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RESEARCH ARTICLE **APPLIED SCIENCE**

The Impact of Kahoot Gamification on IT Project Management Learning in Libyan Higher Education

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ABSTRACT

This study aims to investigate the effectiveness of using gamification on Kahoot to enhance learning in Information Technology Project Management course, boost student engagement and motivation, raise academic achievement, and improve attitudes toward learning. The importance of this study is highlighted by the integration of educational games into learning to enhance student participation, improve cognitive skills and attitudes toward learning, motivation, and academic achievement. In addition, it explores the challenges facing the implementation of gamification at Information Technology Faculty of Alasmarya Islamic University (AIU), Libya. The study employs a mixed-methods approach that combines quantitative and qualitative methods to investigate the effects of gamification tools on student engagement. The study framework includes two phases carried out during the 2024/2025 academic year: the first phase used the gamification platform, Kahoot, with lectures conducted throughout the semester. The second phase took place at the end of the semester, after the completion of Project Management course topics. Students in the experimental and control groups underwent a pre-test and post-test, along with pre- and post-intervention questionnaire, and semi-structured interview was conducted with the experimental group only. The results from previous studies, along with this study's results, indicate that game-based learning significantly increases student engagement, fosters motivation, boosts self-confidence, and improves learning outcomes in IT Project Management course. This study faces challenges, including the incompatibility of students' devices with Kahoot in the classroom. Therefore, the integration of gamification is necessary for enhancing the quality of the educational process and preparing graduates capable of working effectively in a technology project environment.

تأثير استخدام أسلوب التلعيب من كاهوت على تعلم إدارة مشاريع تكنولوجيا المعلومات في التعليم العالي الليبي

انتصار الهادي الغويل[1,*]

الكلمات المفتاحية

أسلوب التلعيب من كاهوت
إدارة مشاريع تكنولوجيا المعلومات
التعلم القائم على الألعاب
الإنجاز الأكاديمي
مخرجات التعليم العالي
مشاركة ودافعية التعلم للطلاب.

الملخص

تهدف هذه الدراسة للتحقق من فعالية استخدام أسلوب التلعيب على منصة كاهوت في تحسين التعلم في مقرر إدارة مشاريع تقنية المعلومات، وتعزيز مشاركة الطلاب، وتحفيزهم، ورفع مستوى تحصيلهم الدراسي، وتحسين سلوكهم تجاه التعلم. وتتركز أهمية هذه الدراسة في توظيف ودمج الألعاب التعليمية في عملية التعلم. بالإضافة إلى ذلك، تستكشف الدراسة مجموعة من التحديات التي تواجه تطبيق أدوات التلعيب والتي تتضمن عدم توافق أجهزة بعض الطلاب مع تطبيق لعبة Kahoot داخل الفصل الدراسي في كلية تقنية المعلومات بالجامعة الأسمرية الإسلامية في ليبيا. واتبعت الدراسة منهجية مختلطة تجمع بين الأسلوب الكمي والنوعي لدراسة تأثير استخدام أدوات التلعيب على تعلم الطلاب. يتضمن إطار الدراسة مرحلتين نُفذتا خلال العام الدراسي 2025/2024: استخدمت المرحلة الأولى منصة كاهوت (Kahoot) للتحفيز بالألعاب، مع محاضرات عُقدت طوال الفصل الدراسي. أما المرحلة الثانية، فقد اجريت في نهاية الفصل الدراسي، بعد إتمام دراسة موضوعات مقرر إدارة المشاريع. حيث خضع طلاب المجموعتين التجريبية والضابطة لاختبار قبلي وبعدي، بالإضافة إلى استبيان قبلي وبعدي للتدخل، كما أُجريت مقابلة شبه منظمة مع المجموعة التجريبية فقط. وتشير نتائج هذه الدراسة مقارنة بنتائج الدراسات السابقة إلى أن التعلم القائم على الألعاب يسهم في رفع مستوى مشاركة الطلاب بشكل ملحوظ، وتنمية دافعيتهم الداخلية، وزيادة ثقتهم بأنفسهم، وتحسين مخرجات التعلم في مقرر إدارة مشاريع تقنية المعلومات. وبالتالي فإن توظيف التلعيب أمر مهم في تعزيز جودة العملية التعليمية، وإعداد خريجين قادرين للعمل بما يتناسب مع متطلبات بيئة المشاريع التقنية.

Introduction

In recent decades, the world has witnessed a remarkable

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development in teaching and learning technologies, with educational games and gamification becoming among the most prominent modern trends in the educational field. These technologies rely on integrating game elements such as points, badges, and leaderboards into traditional learning environments to increase student engagement and motivation to learn [1]. In the field of IT project management, gamification is critical given the nature of the field, which requires practical skills in planning, implementation, monitoring, and evaluation [5, 31].

Libyan Higher education institutions (LHEI) face multiple challenges in developing and modernizing teaching and learning methods, particularly in the exceptional circumstances the country has experienced in recent years [29]. Challenges have led to a decline in the quality of education and a decrease in the level of student engagement and interaction with educational content. Thus, there is an urgent need to adopt innovative educational methods that can overcome these challenges and improve educational outcomes [2, 6].

