizes the utilization of digital stimuli to enhance and consistently motivate learners in their pursuit of completing educational tasks (Bíró, 2014). This is consistent with Skinner's Principle of Partial Reinforcement, which suggests that intermittent or selective reinforcement results in increased persistence of behaviours and inhibits the extinction of positive responses, in contrast to continuous reinforcement (Richter et al., 2015).

The application of gamification within educational settings is associated with Motivation Theory (MT), particularly concerning extrinsic motivation that is characterized by a range of external incentives aimed at learners via digital platforms across diverse contexts (Aguiar-Castillo et al., 2020). This form of incentive, grounded in gamification, is crucial for encouraging learners to engage with and find enjoyment in their tasks. It serves to connect intrinsic motivations with the learner's current capabilities (Alsuhaimi et al., 2026). A learner may possess an intrinsic motivation to achieve excellence; however, their scientific and cognitive capabilities might not support this aspiration. Consequently, external incentives are crucial in encouraging the learner to attain the desired level (Zichermann & Cunningham, 2011).

Methods

Approach

The present study utilized a quasi-experimental approach, deemed most appropriate for examining the causal

relationship concerning the influence of gamification-based platforms on the enhancement of the need for cognition among students in higher education. This methodology facilitates an analysis of the influence exerted by the independent variable (gamification-based platforms) on the dependent variable (need for cognition) in regulated educational settings, thereby enabling a more precise verification of the independent variable's effect. The study utilized a descriptive-analytical approach throughout the research and design phases to examine the characteristics of gamified platforms and to define the dimensions and components associated with the need for cognition.

Experimental Design

The experimental design with two groups, the experimental and control groups, was used. The first experimental group is the one that will be taught using gamified platforms, while the second experimental group uses the same platforms but without gamification. Figure 1 illustrates the experimental design for the research.

