INTERNATIONAL JOURNAL OF MODERN EDUCATION (IJMOE)

www.ijmoe.com

THE USE OF DIGITAL TECHNOLOGY IN ENHANCING STUDENT ENGAGEMENT AND MOTIVATION IN THE CLASSROOM

Ahmad Amri Zainal Adnan[1*], Ahmad Wiraputra Selamat[2], Luqman Haqim Mekedad[3], Putra Khairi Amir Mohd Zulkifli[4]

[1] Faculty of Business Management & Economics, Universiti Pendidikan Sultan Idris, Malaysia
Email: a.amri@fpe.upsi.edu.my
[2] Faculty of Computing & Meta-Technology, Universiti Pendidikan Sultan Idris, Malaysia
Email: wiraputra@meta.upsi.edu.my
[3] Faculty of Computing & Meta-Technology, Universiti Pendidikan Sultan Idris, Malaysia
Email: luqmanhaqim21@gmail.com.
[4] Faculty of Computing & Meta-Technology, Universiti Pendidikan Sultan Idris, Malaysia
Email: khairiamir321@gmail.com
* Corresponding Author

Article Info:

Abstract:

The transformation of education in the Industrial Revolution 4.0 era demands a new learning approach that can meet the needs of Generation Z students, who have short attention spans and are easily distracted. This study evaluates the effectiveness of the E-Prestasi application, developed based on game-based learning principles and powered by digital technology, in enhancing student engagement and motivation during learning sessions. A structured questionnaire was administered to 126 students after using the application in class. The findings indicate that students responded positively to the use of E-Prestasi in terms of motivation, challenge, interaction, and rewards gained. This study supports the potential of digital technology in enhancing experiential and digital interaction-based pedagogy. The potential use of digital technology through this application can be expanded not only in the learning process at educational institutions but also in staff training.

Keywords:

Digital Technology, Gamification, Student Motivation, Student Engagement, Digital Learning
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Introduction

Student engagement in the classroom is a fundamental pillar of effective education, directly influencing knowledge retention, critical thinking, and academic performance. However, contemporary educational systems face significant challenges when catering to Generation-Z learners, who are characterized by shorter attention spans, a preference for interactive content, and diminished motivation in conventional lecture-based settings (Lee, 2024). Traditional pedagogical methods, which often rely on passive learning and rigid structures, struggle to resonate with this digitally native generation. To bridge this gap, educators and technologists are increasingly turning to innovative solutions that leverage cutting-edge advancements, such as gamification and artificial intelligence (AI), to create dynamic and immersive learning experiences. These approaches aim to align with the cognitive and behavioral tendencies of modern students, fostering deeper participation and sustained interest in educational content.

One promising solution is the development of specialized digital technology applications designed to enhance engagement through personalized and interactive learning. By integrating gamification elements such as point systems, leaderboards, and achievement badges, these applications tap into intrinsic motivational triggers, transforming mundane tasks into stimulating challenges. For instance, a digital technology app might identify a student's struggle with a specific concept and subsequently modify the difficulty level or recommend targeted exercises. This dual emphasis on gamification and intelligent automation not only revitalizes student interest but also promotes self-directed learning, a critical skill in the rapidly evolving Industrial Revolution 4.0 (IR4.0) landscape.

The primary objectives of this study are threefold, each addressing a key dimension of modern educational innovation. First, the research seeks to design and implement an interactive learning platform that harnesses gamification to facilitate active student participation. Second, it aims to empirically assess the application's impact on motivation and engagement levels through quantitative and qualitative measures, such as surveys and behavioral analytics. Third, the study evaluates the broader efficacy of experiential digital learning in preparing students for the demands of the IR4.0 era, where adaptability, technological literacy, and collaborative problem-solving are paramount. By examining these facets, the study contributes to the growing body of evidence supporting technology-based pedagogies as a transformative tool in education, with potential applications extending beyond classrooms to corporate training and lifelong learning initiatives.

Literature Review

Research on student engagement and motivation through technology use has grown rapidly alongside advancements in digital techmology and gamification approaches in education. Self-Determination Theory by Deci and Ryan (2000) emphasizes the importance of three basic human needs: autonomy, competence, and relatedness, as key drivers of effective learning. In the context of 21st-century education, these needs can be supported through strategies that allow students to experience control, challenge, and rewards for their efforts. Csikszentmihalyi (1990) introduced the concept of "flow" as an optimal psychological state achieved when an individual is deeply immersed in an activity with balanced levels of focus and challenge.