IT project management learning requires students to acquire skills in technical, administrative, and communication areas. This diversity of required skills makes teaching this course a significant challenge for instructors, especially in traditional educational settings that rely on rote learning, as in Libyan education [9, 10]. Therefore, the use of educational gamification technologies can provide an interactive learning environment that simulates work environments and enables students to apply theoretical concepts in practical contexts [6, 15]. Several studies have referred to gamification as a technique to increase students' engagement. Gamification is the use of game design elements in non-game settings to engage participants and encourage desired behaviors. Kahoot! allows the use of game elements in a non-game context by extending the methods that can be employed by educators in developing lesson plans [31, 32, 19].

In addition, online platforms such as Kahoot, Quizizz, and Socrative provide educators with options to diversify lessons and activities that can captivate and inspire students' motivation and increase students' engagement in the classroom [21]. Gamification has an impact on the effort to enrich students' experience in the learning environment [6, 7]. Thus, the present study aims to investigate the effectiveness of using gamified learning platforms in enhancing participation, behavior, motivation, and healthy competition, and improving academic achievement among higher education students in IT project management course. This study seeks to identify the challenges and opportunities associated with implementing gamification in Libyan higher education (LHE). However, in Libyan education, there is a limited amount of previous research that addresses the use of gamification [2, 3, 29].

Problem statement

In the context of higher education in Libya, particularly in the Faculty of IT at Alasmarya Islamic University (AIU), the implementation of educational technologies such as Kahoot is hindered by various challenges, including, the academic environment is characterized by limited access to reliable internet connectivity, weakness infrastructure, and a reliance on traditional teaching methods, which impede the effective utilization of Kahoot and similar educational tools. These challenges hinder the effective integration of innovative teaching methods, thereby limiting the potential for enhanced student learning outcomes [33].

In addition, there are knowledge gaps and a mismatch between learners and educators in LHE, necessitating awareness of project management course learning with gamification to meet the labor market requirements, and enhancing awareness of the difficulties faced by students, addressing the false thinking about using gamification technologies in education and learning. The importance of using educational games to bridge this gap and provide simulated and interactive learning environments [15, 29].

Study Questions

1. Does Kahoot! affect students' motivation and engagement in IT project management learning?
2. How does Kahoot! affect students' cognitive skills and attitudes towards gamified-based learning?
3. What are the challenges and opportunities associated with implementing gamification in higher education (HE)?

Study Objectives

The objective of this study is to explore the use of gamified learning techniques using Kahoot on student participation, behavior, motivation, and academic achievement in IT Project Management course. The study also aims to investigate the challenges associated with implementing gamification and propose an effective framework for integrating gamification into higher education (HE) to enhance learning outcomes.

Significance of the Study

This study is significant because it addresses the gap in understanding how educational gamification can be leveraged to promote active participation, constructive competition, and increased motivation to improve academic achievement among IT project management students in LHE. The results will provide valuable insights for educators and decision-makers to modernize learning practices and interactive learning environments. The proposed framework for Kahoot implementation can serve as a model for other educational contexts aiming to enhance student engagement and success [2, 3].

Following the introduction, Section 2, "Literature Review," presents related studies on students' engagement with gamification techniques. Then followed by Section 3, "Methodology and Research Framework," which elaborates on the research framework and model, study sample, and describes the empirical investigation instruments to explore the gamification effectiveness; Section 4, "Results," presents the results and analysis; and Section 5, "Discussion," interprets the questionnaire results revealed that Kahoot. Finally, Section 6, "Conclusion and Recommendations".

Literature Review

Implementation of Gamification in Higher Education (HE)

Numerous local studies have confirmed the importance of integrating technologies and the Internet of Things into educational processes [33-38]. Gamification is used in applications and processes to improve learning. This is supported by [5], who state that "in education, game mechanics are proving to be very useful tools within the classroom". They found that incorporating games into the curriculum, using leaderboards, and challenges could improve students' learning. The existence of the key elements in gamification, which are points, badges, and leaderboards, has long been in and out of a student's life recently, with the implementation of School-Based Assessment. Results show that gamification, as a game mechanic, can be transferred and used in real life. Yet this research provides no clear model or framework for others to reference [30].

[7, 9] indicated that gamification can significantly enhance student engagement and motivation to learn while also contributing to the development of critical thinking and problem-solving skills. A study by Al Ghawail & Ben Yhaia (2022) explored the gamification elements used in HE, which vary, including points, badges, leaderboards, levels,

feedback, and challenges. These elements are the most common in gamified educational systems, as they motivate students by meeting their basic psychological needs for competence, autonomy, and social belonging. The successful implementation of gamification has the potential to not only provide enjoyment for students but also assist teachers in evaluating their students in a more constructive manner as opposed to just using worksheets and observation-based assessment in the classroom [9, 35]**.**

On the other hand, gamification is defined as the use of game elements and mechanisms in non-game environments to improve engagement, motivation, and behavior. In the context of HE, gamification aims to make learning more fun and interactive by incorporating elements such as points, levels, challenges, and rewards into the curriculum [3]. Therefore, previous studies show that using gamification techniques in education helps to achieve academic goals, including raising student engagement, encouraging motivation and interest, enhancing academic performance and attitudes toward learning, and improving the overall learning experience through increased enjoyment and participation [35, 20, 21].