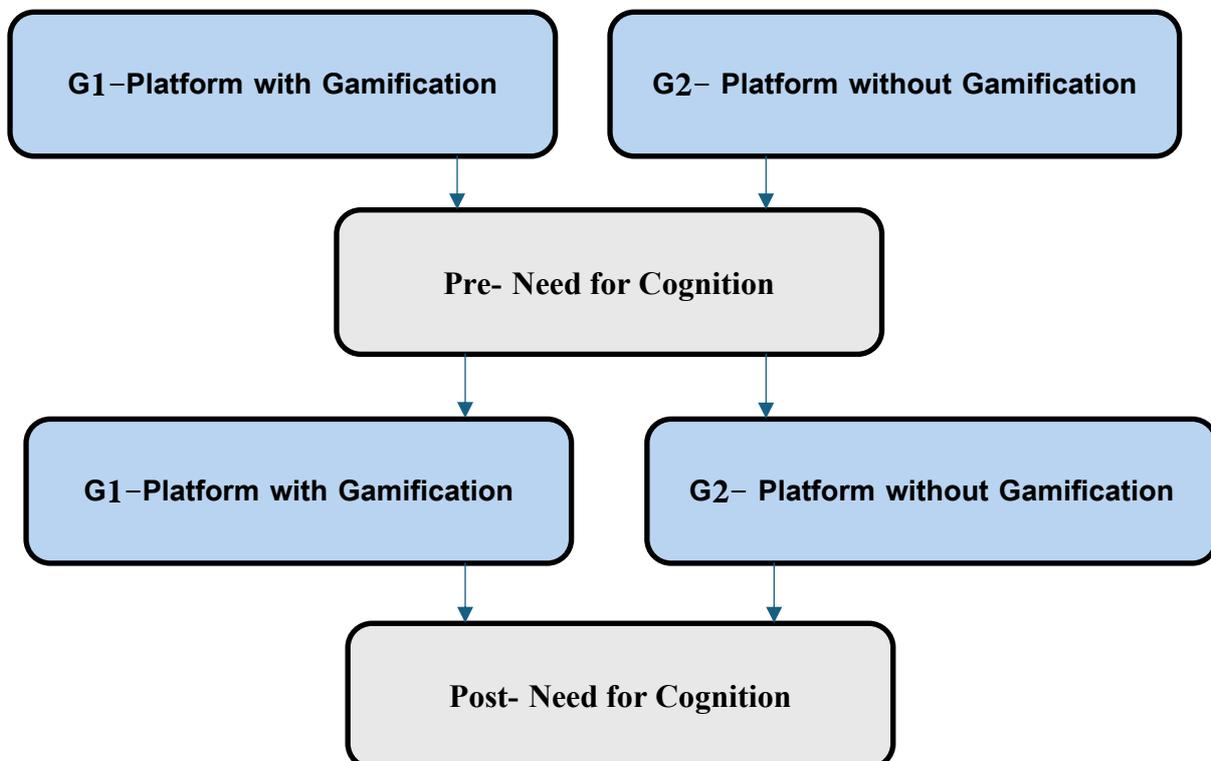


Figure 1. The Experimental Design for the Research

Sample

The research sample comprised (63) female students from the College of Social Sciences at the University of Jeddah, enrolled in media and communication technology courses during the second semester of the 1447 AH academic year. The participants' ages varied from (19 to 22) years, with a mean age of (20.4) years. The sample was randomly chosen among students who met the inclusion requirements, which comprised: current enrolment in the mobile phone media course, consistent attendance at lectures, and fundamental proficiency in utilizing

digital learning platforms. However, cases that did not fulfil the pre- or post-measurement protocols were eliminated to enhance the integrity of the final data.

The female students were categorized into two groups: an experimental group including (32) students who underwent experimental processing using gamification-based platforms, and a control group of (31) students who utilized the same platform without engaging the gamification features. The experiment endured for a duration of four weeks.

Informed consents were secured from all participants, highlighting data confidentiality and its exclusive use for scientific study objectives. Both groups were afforded equal educational settings, and a pre-test was administered to ascertain their equivalence in the dependent variable prior to the commencement of the experimental treatment.

Need for Cognition Scale

The Need for Cognition Scale was developed by Cacioppo et al. (1984) and adapted to Arabic by Jaradat & Al-Ali (2010) to measure the level of need for cognition at three levels (high, medium, low). The final version of the scale consists of (18) items on one dimension. The students respond to the scale using a five-point Likert scale: Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree. The scores corresponding to these alternatives range from (5 to 1), and the total score for the scale is (90) points. The students who score close to (90) are those with a high level of need for cognition, while the students with a low level are those whose scores approach (18), and the neutral score is (54).

The scale was presented to a group of experts to ensure the appropriateness of the statements and paragraphs for the female higher education students in the current study. The experts suggested modifying some phrasings to better suit the students and the nature of the research—for example, replacing "issues" with "educational tasks." Then, the reliability of the scale was calculated using the remeasurement method under conditions similar to those of the initial application, followed by calculating the correlation coefficient, which was found to be an overall average of (0.87).

Procedures

The educational program for female students was designed to enhance the level of the need for cognition among female higher education students, based on findings from an initial exploratory study that indicated a deficiency in the motivation to seek cognition and highlighted the necessity for the educational framework to incorporate motivational strategies that facilitate learning. The phases of instructional design were adhered to according to a cohesive analytical, design, and developmental approach.

During the analysis phase, the educational problem was identified, and the related needs were evaluated by diagnosing the students' circumstances and noting a gap in the need for cognition, which warranted the implementation of a gamified educational platform inside the learning environment. The primary purpose in

fostering the need for cognition through the enhancement of cognitive engagement, enjoyment of contemplation, and the quest for information was recognised. A set of educational assignments pertaining to "mobile phone media" was delineated within the media and communication technology curriculum, categorized into four primary tasks encompassing the principles of mobile phone media, journalistic news, mobile editing, and journalistic photography techniques utilizing mobile phones. The assignments were segmented into sub-tasks to be accomplished within designated durations, enabling the learner to monitor their cognitive advancement incrementally.