Sailer and Homner (2020), in their meta-analysis, found that gamification has a moderate yet significant impact on learning motivation. Elements such as reward systems, leaderboards, and badges were linked to increased intrinsic motivation among students. Similarly, Ruiz et al. (2024) noted that gamification in education consistently enhances student engagement, particularly when designed using pedagogical frameworks aligned with contemporary trends. Previous studies found that competition in game-based learning positively influences learning outcomes, especially in terms of motivation and classroom engagement (Chen, Shih & Law, 2020). Kovari (2025), through a systematic analysis, concluded that AI use in collaborative learning at higher education institutions generally leads to improved student motivation and engagement. This is supported by Tariq (2025), who highlighted AI's potential in delivering personalized and interactive learning, thereby enhancing instructor efficiency and student participation.

Further research by Zawacki-Richter et al. (2019) demonstrated AI applications in higher education, including intelligent tutoring, content adaptation, and learning analytics, all contributing to higher student engagement levels. Additionally, Singh and Hiran (2022) proved that technology integration in teaching provides immediate feedback on student performance and strengthens instructor-student relationships. Lee (2024) emphasized that Generation Z students are easily distracted and prone to boredom, yet their engagement can be enhanced through appropriate digital approaches. Similarly, Ullah and Anwar (2020) found that technology and interactive activities significantly improve student engagement in active learning contexts.

Collectively, existing literature supports the idea that integrating digital technology and gamification in education fosters more engaging, challenging, and meaningful learning experiences tailored to modern students' needs. The development of the E-Prestasi application emphasizes gamification elements such as clear goals, rules, interaction, challenges, and rewards, allowing students to experience "flow" and thereby enhancing their focus and participation in learning.

Methodology

This study is underpinned by the integration of Self-Determination Theory (Deci & Ryan, 2000), Flow Theory (Csikszentmihalyi, 1990), and the Gamified Learning Theory (Landers, 2014). Self-Determination Theory explains how gamification elements such as goals, interaction, and rewards foster intrinsic motivation through autonomy, competence, and relatedness. Flow Theory supports the role of challenges, rules, and clear objectives in creating an optimal engagement state where students experience deep focus. Meanwhile, Gamified Learning Theory provides a structural explanation of how game elements influence learning outcomes through motivational and behavioral mechanisms. Collectively, these theories form a comprehensive framework for examining how an application can enhances student motivation and engagement through its gamified digital environment.

The E-Prestasi application was developed based on the principles of game-based learning. The purpose of this digital application is to provide students with a more dynamic and interactive learning environment, thereby enhancing their motivation and classroom engagement. Each student was equipped with the E-Prestasi app, which they used over a four-week lecture period to evaluate its effectiveness in improving student motivation and participation in class.

This study adopted a quantitative approach with a survey design. A total of 126 students from a Malaysian public higher education institution (Sultan Idris Education University) participated as respondents. The respondents comprised students from the 4th to the 8th semester, with 73% being female and 27% male. The research instrument consisted of a concise questionnaire developed around five key gamification components: goals, rules, challenges, interaction, and rewards. Each component was measured using 10 questionnaire items (refer to Table 1). A 4-point Likert scale was employed to gauge student perceptions, with the following ratings: 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, and 4 = Strongly Agree. Date was taken from May to June 2025 using online Google Form. Random sampling technique was used.

Descriptive analysis was conducted to calculate percentages and mean scores for each item. The findings were then critically discussed and compared with previous studies to assess their implications and validity in the context of gamified and technology-enhanced learning environments.

Table 1: Survey Items

Item No.	Description
1	"Aplikasi yang digunakan dalam kelas memberikan saya matlamat untuk bersaing." *The application used in class gives me a goal to compete.*
2	"Aplikasi yang digunakan dalam kelas menetapkan peraturan yang jelas dalam penggunaannya." *The application used in the class sets clear rules for its usage.*
3	"Aplikasi yang digunakan dalam kelas mencabar saya untuk mencuba mengemukakan pandangan." *The application used in class challenges me to try to express my views.*
4	"Aplikasi yang digunakan dalam kelas meningkatkan interaksi saya dengan pensyarah." *The application used in class enhances my interaction with the lecturer.*
5	"Aplikasi yang digunakan dalam kelas memberi ganjaran bermakna kepada pelajar yang aktif." *The applications used in class provide meaningful rewards to active students.*
6	"Penglibatan dalam kelas dapat ditingkatkan dengan penggunaan aplikasi ini." *Participation in classes can be enhanced with the use of this application.*
7	"Pelajar yang menggunakan aplikasi ini perlu meningkatkan penglibatan untuk mendapat markah." *Students using this application need to increase their engagement to score points.*
8	"Sistem ranking yang digunakan melalui aplikasi ini menjadi cabaran kepada setiap pelajar." *The ranking system used through this application poses a challenge to every student.*
9	"Interaksi dua hala dalam kelas berjaya ditingkatkan dengan menggunakan aplikasi ini."

