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Enhancing Engagement through Gamification in Malaysian Blended Learning

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ABSTRACT

The transition to blended learning in Malaysia's higher education system, particularly following the COVID-19 pandemic, has brought student engagement and participation to the forefront of educational challenges. This study investigates the potential of gamification as a tool to enhance student engagement, with a specific focus on perceived usefulness as a critical factor. Research design, data and methodology: Utilising the Gamification Acceptance Model (GAM), an extension of the Technology Acceptance Model (TAM), the research analyses survey data collected from 200 undergraduate students enrolled in the Strategic Management course at Universiti Teknologi MARA (UiTM) Kampus Bandaraya Melaka. Results: The findings indicate that perceived usefulness significantly enhances three dimensions of engagement: attitude, interactive engagement, and skill engagement. However, the mediating role of attitude in the relationship between perceived usefulness and engagement was not substantiated. These results underline the applicability of GAM in blended learning environments and emphasise the importance of perceived usefulness in directly fostering student engagement. Conclusions: The study provides useful advice to educators and higher education institutions, advocating for the integration of gamification into course designs to create more engaging and effective learning experiences.

Keywords: Blended Learning, Higher Education, Gamification Acceptance Model, Technology Acceptance Model, Malaysia
JEL Classifications: I0, I2, O0, O3

1. INTRODUCTION

In the rapidly evolving educational landscape, fostering meaningful student engagement has become a central focus for higr education institutions. Traditional lecture-based pedagogies, long the cornerstone of education, are increasingly criticised for their inability to meet the diverse and dynamic needs of contemporary learners (Byusa et al., 2022; Platz, 2022). The rise of digital-native students and blended learning environments has highlighted the potential of online gamification as a transformative strategy to create interactive, dynamic, and student-centred learning experiences (Feng et al., 2024; Rahman et al., 2018).

The Malaysia Education Blueprint 2013-2025 underscores the integration of technology and digital platforms as a pivotal strategy to enhance learning outcomes and equip students with 21st-century skills. Gamification aligns closely with this national vision, introducing game-based elements such as rewards, challenges, and instant feedback to make learning more engaging, interactive, and personalised. It promotes critical thinking, collaboration, and digital literacy—key priorities outlined in the blueprint. Tools like Kahoot!, Quizizz, and STEM-related competitions exemplify gamification's practical applications in Malaysian classrooms, transforming traditional pedagogies into technology-driven, enjoyable learning experiences. For instance, Alnuaim (2024) reported that students in a gamified digital literacy course

demonstrated superior academic performance compared to those in conventional learning environments, reinforcing the efficacy of gamification in improving engagement and outcomes.

Despite these promising outcomes, challenges remain in understanding how gamification fosters meaningful engagement. Many studies emphasise ease of use but fail to explore its pedagogical impact comprehensively. Rahman et al. (2018) found that while students often appreciated user-friendly gamified platforms, usability alone did not consistently enhance learning outcomes. This observation underscores the need for a nuanced understanding of how gamification elements drive psychological and behavioural engagement beyond mere interface functionality. Without such insights, educators may struggle to design gamified learning environments that address learners' academic needs effectively (Norazlina et al., 2010). Moreover, existing research often conflates perceived ease of use with the academic value of gamification, limiting insights into the distinct roles of perceived usefulness and attitudes toward gamification (Su and Chiu, 2021). This oversight creates critical gaps in understanding how these factors independently influence student engagement. Addressing this limitation requires targeted empirical investigations to disentangle the motivational and value-based dimensions of gamification from usability considerations.

This study seeks to bridge these gaps by examining the impact of Gamification Perceived Usefulness (GPU) and Attitude Toward Gamification (A) on student engagement, specifically focusing on Skill Engagement (SKE) and Interaction Engagement (IE) among undergraduate students enrolled in the Strategic Management course at UiTM Kampus Bandaraya Melaka. By excluding the Gamification Ease of Use (GEoU) construct, the study isolates value-driven and motivational factors, offering a clearer understanding of their influence on engagement.