The analysis phase further encompassed the identification of the characteristics of female students through the observation of their preparedness to engage with digital platforms. The data indicated that students are equipped with smart devices and exhibit significant engagement with the internet and digital platforms, thereby affirming the appropriateness of delivering academic assignments through a gamified medium. The learning environment underwent a thorough analysis, leading to the selection of the TalentLMS platform as a multifaceted digital space. This platform facilitates the presentation of educational media, the management of interactions, tasks, and assessments, while also implementing a gamification system that incorporates points, badges, levels, and leaderboards.

During the design phase, the procedural educational objectives were established to be consistent with the goals stipulated in the mobile phone communication course, and the educational content was developed to correspond with these objectives. The materials encompassed educational videos, presentations, illustrated articles, interactive quizzes, and digital practical tasks, thereby providing a diverse array of media tailored to accommodate the varying learning styles of the students. The integrated gamification system within the platform was meticulously crafted for awarding points and badges, as well as to advance levels predicated on achievement rates and task progression. Furthermore, it facilitates the ranking of students on leaderboards that accurately represent their performance levels. The platform was designed with a variety of interactive patterns, encompassing engagement with digital content, interaction with the instructor, and collaborative exchanges among students during discussions and activities. A feedback mechanism was established, which involved monitoring students' progress via platform reports and offering ongoing guidance, correction, and motivation. The platform utilized both individual and collaborative learning methodologies, thereby granting students the autonomy to regulate their learning pace while simultaneously engaging in group discussions within the platform.

During the development phase, digital content was generated and incorporated into both platforms, while lessons, assessments, and assignments were formulated, and gamification tools were implemented. Next, the platform and its contents underwent an initial evaluation phase conducted by a panel of reviewers to ascertain the appropriateness of the content, tasks, and digital incentives pertaining to the students' level. The findings from the formative evaluation demonstrated the platform's preparedness for implementation in the field. The implementation and evaluation phase was elaborated upon subsequently within the experimental procedures and research findings.

The study comprised two experimental groups that utilized the same digital educational platform. Nonetheless,

the distinction between the two groups lay in the implementation of the gamification system in the first group, which was absent in the second, thereby facilitating the isolation of gamification's impact on the evolution of the need for cognition. The initial experimental group was exposed to the content via the gamified platform subsequent to the activation of the four fundamental gamification elements: points, badges, levels, and leaderboards. In contrast, the second experimental group was exposed to the identical content devoid of any activation of these elements, thereby restricting their experience to the educational material alone, and devoid of any supplementary gamification components.

In the initial experimental group, students received digital points based on established criteria, which included: (10) points for each login to the platform, (10) points for the completion of any digital unit, (5) points for each correct response in the assessments, (5) points for initiating new discussions, and (10) points for the comprehensive completion of each educational task. Badges were conferred based on quantitative sequences that signify the degree of participation and advancement. For instance, a badge was awarded following a specified number of logins: 4, 8, 16, 32, 64, 128, 256, and 512 times. Additionally, badges were granted upon the completion of digital units in the following sequence: 1, 2, 4, 6, 8, and 12 units. Furthermore, badges were conferred for successfully passing assessments based on the progression of correct responses: 2, 4, 8, 16, and 32 questions, in addition to the completion of educational tasks following the sequence: 1, 2, 4, 8, and 16 tasks.

The levels are associated with three quantitative criteria, through which a student's level is elevated upon the completion of (100) points, or the acquisition of (4) badges, or the fulfilment of all four educational topics. In conclusion, three distinct leaderboards were established for the students, each reflecting independent criteria: the total points accumulated, the badges obtained, and the level attained by each student. This approach facilitated the enhancement of social competition while simultaneously fostering both internal and external motivation.

In contrast, the second experimental group was exposed to the same educational content via the platform; however, this group did not receive any points, badges, or levels, nor were leaderboards presented. This approach guaranteed that the educational environment was consistent across both groups regarding content, duration, resources, and subjects, with the sole distinction being the presence or absence of the gamification system. Therefore, any observed differences could be ascribed to the impact of gamification as the experimental variable in the study.

