https://research.adra.ac.id /index.php/jssut/
P - ISSN: 3026-5959
E - ISSN: 3026-605X

Gamification in Higher Education: Enhancing Student Motivation and Cognitive Outcomes Through Game-Based Learning

Andres Villanueva[1], Catherine Li[2], Dodi Setiawan Riatmaja[3]
[1]University of San Carlos, Philippines
[2]University of Mindanao, Philippines
[3]Universitas Amikom Yogyakarta, Indonesia

ABSTRACT

The increasing demand for active, engaging, and meaningful learning in higher education has encouraged the adoption of innovative instructional strategies such as gamification. Traditional teaching approaches often struggle to sustain student motivation and to promote higher-order cognitive outcomes, particularly in digitally mediated learning environments. This study aims to examine the role of gamification in higher education by analyzing its effectiveness in enhancing student motivation and cognitive outcomes through game-based learning. A quantitative quasi-experimental research design was employed, involving undergraduate students divided into experimental and control groups. Data were collected using validated motivation questionnaires and cognitive achievement tests aligned with course learning objectives, and were analyzed using descriptive and inferential statistical techniques. The results demonstrate that students exposed to gamified learning environments show significantly higher levels of intrinsic motivation, engagement, and persistence compared to those in non-gamified settings. In addition, gamification was found to have a positive and significant effect on cognitive outcomes, particularly in comprehension, application, and problem-solving skills. These findings indicate that gamification contributes not only to affective engagement but also to meaningful cognitive development. In conclusion, the study confirms that well-designed gamification can function as an effective pedagogical approach in higher education, supporting both motivational and cognitive dimensions of learning when aligned with instructional goals.

KEYWORDS

Cognitive Outcomes, Game-Based Learning, Gamification, Higher Education, Student Motivation.

Citation: Villanueva, A., Li, C., & Riatmaja, S., D. (2026). Gamification in Higher Education: Enhancing Student Motivation and Cognitive Outcomes Through Game-Based Learning. *Journal of Social Science Utilizing Technology*, *4*(1), 14–25. https://doi.org/10.70177/jssut.v4i1.3429

Correspondence:

Andres Villanueva,
andresvillanueva@gmail.com

Received: August 7, 2025

Accepted: January 13, 2026

Published: February 25, 2026

INTRODUCTION

The increasing complexity of learning demands in higher education has intensified concerns regarding student motivation, engagement, and meaningful learning outcomes. Universities are expected to prepare students not only with disciplinary knowledge but also with higher -order cognitive skills such as problem-solving, critical thinking, and self-regulated learning (Mahmoudi dkk., 2026). Traditional instructional approaches, which often rely on passive content delivery, have been criticized for their limited ability to sustain student motivation and foster deep cognitive engagement in diverse learning environments.

The rapid advancement of digital technologies has introduced new pedagogical opportunities that reshape how delivered (Duran dkk., 2024). Among these innovations,

gamification has gained significant attention as an instructional approach that integrates game elements into non-game educational contexts (Sukavatee & Khlaisang, 2026). By incorporating features such as points, badges, leaderboards, challenges, and feedback systems, gamification seeks to create more interactive and motivating learning environments that align with students' digital habits and preferences.

In higher education contexts, gamification is increasingly viewed as a strategy to address motivational deficits and enhance cognitive outcomes (Hajarian dkk., 2025). Game-based learning environments encourage active participation, goal-oriented behavior, and sustained engagement, which are essential for effective learning (Lau dkk., 2025). The growing adoption of gamification across disciplines highlights the need for systematic academic investigation into its pedagogical value, particularly regarding how it influences student motivation and cognitive development in higher education settings.

Despite the growing popularity of gamification in higher education, its implementation often lacks a clear pedagogical foundation (Kumar Karanam & Hartman, 2025). Many gamified learning designs emphasize surface-level engagement through extrinsic rewards without adequately supporting meaningful cognitive processing (Sangamuang dkk., 2025). This imbalance raises concerns that gamification may increase short-term motivation while failing to promote deeper learning and long-term academic achievement.