Leveraging the Gamification Acceptance Model (GAM)—an extension of the Technology Acceptance Model (TAM)—and employing Partial Least Squares Structural Equation Modeling (PLS-SEM), the research aims to provide robust insights into the causal relationships among these constructs. The findings will guide educators and instructional designers in crafting pedagogically sound gamification strategies that prioritise learning outcomes over technological convenience, contributing to the development of effective and student-centred educational practices.

2. LITERATURE REVIEW

2.1. Online Gamification Technique for higher education

Generation Z, also known as Gen Z, born between 1996 and 2010 (McNeil, 2018). Known as the most digitally native generation, Gen Z is highly connected to technology (Mahapatra et al., 2022; Alzahrani, 2024), as they have grown up with electronic devices, the internet and social media. Their comfort with platforms like Google Drive, Zoom, and cloud-based tools supports collaborative learning and remote work, contributing to the evolution of IT practices in higher education. Gen Z learners value personalization and flexibility, often seeking learning environments that incorporate mobile applications, gamified content, and AI-powered tools (Luan et al., 2010; Chicca and Shellenbarger, 2018). They are adept at navigating learning management systems and digital platforms, favoring tools that offer immediate feedback and social connectivity. Moreover, the integration of IT in academic settings has been shown to improve engagement and performance among Gen Z students, who often view technology not as a support tool but as an essential part of the learning process (Mohr and Mohr, 2017; Lai and Wang, 2012). As this generation increasingly enters higher education, institutions must adapt IT infrastructure and strategies to meet their needs, leveraging their digital fluency while addressing potential drawbacks related to overexposure and digital dependence.

2.2. Gamification Acceptance Model (GAM)

This study utilized the Gamification Acceptance Model (GAM) developed by Rahman et al. (2018) to examine how higher education students accept and engage with gamified learning tools. GAM is adapted from the Technology Acceptance Model (TAM) (Davis, 1989) but excludes the components of Behavioral Intention (BI) and Actual System Usage (U). The model emphasizes that Gamification Perceived Usefulness (GPU)—influenced by Gamification Ease of Use (GEOU)—along with GEOU itself, are key factors shaping students' attitudes toward gamification. GPU refers to the extent to which students believe gamification can enhance their learning performance, while GEOU represents how effortless they perceive the gamified system to be. This model offers a valuable framework for educators seeking to develop effective, engaging, and user-friendly gamified learning experiences in higher education (Van der Heijden, 2003).

2.3. Skill Engagement (SKE)

Skill engagement is in the form of taking notes while learning to understand the teaching materials and related to learning strategies in general that a student uses to achieve intrinsic and extrinsic rewards (Handelsman et al., 2005). According to Schnitzler et al. (2021) and Wong and Liem (2022), skill engagement focuses on developing and mastering specific skills essential for academic success and beyond. Meanwhile, Mauidloh et al. (2024) defined skill engagement as how the students participate in learning experiences, practice applying skills, seek challenges to enhance proficiency and demonstrate a continuous commitment to skill development.

Research by Domínguez et al. (2013), showed that students engaged more deeply with learning tasks when interactive elements simulated game mechanics, especially in skill-based courses such as programming, engineering, and language learning. Similarly, a study by Rahman et al. (2018), stated that 96% of students feel that gamification helped them in increasing their skill engagement where they were more inclined to take notes in the classroom and prompted them to listen more carefully during lectures. As digital learning platforms became more sophisticated and widespread, newer studies began to focus specifically on cognitive and behavioral skill engagement. For instance, Subhash and Cudney (2018) found that gamification increased students' enjoyment of knowledge and willingness to apply more effort to

their coursework. Taşkın and Kılıç Çakmak (2022) reported that gamified learning tools helped students develop critical thinking, collaboration, and problem-solving skills through consistent feedback and challenge-based progression.

Furthermore, personalized and adaptive gamification became an area of focus. Research by Lopez and Tucker (2021) in higher education settings showed that when gamification was tailored to learner profiles—using models like the Hexad typology—students demonstrated greater persistence and skill mastery. This personalization enhanced the alignment between gamified tasks and students' intrinsic motivations, which is critical for skill development in self-directed learning environments.