Results

As detailed in Table 1, the descriptive results indicated a convergence between the two groups in the pre-test measurement of the need for cognition variable, with an average for the group utilizing the gamified platform ($M=34.13$, $SD=2.20$), in contrast to ($M=23.38$, $SD=1.60$) for the group employing the non-gamified platform. In the post-test measurement, a distinct superiority was evident in favour of the gamification group, which exhibited an average score of ($M=83.26$, $SD=2.95$), in contrast to the average score of ($M=70.84$, $SD=2.37$) recorded by the group that did not employ gamification. This suggests a significant rise in the need for cognition among female students engaged in a learning environment augmented by gamification elements.

Table 1. Means and Standard Deviations of the Need for *Cognition* Scores by Group and Time (N=63)

Time	Groups	Mean	SD	N
Pre-test	Platform with Gamification	34.13	2.20	31
Pre-test	Platform without Gamification	32.38	1.60	32
Post-test	Platform with Gamification	83.26	2.95	31
Post-test	Platform without Gamification	70.84	2.37	32

Table 2 displays the adjusted means of the need for cognition scores categorized by the group factor (gamified platform versus non-gamified platform) and the temporal factor (pre-test/post-test). The findings demonstrate a notable enhancement in the post-measurement for both groups relative to the pre-measurement; however, the disparity between the two groups has increased subsequent to the implementation of the experiment. The mean scores of the gamified platform group rose from (M=34.13) in the pre-test to (M=83.26) in the post-test, whereas the mean scores of the group utilizing the platform without gamification increased from (M=70.84) to (M=83.26). The 95% confidence intervals reveal a lack of overlap between the two groups in the post-test measurement, thereby indicating a statistically significant difference in the level of improvement favouring the group that incorporated gamification. The findings suggest that the incorporation of gamification elements—such as points, badges, levels, and leaderboards—has significantly fostered the need for cognition in comparison to the presentation of educational tasks devoid of gamification.

Table 2. Estimated Marginal Means of Need for Cognition by Group and Time

Time	Groups	Mean	SE	CI 95%
Pre-test	Platform with Gamification	34.13	.35	34.82-33.44
Post-test	Platform with Gamification	83.26	.48	82.30- 84.22
Pre-test	Platform without Gamification	32.38	.34	31.70-33.05
Post-test	Platform without Gamification	70.84	.47	69.90- 71. 79

Table 3 presents the findings from the time effect test, as well as the interaction effect between the time factor and the group factor concerning the variable of need for cognition, utilizing repeated measures ANOVA. The findings reveal a statistically significant main effect of time ($F(1, 61)= 9808.12, P< .001, \eta^2=.994$), demonstrating a general enhancement in the need for cognition scores among female students from the pre-test to the post-test, irrespective of the experimental group. The findings further revealed a statistically significant interaction effect between time and group ($F(1, 61)= 145.26, P< .001, \eta^2=.704$), suggesting a differential rate of improvement between the two groups contingent upon the nature of the treatment administered. This indicates that the female students who engaged with the gamified platform experienced a more significant enhancement in their need for cognition in comparison to their counterparts who utilized the same platform without the activation of gamification elements. The effect size related to the interaction ($\eta^2 = .704$) suggests that a substantial portion of the variance in improvement is attributable to the gamification component. This underscores the efficacy of incorporating points, badges, levels, and leaderboards in fostering the need for cognition within the digital learning context.

Table 3. Tests of Within-Subjects Effects for Need for Cognition

Effect	F	df	P	η^2
Time	9808.12	(1,61)	.000	.994
Time \times Group	145.26	(1,61)	.000	.704

Note. Group = Platform with Gamification vs Platform without Gamification

Table 4 presents the findings from the group effect test, which serves as a between-subjects factor pertaining to the variable of the need for cognition. The findings revealed a statistically significant main effect of the group ($F(1, 61) = 337.78, P < .001, \eta^2 = .847$), suggesting a considerable difference in means between the gamification and non-gamification groups pertaining to the variable of the need for cognition. The substantial effect size value ($\eta^2 = .847$) signifies that a considerable portion of the variance in scores is attributable to the type of treatment. This finding implies that the incorporation of gamification elements within the digital platform has played a significant role in enhancing the levels of the need for cognition, in contrast to the conventional use of the platform devoid of such gamification features.