Variability in student responses to gamified learning environments presents another critical challenge (Murugan dkk., 2024). Learners differ in motivational orientations, prior knowledge, learning strategies, and cognitive readiness, which can influence how they perceive and benefit from gamified instruction (Varhata dkk., 2025). Uniform gamification designs may therefore produce uneven learning outcomes, benefiting some students while disengaging others (Warford, 2025). This variability complicates efforts to generalize the effectiveness of gamification in higher education.

A further problem lies in the limited integration of motivational and cognitive theories within gamification research (Garg dkk., 2025). Many studies focus primarily on engagement metrics or student satisfaction, offering limited insight into how gamification influences cognitive outcomes such as comprehension, retention, and transfer of knowledge (Torrado Cespón & Bárcena Toyos, 2025). The absence of theoretically grounded frameworks restricts the ability to evaluate gamification as a holistic instructional strategy rather than a motivational add-on.

The primary objective of this research is to examine the role of gamification in enhancing student motivation and cognitive outcomes in higher education (Attuquayefio dkk., 2025). The study seeks to analyze how game-based learning elements influence students' engagement, persistence, and willingness to invest effort in academic tasks (Park dkk., 2026). By focusing on motivation as a central construct, the research aims to clarify the mechanisms through which gamification affects learning behavior.

Another objective of this study is to investigate the impact of gamified learning environments on students' cognitive outcomes (Sharma & Sengar, 2026). This includes examining how gamification influences processes such as understanding, problem-solving, and knowledge application (Martín-del-Pozo dkk., 2025). The research aims to move beyond affective outcomes by providing empirical evidence on whether gamification contributes to meaningful learning and cognitive development.

The study also aims to contribute practical insights for instructional designers and educators in higher education (Ivarson dkk., 2025). By identifying effective gamification strategies and design principles, the research seeks to support the development of learning environments that balance

motivational appeal with cognitive rigor (Gronseth dkk., 2026). These objectives collectively position the study as both theoretically informative and pedagogically relevant.

Existing literature on gamification in education has primarily focused on engagement and motivation, often reporting positive effects on student participation and enjoyment (Martín-Lara dkk., 2025). However, many of these studies adopt short-term experimental designs or rely on self-reported perceptions, limiting their ability to capture sustained cognitive outcomes (Valencia-Lazcano dkk., 2025). This emphasis on immediate engagement leaves questions about the long-term educational value of gamification largely unanswered.

Research on cognitive outcomes in gamified learning environments remains fragmented and inconsistent (Denoni-Buján dkk., 2025). Some studies report improvements in learning performance, while others find minimal or no significant effects (Bamford & Moschini, 2025). These mixed findings suggest that the effectiveness of gamification may depend on contextual factors such as instructional design quality, disciplinary context, and alignment with learning objectives (Mazlan dkk., 2025). The lack of integrative analyses contributes to uncertainty regarding when and how gamification enhances cognition.

Another notable gap is the limited theoretical integration in gamification research. Many studies adopt a descriptive or exploratory approach without grounding their designs in established theories of motivation and cognition (Fleissner-Martin dkk., 2025). The absence of frameworks that connect gamification elements with motivational regulation and cognitive processing restricts the explanatory power of existing research (Sagar & Saini, 2025). Addressing this gap requires a more theory-driven examination of gamification in higher education.

The novelty of this research lies in its integrative focus on both motivational and cognitive dimensions of gamification in higher education (Hasmizan dkk., 2025). Rather than treating motivation and cognition as separate outcomes, the study examines their interrelationship within game-based learning environments (Chen & Hou, 2025). This perspective allows for a more comprehensive understanding of how gamification supports not only student engagement but also meaningful learning processes.