2.4. Interaction Engagement (IE)

According to Handelsman et al. (2005), interaction/participation engagement involves students' willingness and desire to interact with the instructor and/or peers about the course content. Meanwhile, according to Mauidloh et al. (2024), interaction engagement focuses on the involvement, participation and interaction that the students have with the gamified elements. Studies show that adding game components such as points, badges, leaderboards and group projects can greatly boost student engagement and participation. According to Hamid and Barzenji (2021), gamification strategies in online education encourage active learning and boost student retention by offering clear goals and fast feedback. Additionally, gamification techniques promote cooperation, communication, and group contributions towards common objectives among students (Hu et al., 2009; Bouchrika et al., 2021).

However, there are several difficulties to gamification's efficacy. Some studies have indicated that the initial surge in engagement may diminish over time owing to the novelty effect, where the thrill of new game aspects wears off, possibly leading to diminished motivation. For example, Hanus and Fox (2015) observed a decline in student motivation over a 16-week period in a gamified learning environment, suggesting that the initial enthusiasm may not sustain long -term engagement. Additionally, research by Mogavi et al. (2022) on language apps like Duolingo indicates that excessive focus on gamification can distract learners from the educational content, leading to what they term "gamification misuse."

2.5. Perceived Usefulness and Attitude

Recent research continues to affirm the strong positive relationship between perceived usefulness and learners' attitudes toward digital and blended learning environments. For example, Ali et al. (2022) found that university students' attitudes toward e-learning platforms were significantly influenced by their perceptions of the platforms' effectiveness in enhancing academic performance. Learners who viewed digital tools as beneficial for improving learning efficiency tended to exhibit more favorable attitudes toward online education.

Similarly, Bui and Nguyen (2023) investigated students' attitudes toward learning management systems (LMS) in hybrid classroom settings and found that perceived usefulness was the most significant predictor of positive attitude formation. Their study further highlighted that students expressed more favorable attitudes when the usefulness of the LMS was associated with real-world applicability and the potential to support academic success.The relationship was also supported by Rosyidin et al. (2023), showed that perceived ease of use and perceived usefulness directly had a positive and significant effect on the attitudes of BRI internet banking users in DI Yogyakarta.

2.6. Perceived Usefulness and Skill Engagement

Recent studies have consistently demonstrated a strong positive correlation between perceived usefulness and skill engagement within online and blended learning contexts. For instance, Zhu et al. (2022) found that among higher education students during the COVID-19 pandemic, the perceived usefulness of online learning platforms significantly predicted both study skill engagement and active participation. Likewise, Li and Salleh (2024), in a systematic review of blended learning effectiveness, reported that learners' perceptions of usefulness in hybrid environments had a direct impact on their cognitive and emotional engagement with skill-oriented content.

Furthermore, Chen et al. (2025) emphasized that in mobile learning environments, features perceived as valuable for skill development,such as real-time feedback and ease of access that contribute to higher levels of sustained learner engagement. These findings indicate that perceived usefulness influences not only initial motivation but also ongoing interaction with skill-based learning tools.

2.7. Perceived Usefulness and Interaction Engagement

The influence of perceived usefulness on interaction engagement is particularly evident in blended learning environments. According to a systematic review by Vlachopoulos and Makri (2017), game-based learning approaches confer significant benefits beyond mere cognitive knowledge acquisition. Their findings show that game-based learning not only increases interaction engagement and student motivation, but also promotes the development of critical soft skills such as teamwork, collaboration, organizational skills, adaptability, leadership, as well as a greater ability to resolve conflicts.

Meanwhile, Xie et al. (2024) found that learners who perceived peer collaboration, discussion forums, and in-class group activities as beneficial were significantly more likely to engage in interactive learning behaviors. Wang et al. (2022) found that digital literacy and previous experience with online tools strengthened the impact of perceived usefulness on engagement in peer discussions.

Therefore, the following hypotheses were develop:

H_1: There is a positive relationship between perceived usefulness and attitude

H_2: There is a positive relationship between perceived usefulness and skill Engagement

H_3: There is a positive relationship between perceived usefulness and interaction engagement

2.8. Effect of Attitude as a Mediator Variable

Attitude operates as a critical mediating variable between perceived usefulness and skill engagement, elucidating the

psychological pathway through which perceptions of utility shape individuals' willingness to actively engage in skill development. The study from Norazlina et al. (2020) confirms that the presence of attitude as a mediator between the technology access, technical usage self -efficacy, online communication self-efficacy and online media, leads to increased blended learning readiness among students (Jack et al., 2024).