Students' Engagement and Competition in Gamification Environment

Students' engagement is recognized as a crucial attribute that influences students' achievement. Students' learning models contribute to engaging in teachers' activities [17, 18]. Student engagement comprises three dimensions: cognitive, behavioral, and emotional engagement. Martín-Hernández et al. (2021) categorized student engagement into four factors: skill engagement, emotional engagement, participation, and performance. Active students are more likely to perform well as they retain more knowledge during collaborative learning activities. Students' involvement plays an important role in their achievement and performance measured during formative or summative assessment [28]. Engagement occurs when students use an online learning platform for learning [18]. Collaborative practices in game-based learning environments provide a scaffold that enhances students' engagement and cognitive performance. Students' interaction in small groups through gameplay provides an avenue for teamwork, allowing students to solve problems collaboratively.

Competitiveness in education involves the use of performance-based elements like rankings, scores, and timed activities to foster motivation and achievement. According to Martín-Hernández et al. (2021), competition in learning can be healthy, encouraging collaboration, growth, and resilience, or unhealthy, creating stress and demotivation. Hu et al. (2023) suggest that competitive features like leaderboards and scoring in gamified learning increase motivation, social interaction, and academic performance. Students' competitive behavior is influenced by personality traits and motivation types, which can either enhance or hinder academic outcomes. This led to the definition of gamification [13]. Many educational gamification systems depend on rewards and a very thin model of a game experience to engage people through points, levels, leaderboards, achievements, and badges [2].

The Role of Kahoot in Evaluating Academic Performance

Academic performance refers to the outcomes of a student's educational process, often measured through grades or assessments. It is affected by both intrinsic and extrinsic motivation. Intrinsic motivation, such as personal interest in the subject, leads to long-term achievement, while extrinsic motivation driven by rewards or social pressure can influence short-term success [22]. Structured gamification impacts student behavior and engagement, thereby influencing academic performance. Bicen & Kocakoyun (2018) confirm that gamified tools like Kahoot improve motivation and result in higher academic scores by encouraging students to participate more actively in learning. Laine et al. (2016) found that gamified tests with design elements such as leaderboards and a point system increased students' grades, enjoyment, engagement, and provided immediate feedback that contributes to enhanced motivation and achievement.

Kahoot! is one of the most popular and widely used educational gamification platforms, allowing teachers to create interactive quizzes, surveys, and discussions as group games [22]. This platform is easy to use and accessible through any web browser, making it suitable for use in a variety of educational settings. The platform also supports the use of smartphones and tablets [8, 22].

A study by Aliyu et al. (2022) conducted on 32 students at Sokoto State University in Nigeria showed that using Kahoot! in chemistry teaching significantly improved student performance and classroom engagement. The results revealed statistically significant differences between students' scores before and after using the platform, indicating its effectiveness as a formative assessment tool. Students also demonstrated high levels of satisfaction and interest in using games for learning, with all students agreeing that the platform increased their motivation to learn and improved their concentration in the classroom [22].

In another study by Özdemir (2024) conducted in Morocco on 97 secondary school students, Kahoot! was used to teach English as a foreign language. The results showed that 84.5% of students found the activities available on the platform to be diverse and interesting, while 82.43% reported that Kahoot! helped them enhance their understanding of the English language. 77.35% of students use Kahoot! exemplifies gamification in higher education. This platform's interactive quizzes feature motivational elements, points for speed and accuracy, leaderboards, and immediate feedback, resulting in positive outcomes [26, 4].

Game-Based Learning (GBL) in IT Project Management Learning

Project management learning requires an integrated approach that combines theoretical knowledge with practical application, especially in information technology, enabling students to develop the skills necessary to successfully manage technical projects.

Petri et al. (2019) presented an experimental study evaluating the effectiveness of a specific project management educational board game, PMBoG, rather than providing a literature survey itself. This study focuses on assessing the impact of an innovative educational tool on students' project management skills. It involved two samples of university students: an experimental group that participated in PMBoG sessions and a control group that did not. Both groups took a project management test to assess their decision-making and countermeasure capabilities related to project management issues. Meanwhile, t-test, ANOVA, Tukey, and effect size were used for preliminary analysis [1]. The results indicate that adopting PMBoG positively impacts the increase in students' project management competencies. Participants demonstrated statistically significantly higher performance in comparison to the control group.

Ahmed et al. (2025) proposed a review and a timeline of serious games in construction management, software project management, and business project management across undergraduate and graduate engineering courses. This systematic review of 50 project management serious games case studies identifies key themes, trends, and gaps in GBL adoption in HE, providing guidelines for developers and adopters. Results indicate that students who participate in

game-based learning activities in PM demonstrate a better understanding of project uncertainty and risk management, an ability to develop alternative planning, coping strategies, and improved skills in decision-making [33, 35].

Technology Acceptance Model (TAM)

TAM provides a theoretical framework for understanding the factors that influence students' and faculty members' willingness to adopt and use educational gamification technologies. This model identifies two key factors that influence technology acceptance: perceived usefulness and perceived ease of use. Perceived usefulness improves student engagement and learning outcomes, while ease of use is reflected in the platform's simple interface and the lack of extensive training required [35].