This research is further distinguished by its emphasis on higher education contexts, where learning demands are complex and cognitively intensive (Gkintoni dkk., 2025). While much gamification research has been conducted in primary or secondary education, fewer studies have systematically examined its impact at the university level (Queiro-Ameijeiras dkk., 2024). The present study addresses this gap by situating gamification within the pedagogical and cognitive challenges unique to higher education.

The justification for this research is grounded in the need for evidence-based instructional innovation. As higher education institutions increasingly adopt gamification, understanding its educational value becomes essential for informed decision-making. By providing theoretically grounded and empirically supported insights, this study contributes to advancing scholarship on game-based learning and informs the design of effective, cognitively meaningful gamified learning environments.

RESEARCH METHODOLOGY

This study employed a quantitative research design with a quasi-experimental approach to examine the effects of gamification on student motivation and cognitive outcomes in higher education (Turzhanov dkk., 2026). The design was selected to allow systematic comparison between learning environments that integrated game-based elements and those that followed conventional instructional methods (Gruber & Faßbender, 2025). A pretest–posttest structure was

applied to measure changes in motivation and cognitive performance before and after the implementation of gamified learning activities, enabling the assessment of instructional impact within an authentic academic setting.

The population of this study consisted of undergraduate students enrolled in higher education institutions who participated in courses incorporating digital learning platforms (Ibragimova dkk., 2025). The sample was selected using a purposive sampling technique to ensure that participants were actively engaged in course activities and had prior exposure to technology-enhanced learning environments (Flores & Mean, 2025). Two groups of students were formed, comprising an experimental group that experienced gamified instruction and a control group that received non-gamified instruction (Tec Chim dkk., 2025). The selected sample represented diverse academic backgrounds and levels of prior learning experience.

Data were collected using standardized research instruments designed to measure student motivation and cognitive outcomes. Student motivation was assessed through a validated questionnaire based on established motivational constructs, including intrinsic motivation, engagement, and persistence. Cognitive outcomes were measured using achievement tests aligned with course learning objectives, focusing on comprehension, application, and problem-solving skills. All instruments were reviewed by subject-matter experts to ensure content validity, and reliability testing was conducted to confirm internal consistency.

The research procedures began with administering pretests to both experimental and control groups to establish baseline measures of motivation and cognitive performance. Gamified learning activities incorporating elements such as points, challenges, feedback, and progress tracking were then implemented in the experimental group over a defined instructional period. The control group continued with traditional instructional methods during the same timeframe. Posttests were administered at the end of the intervention to collect outcome data, which were subsequently analyzed using appropriate statistical techniques to evaluate the effects of gamification on student motivation and cognitive outcomes.

RESULT AND DISCUSSION

The descriptive statistical analysis summarizes student motivation and cognitive outcome measures collected from both the experimental and control groups. The dataset consisted of valid responses from undergraduate students who completed the pretest and posttest instruments. Descriptive measures were calculated to represent motivation indicators, including intrinsic motivation, engagement, and persistence, as well as cognitive outcomes related to comprehension, application, and problem-solving performance.

Table 1. Descriptive Statistics of Student Motivation and Cognitive Outcomes

Variable Category	Indicator	Experimental Group Mean	Control Group Mean	Standard Deviation
Student Motivation	Intrinsic Motivation	4.18	3.52	0.61
	Learning Engagement	4.25	3.60	0.58
	Persistence	4.10	3.48	0.65
Cognitive Outcomes	Comprehension	82.6	74.3	6.8
	Application	80.9	72.1	7.2
	Problem-Solving	78.4	70.5	7.6

The descriptive results indicate that students exposed to gamified learning environments demonstrated higher levels of motivation compared to those in traditional instructional settings. Mean scores for intrinsic motivation, engagement, and persistence were consistently higher in the experimental group, suggesting that game-based elements positively influenced students' willingness to participate and sustain learning efforts.