2.9. Perceived Usefulness - Attitude - Skill Engagement

Chiou et al. (2010) found that when individuals have a positive attitude, they are ready to engage in any web-based course using an online learning portal. Recent work by Wong et al., (2021) and Xie et al. (2023) revealed that perceived usefulness of online platforms and learners' attitudes influenced their engagement with course content. Technologies such as gamification, mobile apps, and adaptive learning systems showed promise in boosting skill engagement through user-centered design and interactivity. Similarly, Huang et al. (2020), in the context of online collaborative learning, showed that perceived usefulness and attitude directly impacted both behavioral intention and skill engagement.

2.10. Perceived Usefulness - Attitude - Interaction Engagement

Based on attitude and interaction engagement, there was no significant difference between the two learning methods for most items and the findings suggest that the board game method was non-inferior in promoting interaction engagement among students (Chew et al., 2023). Meanwhile, Feroz et al. (2020) indicated that perceived usefulness, perceived ease of use, and increased positive attitude toward Kahoot! are significantly related to increased study skills and interaction engagement.

In the light of this, the following hypotheses were developed:

H_4: The attitude positively mediates the relationship between perceived usefulness and skill engagement

H_5: The attitude positively mediates the relationship between perceived usefulness and interaction engagement.

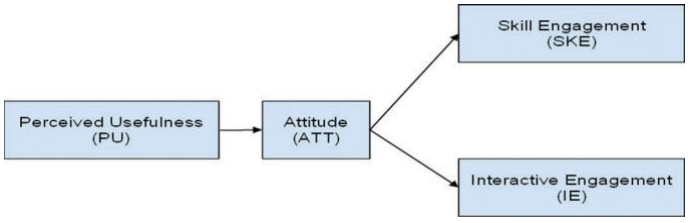
Figure 1 illustrates the conceptual framework developed for this study, which is grounded in the extended Gamification Acceptance Model (GAM), itself an adaptation of the Technology Acceptance Model (TAM). Additionally, the study proposes attitude as a mediating variable.

3. RESEARCH METHODOLOGY

3.1. Sampling and Population

This study employs a quantitative, cross-sectional research design to examine the influence of Gamification Perceived Usefulness (GPU) and Attitude Toward Gamification (A) on two dimensions of student engagement: Skill Engagement (SKE) and Interaction Engagement (IE). The research leverages the Gamification Acceptance Model (GAM) as the theoretical framework and applies Partial Least Squares Structural Equation Modeling (PLS-SEM) to test the proposed relationships. The population comprises bachelor's degree students enrolled in the Strategic Management course at Universiti Teknologi MARA (UiTM) Kampus Bandaraya Melaka, Malaysia. The study collected data from 200 students, ensuring statistical reliability and representativeness within the course context. The demographic composition of respondents showed that 79.8% were female, while 20.2% were male. Regarding academic programs, the majority (56.6%) were enrolled in the Finance program. Additionally, 20.9% were pursuing studies in Office Management, 11.6% in International Business, and 10.9% in Human Resource Management.

Figure 1: Conceptual framework of this study



A purposive sampling technique is employed due to the specific course context and the need for participants with direct experience using gamified learning tools (e.g., Kahoot!, Quizizz) in a Strategic Management setting. Data collection commenced after the questionnaire items were refined. According to Sarstedt et al. (2017), G*Power software is recommended for determining appropriate sample sizes in quantitative research. Faul et al. (2009) suggest that a sample size of 150 is adequate when analyzing models with fewer than seven constructs using Structural Equation Modeling (SEM).

3.2. Questionnaire Development

Data collection will involve structured questionnaires containing multiple items measured on a five-point Likert scale, with response options ranging from 1 (strongly disagree) to 5 (strongly agree). This scale is widely recognized for its ability to reduce response bias, increase statistical power, and limit measurement errors. However, some research indicates that utilizing scales with more than five points may enhance the sensitivity of responses and improve reliability. To ensure convenience and broader participation, the questionnaires will be administered via online platforms.