Understanding these two factors (perceived usefulness and perceived ease of use) helps design effective strategies for implementing gamification in an educational environment, focusing on demonstrating the direct benefits of technology while ensuring its ease of learning and use. This model can guide the process of training faculty members and students and preparing them to effectively adopt these games [11, 12, 35]. Thus, this model aims to highlight the necessity of incorporating self-efficacy and flow experience into the TAM framework to create educational games that improve learning quality [33, 35].

Constructivist Learning Theory

Constructivist learning theories view learning as a process of constructing new knowledge, in which the learner builds their own understanding of the world through interaction with the environment and personal experience, rather than passively receiving information [12]. Gamification can support constructive learning by creating engaging, meaningful, and interactive learning experiences that incorporate elements such as challenges, problem-solving, storytelling, and feedback, all aligned with learning goals [11, 30].

Vygotsky's theory focuses on Zone concept of Proximal Development, which represents the gap between what a student can achieve independently and what they can accomplish with the help of more experienced others. In a gamified environment, students can benefit from peers' experiences and learn from their mistakes in a safe and stimulating atmosphere, helping them develop their skills and knowledge gradually and systematically [27, 35].

The effectiveness of educational gaming techniques is based on several educational and psychological theories, most notably Vygotsky's social constructivist learning theory. This theory emphasizes the importance of social interaction and collaborative learning in constructing knowledge, which is naturally supported by game-based learning environments. In Kahoot! students interact with each other and with educational content in a collaborative environment that encourages the exchange of knowledge and experiences [27, 35].

Behaviorist Learning Theory

Behaviorist theories posit that human behavior is acquired through learning and shaped by environmental factors that modify responses via mechanisms such as reinforcement, punishment, and imitation [24]. Behavioral learning occurs because of the relationship between response and reinforcement; because a relationship is considered one of the most important factors in strengthening desired behavior [24, 25].

In this context, gamification can provide learners with positive reinforcement through game elements such as points, badges, rewards, and leaderboards to positively reinforce desired behaviors. The social interaction built into games like Kahoot! contributes to the need for social belonging by creating team spirit and friendly competition among students, and develops communication and teamwork skills, which are essential in managing technology projects [21, 36].

Gamified Learning Theory

Landers (2015) proposed a theory of gamified learning that offers an instructional framework for integrating gamification into education. It asserts that incorporating game attributes into non-game contexts influences learning-related behaviors and attitudes, thereby enhancing student learning outcomes and reinforcing the connection between instructional design and objectives.

According to Landers, gamification impacts learning through two primary pathways: moderation and mediation. In the moderation pathway, meaningfully integrated game elements enhance instructional content, directly leading to improved learning outcomes [12, 16]. Conversely, the mediation pathway occurs when these elements foster specific behaviors or attitudes that subsequently boost learning effectiveness. Landers emphasizes that gamification aims to augment, rather than supplant, existing instruction; it cannot induce learning if the underlying content lacks inherent educational value. Consequently, Landers critiques some previous studies on gamification for neglecting to measure the direct behavioral or attitudinal effects [35, 37].

On the other hand, platforms such as Kahoot! and Quizizz show similar results in enhancing engagement, and the relationship between students and teachers plays a vital role in enhancing students' engagement [6, 28]. Incorporating game elements into non-gaming contexts is considered an effective way to enhance engagement; elements used include badges, leaderboards, and points. (See Figure 1).

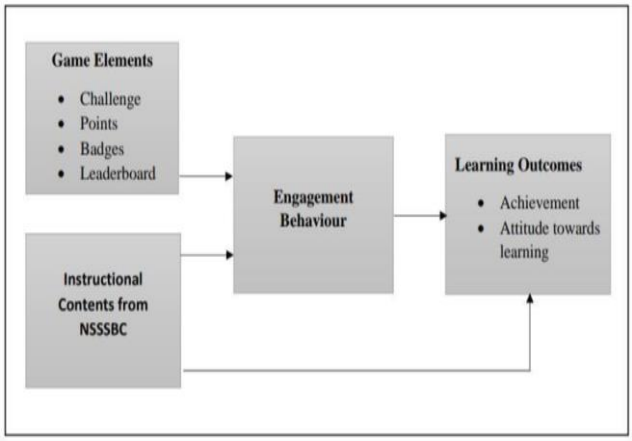

Figure 1: Gamified Learning Environment Adapted [24].

Methodology

Research Framework

The research framework employed in this study, as represented in Figure 3, consisted of two sequential phases spanning the 2024/2025 academic year.

Phase 1: Introduction of Kahoot! platform at semester onset; integration into lectures with intermittent assessments throughout the instructional period.

During the initial phase, Kahoot! was introduced at the commencement of the semester and subsequently integrated into lecture-based instruction through formative assessments distributed throughout the term. Before engagement with the platform, all participants received comprehensive briefings regarding the study's objectives and their expected roles within gamification environment of Kahoot. Participants were further provided with practical training sessions on the operational use of laptop devices pre-configured with Kahoot! platform. Upon completion of

IT project management module, both the experimental and

control groups of students were administered an initial assessment instrument.

Phase 2: Administration of a structured post-intervention questionnaire at semester conclusion to assess educational outcomes associated with using Kahoot!

The concluding phase of the study occurred at the end of the 2024/2025 academic year, following completion of the IT project management module. Participants in the experimental group were administered a post-test measurement and a post-intervention questionnaire to evaluate changes in learning outcomes resulting from exposure to the Kahoot! gamification intervention. The questionnaire was used to capture quantitative and qualitative data on the perceived educational efficacy of Kahoot- based learning approach.