	Bilateral interaction in the classroom has been successfully enhanced using this application.	
10	"Ganjaran yang diberikan semasa menggunakan aplikasi ini memotivasikan saya" *The rewards given while using this application motivate me.*	

Source: Author.

Findings

The analysis revealed strong positive responses from students across all measured dimensions as can be seen in Table 2. Regarding goal-setting, 63.5% strongly agreed that the application provided clear competitive objectives, indicating its effectiveness in establishing learning direction. An impressive 69% strongly agreed that classroom engagement improved through app usage, demonstrating its capacity to structure participation around defined targets.

Table 2: Summary of Findings

Gamification Component	Measured Item	Key Result
Goal	Provides goals in class	63.5% strongly agreed
Goal	Increases participation	69.0% strongly agreed
Rules	Clear rules for usage	59.5% strongly agreed
Rules	Engagement for points	73.0% strongly agreed
Challenges	Actively express opinions	59.5% strongly agreed
Challenges	Ranking system	61.1% strongly agreed
Interaction	Interaction with lecturer	68.3% strongly agreed
Interaction	Two-way communication	67.5% strongly agreed
Rewards	Meaningful rewards	72.2% strongly agreed
Rewards	Continuous engagement	71.4% strongly agreed

Source: Author.

The rules component showed similar success, with 59.5% strongly agreeing on the clarity of guidelines, crucial for understanding reward/penalty mechanisms. Notably, 73% strongly acknowledged the need for active participation to earn good marks, confirming the motivational impact of the scoring system.

The challenge dimension yielded significant results: 59.5% strongly agreed the app challenged them to express opinions (fostering intellectual courage), while 61.1% strongly endorsed the ranking system as promoting healthy competition. Interaction metrics were particularly strong, with 68.3% strongly agreeing the app enhanced instructor-student communication and 67.5% noting improved peer interactions, transforming students from passive recipients to active participants.

The reward system proved highly effective, with 72.2% strongly agreeing on meaningful rewards for active students and 71.4% strongly confirming these incentives sustained their learning motivation.

All five gamification dimensions received exceptionally high acceptance rates, with "Strongly Agree" responses exceeding 59.5% for every item. These results demonstrate the effectiveness of this gamification approach in creating dynamic, structured, and motivational classroom environments. The consistently high approval ratings across all components validate the application's comprehensive success in enhancing student engagement through its multifaceted design.

Discussion

The study results demonstrate strong consensus among students that the E-Prestasi application effectively enhanced their classroom engagement and motivation. All five core dimensions (goals, rules, challenges, interaction, and rewards) received high "strongly agree" ratings (exceeding 59.5%), indicating positive reception of this gamified learning approach.

Goal Dimension

The finding highlights the significance of clear goal-setting in fostering engagement. Over 69% of respondents reported increased motivation when learning objectives were explicitly stated, aligning with Deci and Ryan's (2000) Self-Determination Theory regarding goal clarity's role in strengthening student competence. These findings support Lee's (2024) emphasis on Generation Z's need for transparent learning directions to maintain focus in fast-paced classroom environments. Tariq (2025) suggest activities based on individual performance, a principle preliminarily validated by E-Prestasi's implementation, may contribute to goal delivery.

Rules Dimension

Clear rules provided students with purposeful engagement frameworks. Wang et al. (2024) corroborate that consistent structures enhance student responsibility and focus. The transparent scoring system for active participation created intrinsic motivation, supporting Chen, Shih & Law's (2020) findings about competition-based reward systems in game-based learning environments.

Challenge Dimension

With around 60% approval, students acknowledged the application's competitive elements. Chen et al.'s (2020) meta-analysis confirms that balanced digital competition boosts motivation when implemented appropriately. These results resonate with Hartt, Hosseini & Mostafapour's (2020) findings about challenge-based games fostering both engagement and self-confidence. Winatha & Setiawan (2020) further demonstrate how challenge mechanics (response times, answer accuracy, rankings) enhance academic focus and performance - features effectively incorporated in E-Prestasi.

Interaction Dimension

Over 67% reported improved instructor-peer interactions, consistent with Hutain & Michinov's (2022) findings about digital tools reducing classroom isolation. Kovári's (2025) systematic review emphasizes how collaborative learning promotes active engagement cultures,

reinforced by Wang et al.'s (2024) findings about clear communication's role in academic self-regulation.

Reward Dimension

With 71.4% to 72.2% approval, the reward system successfully cultivated extrinsic motivation for sustained engagement. Ruiz, Sánchez & Figueredo (2024) emphasize the importance of immediate, achievement-based rewards, while Hartt et al. (2020) and Winatha & Setiawan (2020) validate their performance-enhancing effects. Tariq (2025) highlights digital technology advantage in delivering personalized, real-time feedback and recognition, a capability noted by Singh & Hiran (2022) as crucial for higher education effectiveness.