3.3. Statistical Technique

Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed to evaluate all the proposed hypotheses. According to Chan (2001), SEM addresses the limitations of bivariate analysis by allowing the simultaneous examination of complex interrelationships among multiple constructs. It is particularly suitable for studies involving several constructs, each measured by multiple indicators, as it enables the concurrent estimation of all model paths.

4. RESULT OF DATA ANALYSIS

4.1. Measurement Model Assessment

The reliability and validity of the constructs were evaluated using established metrics, including factor loadings, Average Variance Extracted (AVE), Composite Reliability (CR), and Cronbach's Alpha (CA), which are widely recognized for their robustness in assessing construct measurement properties (Hair et al., 2017). Convergent validity was verified by examining the AVE values, which must exceed the threshold of 0.50 to indicate that a construct

explains at least 50% of the variance in its corresponding indicators (Henseler et al., 2016). As reported in Table 1, all constructs demonstrated acceptable AVE values, with Perceived Usefulness (PU) at 0.757, Attitude (ATT) at 0.795, Self-Efficacy (SE) at 0.744, and Intention to Engage (IE) at 0.712, thereby confirming convergent validity. Additionally, CR values for each construct were found to surpass the recommended cutoff of 0.70, with PU at 0.926, ATT at 0.921, SE at 0.897, and IE at 0.903, further reinforcing the constructs' reliability. Cronbach's Alpha values also exceeded the 0.70 threshold, providing additional evidence of internal consistency. Collectively, these results demonstrate the robustness of the measurement model and its appropriateness for the study (Henseler et al., 2009).

4.2. Discriminant Validity

Discriminant validity ensures that constructs are conceptually distinct and that their measures do not exhibit excessive overlap. One commonly applied method for assessing discriminant validity is the Fornell-Larcker Criterion, which stipulates that the square root of the AVE for a construct must be greater than its correlations with other constructs. As presented in Table 2, the square root of the AVE for Attitude (0.892) exceeds its correlations with Interactive Engagement (0.666), Perceived Usefulness (0.741), and Skill Engagement (0.525), thereby satisfying this criterion (Hair et al., 2017).

Additionally, the Heterotrait-Monotrait Ratio (HTMT) was employed to further assess discriminant validity. The HTMT evaluates construct correlations to determine their distinctiveness. As a general guideline, HTMT values should not exceed 0.85 for stricter validation or 0.90 for more lenient criteria (Hair et al., 2017). In this study, the HTMT ratios for all constructs were found to be below 0.85, thereby confirming discriminant validity and demonstrating that the constructs effectively capture distinct dimensions of student interaction engagement (Table 3).

4.3. Structural Model Assessment

The study examined the influence of perceived usefulness on various dimensions of student engagement within gamified learning environments, uncovering significant direct relationships. As outlined in Table 3, perceived usefulness demonstrated a strong positive effect on attitude ($\beta = 0.742$, $t = 12.730$, $P < 0.001$), indicating that students who perceive gamified elements as beneficial are more likely to develop favourable attitudes toward engaging with these features. Besides, the findings revealed that perceived usefulness significantly enhances interactive engagement ($\beta = 0.573$, $t = 5.338$, $P < 0.001$), suggesting that students are more inclined to actively participate in gamified activities when they recognize tangible benefits. Furthermore, a robust positive relationship was identified between perceived usefulness and skill engagement ($\beta = 0.616$, $t = 6.253$, $P < 0.001$), underscoring the role of perceived utility in motivating students to participate in skill-building tasks.These results highlight the pivotal role of perceived usefulness in fostering engagement across multiple dimensions of gamified learning, emphasising its critical impact on shaping students' attitudes, active participation, and skill development.