Study Design

This study uses a mixed-methods research design, combining quantitative and qualitative methods to provide a comprehensive understanding of the use of gamification tools in learning IT Project Management at Faculty of IT in Alasmarya Islamic University (AIU), Zliten, Libya. The researcher divided participants into two groups as follows:

The experimental group: This group utilized the Kahoot! platform as an interactive gamification tool within the classroom throughout 12-weeks period. The education for this group combined traditional lectures with intermittent gamified assessments to enhance behavior, engagement, and academic achievement.

Data is collected throughout the course of the study period to monitor gradual changes and patterns of interaction with Kahoot! over time. This approach was intended to help students understand the material more thoroughly while maintaining engagement through the gamified learning environment. **The control group:** This group follows traditional teaching methods in the classroom without gamification tools.

The **quantitative approach** includes an experimental group that uses Kahoot! game. The qualitative approach includes semi-structured interviews with the experimental group only to explore students' experiences and perceptions of using Kahoot. Twenty-three students volunteered for the interviews from among the 25 members of the experimental group. Each interview lasted 20–30 minutes and was documented through handwritten notes taken during the session. Responses were organized into themes using thematic analysis based on the researcher's notes. Coding was performed by a single researcher without an independent second coder to verify inter-rater reliability, which is likewise acknowledged as a limitation; future studies should incorporate audio recording, full transcription, and independent double-coding to strengthen the credibility and dependability of the qualitative findings. Participants are referred to using anonymized identifiers (Participant 1–23) rather than real names to protect their confidentiality.

Data collection was conducted throughout the teaching period to investigate variations in student engagement. The researcher measured changes in gamification effect on students' behavior, motivation, and performance.

Pre-test: Conducted at the semester's start to establish a performance percentage before the intervention. Post-test: Conducted at the semester's conclusion to evaluate the knowledge acquisition of gamified learning.

The qualitative approach of this study involves semi-structured interview to explore students' experiences, individual challenges, and perceptions regarding the use of Kahoot!

Validity and Reliability

To ensure the internal consistency of the quantitative data collection in the questionnaire, Cronbach's alpha coefficients were calculated. According to Davis (1989), alpha values signify greater scale reliability, with coefficients closer to 1.0 indicating that the items effectively measure the same underlying construct. As demonstrated in Table 1, the instrument achieved Cronbach's Alpha = 0.920, which indicates a high level of reliability and confirms the suitability of study items.

Table 1: Research Design Framework for the Experimental and Control Groups

Stage	Duration	Experimental Group	Control Group
Initial Setup	1 week	Student orientation and platform-on training.	Student orientation for learning.
Pre-Assessment	1 week	Administration of pretest and pre-questionnaire.	Administration of pretest.
Learning Period	12 weeks	Weekly IT Project Management course learning delivered through Kahoot! learning environment.	Weekly IT Project Management course through traditional learning, without gamification.
Post-Assessment	1 week	Administration of post-test and questionnaire.	Administration of post-test.

In this study, the internal consistency of 22 items attained exceptionally high coefficients of Cronbach's alpha = 0.920 and 0.940 when assessed utilizing items. Cronbach's alpha values span from 0 to 1, with figures approaching 1 signifying greater reliability, thereby bolstering confidence in findings and interpretations. This consistency underscores the caliber of the questionnaire items and their appropriateness for quantifying the study variables. As illustrated in Table 2.

Table 2: Cronbach's Alpha Reliability Coefficient

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.920	0.940	22

Study Sample

The study sample consists of 50 undergraduate students from Computer Science and Internet Technology Department enrolled in IT Project Management course at IT Faculty at AIU, academic year 2024-2025 (spring 2025). The sample included 50 female students (25 in the experimental group and 25 in the control group). The participants were female students who were taught by the researcher, making the study easier to conduct. The sample was equally distributed among students, and the two groups were also made sure to be the same in terms of basic factors like age and prior familiarity with gamification tools.

The sample was equally distributed among students, taking into account the diversity of students' academic backgrounds. Participants ranged in age from 19 to 23 years, owned smartphones and laptops, and had internet access, ensuring their ability to participate in gamified activities. While this small sample size limits generalizability, it allows exploration of students' experiences with gamification.

Data Collection Tools

The questionnaire is designed for quantitative data collection and to measure students' experience of engagement, attitude, motivation, cognitive skills, and academic achievement

(competition is discussed as a related aspect of motivation rather than as an independent dimension). The questionnaire consists of 4 variables: attitude, engagement, motivation, and cognitive skills. The validity and reliability of the questionnaire were verified by presenting it to a group of expert judges, and the reliability coefficient was calculated by using Cronbach's alpha. Academic achievement is measured through objective tests covering various aspects of IT Project Management course, including planning, implementation, monitoring, evaluation, quality management, and risk management.

The tests include a variety of question types, such as multiple-choice questions, short-answer questions. Qualitative data include a semi-structured interview procedure containing open-ended questions that explore students' experiences with Kahoot in terms of learning improvement and the challenges they faced during its use; interviews were recorded and analysed using thematic content analysis.