These findings collectively support Ullah & Anwar's (2020) emphasis on interactive technologies for engagement and Pllana's (2020) assertion about structured digital activities sustaining attention. The E-Prestasi application demonstrates how balanced integration of pedagogical structure and technology can achieve optimal educational outcomes, confirming digital technology and gamification as effective tools for modern learning environments. The study substantiates that when entertainment elements are academically purposeful, they create dynamic, motivational classrooms that address contemporary learners' needs.

Conclusion and Recommendations

This study demonstrates that the use of an application integrating digital technology and gamification can significantly enhance student motivation and engagement in teaching and learning sessions. Students provided positive feedback on the five core gamification elements tested: goals, rules, challenges, interaction, and rewards. The application has the potential to serve as a catalyst for immersive classroom learning at both school and higher education levels. It is also suitable for use in staff training programs.

Recommendations for future research include: 1.) conducting longitudinal studies to assess the long-term impact of technology-based applications in learning sessions. 2.) Expanding the research context to different institutions and academic disciplines to identify contextual factors influencing the application's effectiveness. 3.) Performing qualitative studies to gain deeper insights into students' experiences while using the application. 4.) Implementing controlled experimental studies to provide more robust causal evidence on the effects of the application on student learning. 5.) Conducting further in-depth analysis to validate these findings.

This research paves the way for future innovations in gamified learning, offering valuable insights for educators, instructional designers, and policymakers.

Acknowledgement

References

Chen, C.H., Shih, C.C., & Law, V. (2020). The effects of competition in digital game-based learning (DGBL): A meta-analysis. *Educational Technology Research and Development*, 68(4), 1855–1873. doi: org/10.1007/s11423-020-09794-1

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper & Row.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11(4), 227–268. doi.org/10.1207/S15327965PLI1104_01

Hartt, M., Hosseini, H., & Mostafapour, M. (2020). Game on: Exploring the effectiveness of game-based learning. *Planning Practice & Research*, 35(5), 589–604.

Hutain, J., & Michinov, N. (2022). Improving student engagement during in-person classes by using functionalities of a digital learning environment. *Computers & Education*, 183, 104463. doi.org/10.1016/j.compedu.2022.104463

Kovari, A. (2025). A systematic review of AI-powered collaborative learning in higher education: Trends and outcomes from the last decade. *Social Sciences & Humanities Open*, 13, 101335. doi.org/10.1016/j.ssaho.2025.101335

Lee, K. (2024). *Improving student engagement despite lowering attention spans in the classroom* (Senior honors theses, Liberty University). Retrieve from https://digitalcommons.liberty.edu/honors/1397

Pllana, D. (2020). Keeping students' attention active. *Education, Society and Human Studies*, 1(2), 171–182. doi.org/10.22158/eshs.v1n2p171

Ruiz, J. J. R., Sanchez, A. D. V., & Figueredo, O. R. B. (2024). Impact of gamification on school engagement: A systematic review. *Frontiers in Education*, 9, 1466926. doi.org/10.3389/feduc.2024.1466926

Sailer, M., & Homner, L. (2020). The gamification of learning: A meta-analysis. Educational *Psychology Review*, 32(1), 77–112.

Singh, R., & Hiran, K. (2022). The impact of AI on teaching and learning in higher education technology. *Journal of Higher Education Theory and Practice*, 22(13), 102–114. doi.org/10.33423/jhetp.v22i13.5514

Tariq, F. (2025). AI-driven personalized learning: Revolutionizing student engagement and teacher efficiency in education 5.0. In *Artificial Intelligence Applications in Education* (pp. 46–61). IGI Global. doi.org/10.4018/979-8-3693-9770-1.ch004

Ullah, A., & Anwar, S. (2020). The effective use of information technology and interactive activities to improve learner engagement. *Education Sciences*, 10(12), 349. Retrieve from https://www.mdpi.com/2227-7102/10/12/349

Wang, H., Sun, Y., Zhao, X., Wang, W., & Xue, J. (2024). Enhancing academic engagement through students' perceptions of teacher expectations: The mediating role of intentional self-regulation in middle school. *Frontiers in Psychology*, 15, 1456334. doi.org/10.3389/fpsyg.2024.1456334

Winatha, K. R., & Setiawan, I. M. D. (2020). Pengaruh game-based learning terhadap motivasi dan prestasi belajar. *Scholaria: Jurnal Pendidikan Dan Kebudayaan*, 10(3), 198–206.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. *International Journal of Educational Technology in Higher Education*, 16(1), 1–27. doi.org/10.1186/s41239-019-0171-0.