Table 1: Fitness of measurement model

Construct	Items	Factor Loadings	AVE	CR	CA
Perceived usefulness	PU1	0.885	0.757	0.926	0.893
	PU2	0.872			
	PU3	0.864			
	PU4	0.859			
Attitude	ATT1	0.864	0.795	0.921	0.871
	ATT2	0.913			
	ATT3	0.897			
Skill engagement	SE1	0.834	0.744	0.897	0.828
	SE2	0.877			
	SE3	0.876			
Interaction engagement	IE1	0.859	0.712	0.908	0.864
	IE2	0.856			
	IE3	0.864			
	IE4	0.793			

Table 2: Fornell Larcker report

Variables	ATT	IE	PU	SE	PRI	SYS
ATT	0.892					
IE	0.666	0.844				
PU	0.741	0.754	0.870			
SE	0.525	0.711	0.668	0.862		

Table 3: HTMT report

Variables	ATT	IE	PU	SE
ATT				
IE	0.768			
PU	0.839	0.858		
SE	0.619	0.839	0.775	

The study also investigated the indirect relationships, focusing on the potential mediating role of attitude in the relationship between perceived usefulness and engagement (Table 4). The analysis of the first indirect relationship, Perceived Usefulness → Attitude → Skill Engagement (H_4), revealed non-significant results ($\beta = 0.050$, $t = 0.587$, $P = 0.558$). While perceived usefulness demonstrated a direct impact on skill engagement, attitude did not significantly mediate this relationship. These findings suggest that the positive influence of perceived usefulness on skill engagement occurs independently of changes in students' attitudes toward gamification. This highlights that the perceived utility of the gamified tool alone is sufficient to drive skill engagement, without necessitating an attitudinal shift. Similarly, the second indirect relationship, Perceived Usefulness → Attitude → Interactive Engagement (H_5), was also found to be non-significant ($\beta = 0.176$, $t = 1.784$, $P = 0.075$). The results indicate that interactive engagement is directly influenced by the perceived usefulness of the gamified environment, with no substantial mediation by attitude. This suggests that students' active participation in gamified learning activities is primarily driven by their perception of the tool's usefulness, rather than by their attitude toward it.

4.4. Finding and Discussion

The findings provide critical insights into how game-based learning could enhance student engagement in education. This study analyzed the direct and indirect relationships among perceived usefulness, skill engagement, and interaction, as well as the mediating effect of attitude. The findings revealed that H_1,

Table 4: Structural model fitness (Direct relationship)

H	Direct effect	β	SE	t-value	P-value	Result
H_1	Perceived Usefulness→Attitude	0.742	0.058	12.730	0.000	Supported
H_2	Perceived Usefulness→Interactive Engagement	0.573	0.108	5.338	0.000	Supported
H_3	Perceived Usefulness→Skill Engagement	0.616	0.099	6.253	0.000	Supported

Table 5: Structural model fitness (Indirect relationship)

H	Direct effect	β	SE	t-value	P-value	Result
H_4	Perceived Usefulness→Attitude→Skill Engagement	0.050	0.055	0.587	0.558	Not Supported
H_5	Perceived Usefulness→Attitude→Interactive Engagement	0.176	0.181	1.784	0.075	Not Supported

H_2 and H_3 were supported, while H_4 and H_5 were not supported (Table 5). This section discusses the findings where three out of five hypotheses were significant.

Based on the hypothesis results, perceived usefulness shows a significant influence on attitude. This outcome aligns with prior studies by Rosyidin et al. (2023) and Ali et al. (2022), which revealed that university students' attitudes toward e-learning platforms were strongly affected by how effective they perceived the platforms to be in supporting their learning. Likewise, Xie et al. (2024) found that perceived usefulness notably enhances students' likelihood of participating in interactive learning activities. Similarly, Zhu et al. (2022) reported that during the COVID-19 pandemic, higher education students who viewed online learning as useful were more likely to engage in study skills and actively participate in their learning.

Meanwhile, the indirect relationship between perceived usefulness and both skill engagement and interactive engagement, with attitude as a moderator, was found to be insignificant. The results suggest that perceived usefulness directly influences both skill engagement and interactive engagement, without the need for attitude to act as a mediator. This indicates that attitude serves as a weak mediator in the relationship between perceived usefulness and both skill engagement and interactive engagement. The mediation role of attitude between perceived usefulness and engagement could be weak due to individual differences in how students perceive and respond to gamified systems. Research by Chiu and Hew (2020) highlights that while perceived usefulness can influence attitude, the strength of this influence diminishes if the gamification design does not align with students' intrinsic motivations or learning preferences.