Implementation process

During the spring semester of 2024/2025, the researcher, as a university lecturer in the experimental group, introduced students to "Kahoot!" and taught them how to use the platform for learning IT Project Management. Students could use their own smartphones and tablets, in addition to the laboratory computers, to participate in the game activities.

Kahoot! was used for 20-30 minute weekly educational sessions. These sessions included interactive quizzes on IT project management topics covered in the semester. After each lecture, a short Kahoot! Quizzes were given to check students' understanding of the material before moving on to the next topic, such as quick reviews, weekly tests, and course contests. Students received immediate feedback, including correct answers and explanations for any mistakes.

At the end of the semester, students completed an electronic questionnaire to assess their participation in Kahoot platform. The control group learned through a traditional method that included lectures, discussions, and classroom tests. The same course content was used to teach both groups to ensure fairness.

To assess students' acceptance of gamification tools in the learning process, the questionnaire was designed as an instrument based on students' engagement questionnaire and the Technology Acceptance Model (TAM) [17, 33]. The questionnaire consists of 22 items across four constructs: engagement (5 items), cognitive skills in using gamification (6 items), attitude toward using Kahoot (5 items), and motivation to measure technology acceptance (6 items) (Davis, 1989). Questionnaire items use a 5-point Likert scale, with response options ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), including 2 (Disagree), 3 (Neutral), and 4 (Agree). Figures 2 and 3 display using Kahoot! platform in the classroom.

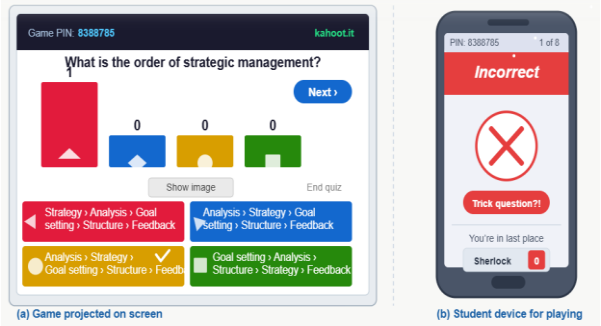

Figure 2: Interactive Kahoot Platform for learning IT Project Management

Figure 3: Shows Using Kahoot Learning Platform in the Classroom

Statistical Analysis

This study followed the approach of Bicen and Kocakoyun (2018), who measured students' engagement after using an educational tool. Quantitative data were analyzed using SPSS version 23 to calculate descriptive statistics, including means, standard deviations, and Cronbach's alpha. The reliability was assessed using Cronbach's alpha coefficient, with values above 0.7 considered! acceptable for social science research. The approach was chosen because of the smaller sample size in this study compared to [4]. Qualitative data were analyzed using thematic content analysis.

Results

Academic achievement was assessed using a pre-test and post-test administered to both groups. An independent-samples t-test on pre-test scores showed no statistically significant difference between the experimental group ($M = 68.52$, $SD = 13.87$) and the control group ($M = 69.32$, $SD = 14.92$) before the intervention, $t(48) = -0.20$, $p = .845$, confirming that the two groups were statistically equivalent at baseline. A paired-samples t-test showed a statistically significant increase in the experimental group's academic achievement from pre-test to post-test ($M = 72.40$, $SD = 13.77$), $t(24) = 6.43$, $p < .001$, while the control group showed no statistically significant change over the same period ($M = 69.52$, $SD = 14.89$), $t(24) = 0.93$, $p = .364$. A direct independent-samples t-test on post-test scores did not reach statistical significance, $t(48) = 0.71$, $p = .481$.

However, because this simple comparison does not account for the (small) baseline difference between groups, two additional and more appropriate analyses were conducted. First, an independent-samples t-test on each student's gain score (post-test minus pre-test) showed a large, statistically significant advantage for the experimental group (M gain $= +3.88$, $SD = 3.02$) over the control group (M gain $= +0.20$, $SD = 1.08$), $t(48) = 5.74$, $p < .001$, Cohen's $d = 1.62$. Second, an ANCOVA on post-test scores with group as the independent variable and pre-test score as a covariate confirmed a statistically significant effect of the intervention, $F(1, 47) = 32.36$, $p < .001$, partial $\eta^2 = 0.408$.

Results indicate that Kahoot! -based education produced a substantial improvement in academic achievement compared with traditional instruction, after accounting for baseline differences between groups (see Table 3). Figure 4 displays pre- and post-test achievement score progression between the experimental and control groups.

Table 3: Academic Achievement Test Pre-Post Comparison, Gain Scores, and ANCOVA of Groups

Group	Pre-Test M (SD)	Post- Test M(SD)	Mean Gain	Within t(p)	ANCOVA F(p)
Experimental (25)	68.52 (13.87)	72.40 (13.77)	+3.88	T (24) =6.43 p<.001	F (1,47) =32.36 p<.001 η^2p=.408
Control (25)	69.32 (14.92)	69.52(14.89)	+0.20	T (24) = 0.93 p=.364	N/A
Between Group	t=-0.20 p=.845	t=0.71 p=.481	d=1.62	t=5.74 p<.001	N/A