Table 4. Tests of Between-Subjects Effects for Need for Cognition

Effect	F	df	P	η^2
Group	337.78	(1,61)	.000	.847

Note. Group = Platform with Gamification vs Platform without Gamification

Figure 2 illustrates that the scores reflecting the need for cognition exhibited an increase for both groups from the pre-measurement to the post-measurement phase.

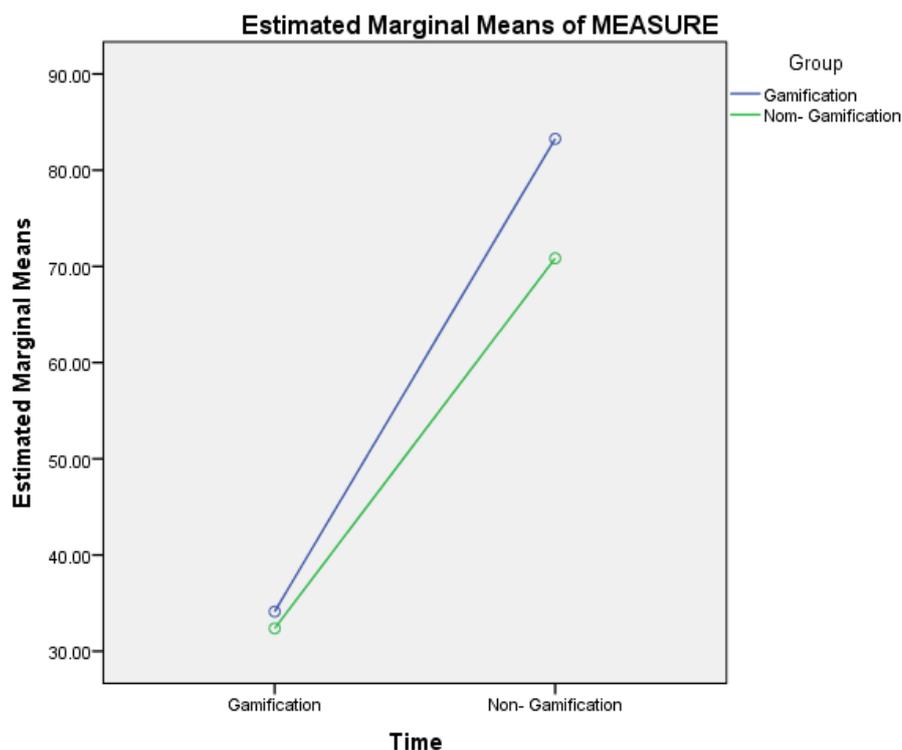


Figure 2. Changes in Need for Cognition Levels by Group

Nevertheless, the elevation in the levels observed in the group utilizing the gamified platform was significantly more pronounced than that of the group engaging with the platform devoid of gamification elements. The observed pattern of change demonstrates a statistically significant interaction effect between time and treatment type, thereby underscoring the efficacy of gamification elements in augmenting the need for cognition.

Prior to executing the analysis of covariance (ANCOVA) to assess the disparities between the two groups in the post-test evaluation of the need for cognition, the assumption of homogeneity of variance was examined via Levene's test. The results revealed non-significance ($F(1,61) = 1.305, P = .258$), indicating that the assumption was met and the analysis could proceed (refer to Table 5). The outcomes of the between-groups analysis revealed statistically significant disparities between the two groups in the post-test, after adjusting for the pre-test as a covariate ($F(1, 61) = 296.65, P < .001, \eta^2 = .832$), signifying that a substantial portion of the variance in post-test scores can be attributed to the type of educational intervention (refer to Table 6). The adjusted means demonstrated that students in the gamification group attained superior averages in the need for cognition ($M_{\text{adjusted}} = 83.44, SE = .505$) relative to their peers in the non-gamified platform group ($M_{\text{adjusted}} = 70.44, SE = .496$), indicating a beneficial impact of gamification elements on the enhancement of the need for cognition in the digital learning environment (refer to Table 7).