Numerous studies have empirically supported the direct relationship between perceived usefulness and engagement in learning activities, indicating that attitude plays a minimal role as a mediator. For example, Xie et al. (2024) found that students who perceived e-learning tools as highly useful were more likely to participate in interactive and skill-based learning tasks, irrespective of their attitudes toward the technology. This behavior is consistent with the findings of Teo and Noyes (2011), who suggested that in task-oriented settings, the perceived practical benefits of a system can directly influence user engagement, often bypassing the attitudinal evaluation process.

5. CONCLUSIONS

The findings revealed that students who perceive gamification as useful are more likely to develop positive attitudes toward its implementation in learning environments. This positive attitude significantly contributes to enhanced interaction engagement, indicating that motivational and affective responses play a crucial role in promoting collaborative learning and participation. Furthermore, perceived usefulness directly influences skill engagement, suggesting that students are more inclined to engage with learning tasks when they recognize the academic value of gamified tools.

Interestingly, while perceived usefulness has a direct impact on skill engagement, attitude alone does not significantly affect it. However, perceived usefulness indirectly influences interaction engagement through the mediation of attitude, highlighting the importance of students' perceptions of gamification's utility in fostering collaborative learning behaviours.

These outcomes align with recent studies emphasizing the role of perceived usefulness and attitude in enhancing student engagement through gamification. For instance, Allehaidan and Wan Zainon (2024) found that students with higher concentration levels exhibited stronger relationships between their attitudes toward gamification and both skill and participation engagement. Similarly, Ambikapathy et al. (2024) reported a significant relationship between gamification and student engagement among Malaysian undergraduates, underscoring the importance of context-specific research in understanding gamification's effectiveness.

5.1. Theoretical and Practical Conclusion

This study makes several contributions to the theoretical development of gamification in higher education. By refining and applying the Gamification Acceptance Model (GAM) in a Malaysian university context, the research advances our understanding of how Perceived Usefulness (PU) and Attitude Toward Gamification (ATT) influence different dimensions of student engagement. Unlike many previous models that combine or emphasize Perceived Ease of Use (PEOU), this study deliberately excluded that construct to isolate value-based and motivational factors, offering a more focused and nuanced theoretical model.

The findings empirically support the role of PU as a direct and indirect predictor of engagement. This reinforces the theoretical

proposition that students are more engaged when they perceive gamified tools as educationally valuable, rather than merely easy to use (Allehaidan and Wan Zainon, 2024). Moreover, the differentiation between Skill Engagement (SKE) and Interaction Engagement (IE) enhances the theoretical construct of engagement by recognizing its multidimensional nature, as also emphasized in recent work by Ambikapathy et al. (2024).

Practically, this research offers several actionable insights for educators, instructional designers, and academic leaders aiming to implement gamification in higher education. First, the strong effect of Perceived Usefulness (PU) on both Attitude and Skill Engagement suggests that gamification should be aligned closely with learning objectives and academic outcomes. Educators should ensure that game elements (e.g., badges, leaderboards, challenges) are not just entertaining but also clearly connected to course goals and performance expectations.

Second, the significant influence of Attitude on Interaction Engagement indicates that fostering positive emotional and motivational climates can enhance peer collaboration, discussion, and participation. Practical strategies may include integrating social rewards, recognition systems, and real-time feedback to build a sense of accomplishment and community within the classroom. Thus, this research equips stakeholders with a deeper understanding of how to design and implement gamified interventions that are purposeful, motivational, and pedagogically grounded in the real-world dynamics of student learning.

5.2. Limitations and Avenues for Future Research

This study applies the Gamification Acceptance Model (GAM) to examine the adoption of gamification among Generation Z in Malaysia. While GAM offers valuable insights, reliance on a single theoretical framework limits the scope for exploring other relevant dimensions of gamification acceptance. Future studies could employ alternative or complementary theories, such as the Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), or Self-Determination Theory (SDT), to offer greater clarity about intrinsic and extrinsic motivational factors.

Additionally, expanding the scope beyond Malaysia and Generation Z can enhance the generalisability of findings. Mixed-methods approaches may offer richer data, capturing both quantitative trends and qualitative learner experiences. Addressing long-term impacts, digital divide issues, and diverse gamification features, like AI personalisation, would also advance the field. By integrating multiple theoretical perspectives and addressing these limitations, future research can better inform the effective use of gamification in education.

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