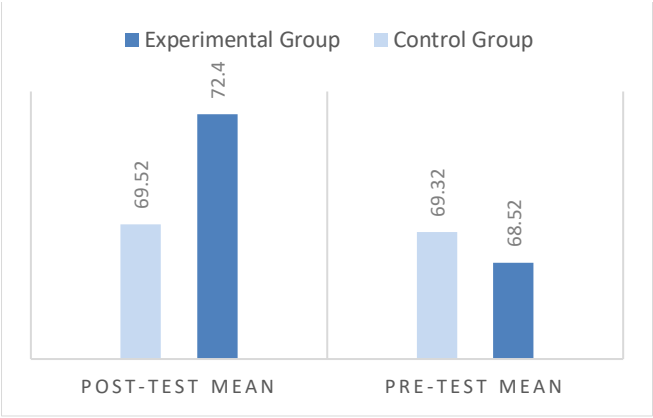

Figure 4: Mean scores for the four questionnaire dimensions against the neutral midpoint (3.00)

Table 4 presents the results of the motivation, engagement, attitude, and cognitive-skills questionnaire administered to the experimental group after the intervention (n = 25). The questionnaire included 16 items across four dimensions (4 items per dimension), each rated on a 5-point Likert scale. For each dimension, a one-sample t-test was used to compare the observed mean against the scale midpoint (3 = neutral) to test whether students' perceptions were significantly more positive than a neutral stance. Figure 5 displays mean scores across the four survey dimensions against the neutral midpoint (3.00).

Table 4: Descriptive and Inferential Statistics for Questionnaire Dimensions (n = 25)

Dimension	Items	M	SD	T (df=24)	p
Attitude	4	4.28	0.48	13.33	<.001
Engagement	4	4.15	0.52	11.06	<.001
Motivation	4	4.22	0.45	13.56	<.001
Cognitive Skills	4	4.10	0.50	11.00	<.001
Overall Perception	16	4.19	0.42	14.17	<0.001

Students' mean ratings on all four dimensions were well above the neutral midpoint of the scale, and each dimension was statistically significant (all p < .001), as shown in Table 4. Attitude toward Kahoot! received the highest mean rating (M = 4.28, SD = 0.48), followed by Motivation (M = 4.22, SD = 0.45), Engagement (M = 4.15, SD = 0.52), and Cognitive Skills (M = 4.10, SD = 0.50). The overall perception score across all 16 items (M = 4.19, SD = 0.42) indicates a positive experience with the Kahoot! based game across all four dimensions measured.

Results of Semi-Structured Interviews

Students enrolled in the IT Project Management course at the Faculty of Information Technology participated in semi-structured interviews as part of the experimental group.

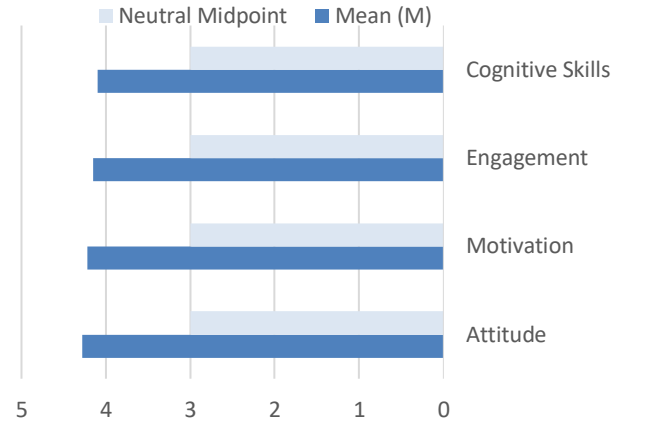

Figure 5: Pre- and post-test achievement score progression between the groups

Students' responses were organized into two main themes: the perceived benefits of using Kahoot and challenges associated with gamification integration in IT faculty courses. The interview provided an opportunity for students to express their experiences with the Kahoot platform and the difficulties they encountered while using it.

During the interviews, the majority of students expressed considerable enthusiasm for Kahoot! platform. Many described Kahoot as an engaging and motivating platform. Students agreed that the gamified, based-learning environment was stimulating and enjoyable, and encouraged active participation in knowledge and skill acquisition. Other students expressed concern that excessive engagement with the game format might cause them to miss course content. Despite the positive attitude of gamification, many students express concerns and doubts about gamification; the focus on earning points and winning competitions might redirect attention away from conceptual understanding of the lesson, which needs careful consideration for IT Project Management learning.

Semi-structured interviews were conducted with 23 volunteer students from the experimental group, each lasting 20–30 minutes; interviews were documented through handwritten notes taken during the session. Of the 23 interviewed students, 20 expressed positive views about the platform, while the remaining 3 voiced specific doubts about its academic value. Most interviewed students expressed positive views about the educational benefits of the gamification platform and elements, including points, quiz-based assessments, and academic competition, which enhanced their interest in the game and reflected participants' acceptance and engagement. A smaller number of students voiced specific doubts regarding the gamification in the academic environment, questioning whether educational games could improve learning outcomes. They suggested that using gamification in higher education could reduce learning quality and turn it into entertainment and amusement.

On the other hand, Participant 1 stated that "Kahoot made me feel more excited to attend lectures and look forward to reviewing the topic before the lecture." Also, Participant 2 noted that "competing with my classmates pushed me to study harder than I normally would."