Table 5. Levene's Test of Equality of Error Variances for Post-test Scores

Test	F	df	P
Levene's test	1.305	(1,61)	.258

Note. Non-significant p-value indicates homogeneity of variances.

Table 6. ANCOVA Results for Post-test Scores After Controlling for Pre-test Scores

Source	F	df	P	η^2
Group (Adjusted)	296.65	(1,61)	.000	.832

Table 7. Adjusted Post-test Means for Need for Cognition Scores with Pre-test as Covariate

Groups	Adjusted Mean	SE	CI 95%
Platform with Gamification	83.44	.505	82.43-84.45
Platform with Gamification	70.67	.496	69.68- 71.66

Discussion

The present findings that demonstrate the efficacy of gamification in enhancing the need for cognition can be attributed to the influence of gamification elements in motivating the research sample students during the learning process, thereby stimulating their cognition requirements for fulfilling educational tasks via the gamified platform. The need for cognition serves as an intrinsic motivator that compels learners to invest greater effort and derive enjoyment from the process. Therefore, it can be asserted that employing gamification to enhance intrinsic motivation among the research sample students has facilitated their attainment of educational objectives. Engagement in learning enhances the indicators of the need for cognition. The gamification elements incorporated

in the developed program immersed the research sample students, motivating them to attain the designated digital rewards, which ultimately resulted in increased cognition acquisition rates among the students.

The findings of the present study correspond with certain literature that has examined digital incentives. The need for cognition ensures that any endeavour engaged in by the learner, regardless of its challenges, provides a sense of pleasure and exhilaration. This aligns with the findings of Alhalafawy and Zaki (2019), which suggest that gamification elements significantly improve well-being metrics among learners when performing educational tasks. This means that gamification elements create an environment rooted in enjoyment, hence motivating learners to complete their duties. The atmosphere of joy and enjoyment fostered by gamification elements cultivates an environment conducive to the development of the need for cognition. According to what Coutinho (2006) suggests for a correlation between the need for cognition and academic achievement and performance, gamification elements in educational systems are regarded as indications of a learner's performance and academic achievement. This indicates that as a learner perceives themselves as intellectually superior, their need for cognition increases, reflecting the association between the need for cognition and academic performance. Strobel et al. (2017) mention that the more exciting the educational situations are, the more effective they are in developing the learner's need for cognition. Consequently, gamification elements are regarded as an effective mechanism to interest learners and maintain their continuous participation. In a different context, the individual, in their need for cognition, experiences cognitive dissonance when confronted with a stimulus that contradicts their cognitive framework or information, leading them to adopt behaviours that facilitate a return to cognitive consonance (FitzGerald et al., 2013; Harmon-Jones & Harmon-Jones, 2012). The role of gamification elements is to enhance the learner's cognition and mitigate cognitive dissonance by incentivizing the completion of numerous tasks and educational activities that substantially aid in cognition development and address cognitive gaps.

The present findings can be interpreted within the framework of Behavioural Theory, which asserts that behaviours are reiterated in the presence of motivating factors. The incorporation of gamification elements significantly improves learner performance and consistently motivates individuals to persist in completing educational tasks (Bíró, 2014). Accordingly, the need for cognition intensifies, and its indicators rise in the presence of gamification elements that enhance the cognitive processes related to the need for cognition. The Flow Theory serves as a foundational framework for understanding the application of gamification in addressing the indicators associated with the need for cognition. This theory suggests that the sustained experience of flow in cognitive development is intrinsically connected to the existence of a motivating system, which may be situated either within the learner or in the external environment. However, it can be deduced that gamification possesses the capacity to position the learner within an incremental framework designed to construct cognitive models that address their cognition requirements within a versatile system of digital reinforcements (Groh, 2012; Nakamura & Csikszentmihalyi, 2009).

The Theory of Basic Psychological Needs suggests that the development of the need for cognition is associated with a constellation of factors that render any activity enjoyable and inspiring for intrinsic motivations. The factors identified include autonomy, competence, and relatedness, as discussed by Ryan and Deci (2000), Sailer et al. (2017), and Suh et al. (2015). It is unequivocal that the incorporation of gamification elements effectively fulfils

these three factors. For example, digital incentives foster learner autonomy by providing individuals with a sense of authority and freedom in the execution of tasks. Moreover, they enhance competence by instilling in learners a sense of efficacy in task completion and the ability to exert influence over their surroundings. Ultimately, they foster a sense of relatedness, which arises as learners cultivate social relationships with their peers within the educational context, thereby experiencing a sense of belonging to the groups established during the execution of tasks. The Flow Theory suggests that human nature is inclined to channel its intrinsic motivations towards the establishment of an internal incentive, which fosters the ongoing and dynamic advancement of cognition in a unique manner. The function of gamification elements is pivotal in sustaining the state of flow for the learner, as it guarantees an ongoing sense of satisfaction while engaging in educational activities. Positive incentives are administered at different intervals that align with the learner's intrinsic flow, which is predominantly influenced by internal motivations, while external rewards serve to promote sustained engagement (Groh, 2012; Nakamura & Csikszentmihalyi, 2009).

The present study corroborates multiple studies that demonstrate the efficacy of gamification in improving dependent performance metrics, including motivation, psychological well-being, and engagement in learning (Chen et al., 2020; Kayımbaşıoğlu et al., 2016), academic achievement (Groening & Binnewies, 2019), facilitation of participatory learning (Dalponte Ayastuy et al., 2021), and the cultivation of creative thinking (Jun, 2023).

Limitations

The utilization of the gamified platform was confined to a limited sample of female students from a college within Saudi universities, perhaps constraining the generalizability of the findings to other fields, institutions, or age demographics. Second, the dependent variable was confined to the need for cognition as a particular cognitive dimension, neglecting other cognitive dimensions or motivational and behavioural factors that could be affected by gamification in educational settings. Third, the research employed a quasi-experimental design with two groups, which improves the capacity to identify causal relations; however, it does not permit comprehensive control over all extraneous variables that may be challenging to regulate in natural educational settings. Fourth, the research lacked a follow-up phase to assess the durability of the gamification effect on the need for cognition after the experiment, necessitating future investigations to employ a longitudinal design or delayed measurement assessments. The research concentrated on four primary gamification aspects (points, badges, levels, and leaderboards), hence precluding the analysis of the effects of additional gamification elements such as storytelling, avatars, or symbolic rewards. This paves the way for the advancement of more intricate and comprehensive gamification models in forthcoming studies.

Conclusion

The present study tried to investigate the effect of gamified educational platforms on enhancing the need for cognition among university students, by contrasting a group that engaged with a gamified version of the platform (incorporating points, badges, levels, and leaderboards) against another group utilizing the same platform devoid of gamification features. The results indicated significant differences favouring the experimental group after

adjusting the pre-measurement, with a substantial effect size demonstrating the efficacy of gamification in improving student engagement and cognitive acquisition. The findings suggest that structuring digital environments based on established gamification elements enhances the need for cognition, serving as a pivotal factor for profound and enduring learning in higher education. The findings indicate significant practical and educational implications, primarily the need to implement more interactive and engaging educational models in university curricula, reevaluating the design of educational activities and platforms to foster curiosity, critical thinking, and exploration, while promoting self-directed learning and enhancing cognitive motivation among students. The research underscores the significance of incorporating gamification aspects into university digital environments as an effective strategy for enhancing learning quality and fostering a greater need for cognition. It underscores the imperative of broadening its implementation across various educational settings and validating its sustainability through forthcoming longitudinal research.

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