Participant 3 said that "answering test questions within a limited time helped me recall information faster, and I started solving questions that I previously found difficult." Participant 4 observed that "the competition in the game was effective and contributed positively to the learning, so it encouraged me to prepare lessons before lectures." As

Participant 5 commended, "Sometimes I would focus so much on answering questions quickly that I couldn't even understand the question; I was just trying to win."

Thus, this study recommends that gamification tools should be carefully designed to maintain an appropriate balance between entertainment and purposeful academic learning. Equip lecturers and students with skills to mitigate technical challenges.

Discussion

Learning Motivation and Engagement

Table 4 shows that the Motivation dimension ($M = 4.22$, $SD = 0.45$) and the Engagement dimension ($M = 4.15$, $SD = 0.52$) are above the neutral midpoint of the scale ($p < .001$). This supports previous studies showing that gamified platforms can increase students' involvement with peers, encourage communication, and sustain active engagement during learning.

Improved Academic Achievement

Students in the experimental group showed a clear and statistically significant improvement in academic achievement from pre-test to post-test, while students in the control group did not improve significantly over the same period. A simple comparison of post-test scores between the two groups did not reach statistical significance. Once this baseline difference was controlled for using an ANCOVA, and when each student's gain score was compared directly, both analyses confirmed a substantial and statistically significant advantage for Kahoot! based group, with a large effect size. This indicates that Kahoot! meaningfully improved academic achievement compared to traditional education, and that relying on a simple post-test comparison alone would have understated this effect. This finding is broadly consistent with Özdemir (2024), who reported positive effects of Kahoot! on learning outcomes.

Enhanced Cognitive Skills

Table 4 shows the students' assessment of the skills dimension; the Cognitive Skills dimension was significantly above the neutral midpoint ($M = 4.10$, $SD = 0.50$, $p < .001$), although it was the lowest-rated of the four dimensions measured. This suggests that the collaborative and competitive elements of Kahoot! based learning, such as teamwork, time management, and technical communication, helped strengthen students' cognitive skills and confidence, consistent with Martín-Hernández et al. (2021), who emphasized the value of incorporating game elements in the classroom.

Students' Attitudes Toward Kahoot

As shown in Table 4, Attitude was the highest-rated dimension in the questionnaire ($M = 4.28$, $SD = 0.48$, $p < .001$), indicating that students have a positive view of Kahoot! and were receptive to integrating gamification tools into future learning activities. This positive attitude is consistent with the qualitative interview findings reported below, in which most students described Kahoot! favorably, and it may increase students' willingness to experiment with gamification technologies.

Challenges and Solutions in Adopting Kahoot in HE

This study aims to bridge the gap in IT Project Management education through a gamified environment. Implementing game-based learning in LHE is difficult. So, the implementation of gamification at the IT Faculty faces challenges, including a lack of technical infrastructure, limited financial resources for educational development, poor Internet connectivity, limited availability of modern computing devices, and a lack of lecturers' experience with gamification, which affect the quality of the educational process [18]. Despite these challenges, students show interest in adopting gamification tools in learning.

Study Limitations

The motivation, engagement, and attitude questionnaires, as well as the semi-structured interviews, were administered to the experimental group only, which limits the ability to compare these dimensions directly against the control group; future research should collect the same measures from both groups where feasible.

The qualitative interviews were documented through handwritten notes rather than audio recording, and coding was carried out by a single researcher without an independent second coder to strengthen credibility. In addition, the sample size was 50 (25 students per group) is modest by the standards of quasi-experimental research; however, the ANCOVA and gain-score analyses of academic achievement reached statistical significance with a large effect size. Also, the study was conducted within a single academic year and a single course context; the findings should be interpreted with caution when applied to other courses, faculties, and timeframes. Future research should address these constraints to produce more comprehensive results.

Long-Term Sustainability

Maintaining the long-term sustainability of gamification in the academic environment remains one of the most challenging issues facing AIU. The learning platforms require long-term institutional commitment to gamification [24]. Technology develops rapidly, and this initial interest in game-based platforms such as Kahoot, Quizizz, Moodle, and Google Classroom may make it necessary for educators to develop teaching approaches to enhance student engagement and motivation. Adopting gamification in learning in the IT Faculty may help bridge the gap between theoretical academic knowledge and the practical implementation required through preparing qualified graduates for professional work environments.

Conclusion and Recommendations

This study investigated the effective use of Kahoot! platform to enhance learning in IT Project Management course at IT Faculty, AIU. Findings indicated that using Kahoot in the classroom led to notable improvement in student engagement, cognitive skills, and academic performance. As well as immediate feedback, flexible access, and ease of use compared to traditional teaching. Kahoot proved to be an interactive environment for learning IT Project Management, and students showed interest and motivation for gamification. However, the study also acknowledged several challenges within the HE context. Not all lecturers and students demonstrated sufficient readiness to incorporate gamification into their teaching and learning, which may limit its adoption. This study recommends gradually introducing gamification into courses, starting with free, user-friendly platforms such as Kahoot! Quizizz, Google Classroom, and Moodle. In addition, establish learning laboratories within the IT faculty to support and adopt various gamification technologies, provide technical and pedagogical support to students and faculty members during the early stages, and improve internet infrastructure. Thus, conducting long-term future studies on a broader scope of technologies used and investigating the efficiency of learning on graduates' professional performance and adaptability in work projects.

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