Cognitive outcome measures also favored the experimental group, with higher mean scores across comprehension, application, and problem-solving indicators. These results suggest that gamification not only enhanced affective aspects of learning but also supported cognitive performance. The observed differences highlight the potential of gamified instructional strategies to foster deeper engagement and improved academic achievement.

A more detailed examination of motivational indicators reveals that learning engagement achieved the highest mean score among the experimental group. This pattern suggests that interactive elements such as challenges, feedback, and progress tracking were particularly effective in maintaining student attention and involvement. Persistence scores also reflected a stronger commitment to task completion in gamified environments.

Cognitive performance indicators showed variation across skill levels, with comprehension demonstrating the largest performance gap between groups. Problem-solving exhibited slightly lower mean scores compared to other cognitive indicators, indicating that higher-order cognitive skills may require more sustained exposure to gamified strategies. These descriptive patterns provide insight into the differential effects of gamification across learning dimensions.

Inferential statistical analysis was conducted to examine the effects of gamification on student motivation and cognitive outcomes. Independent sample t-tests revealed statistically significant differences between the experimental and control groups across all motivational indicators. The magnitude of these differences indicates that gamification had a meaningful impact on students' motivational states.

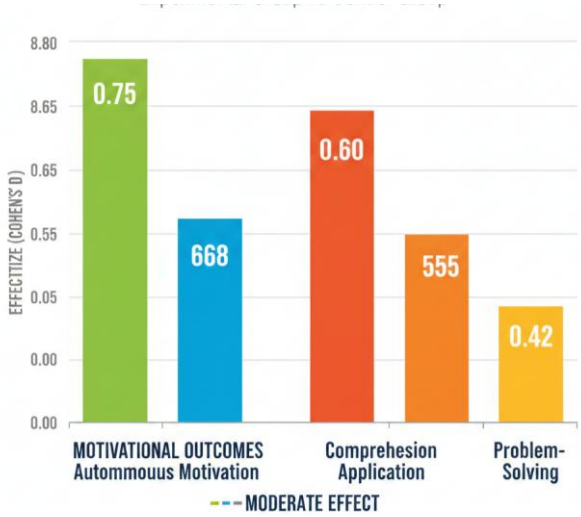

Figure 1. Impact of Gamification on Learning Outcomes

Analysis of cognitive outcomes also revealed statistically significant differences favoring the experimental group. Effect size estimates suggest moderate to strong effects of gamification on comprehension and application, with slightly smaller effects on problem-solving performance. These inferential results provide empirical support for the effectiveness of gamified learning in enhancing both motivation and cognitive outcomes in higher education.

Correlation analysis was conducted to explore the relationship between student motivation and cognitive outcomes within the experimental group. The results revealed positive and significant correlations between intrinsic motivation and comprehension, as well as between engagement and application performance. These relationships suggest that higher motivation levels are associated with improved cognitive achievement.

Moderate correlations were observed between persistence and problem-solving performance, indicating that sustained effort contributes to success in higher-order cognitive tasks. These relational patterns highlight the interconnected nature of motivational and cognitive processes in gamified learning environments and underscore the role of motivation as a facilitator of cognitive development.

To complement the quantitative findings, a case study was conducted in a gamified undergraduate course that integrated game-based learning elements into weekly instructional activities. The course utilized points, badges, timed challenges, and immediate feedback to structure learning tasks. Observational data indicated high levels of student participation and frequent interaction with learning materials.

Student learning artifacts, including quiz attempts and problem-solving submissions, demonstrated increased completion rates and improved accuracy over the instructional period. Instances of disengagement were minimal and primarily associated with students unfamiliar with digital learning tools. This case-based description provides contextual evidence of how gamification operates in authentic higher education settings.

The case study findings illustrate how gamified learning environments support motivation and cognitive engagement in practice. Immediate feedback and visible progress indicators appeared to reinforce students' sense of achievement and control over their learning process. These design features contributed to sustained engagement throughout the course duration.

Challenges observed in the case study help explain variability in problem-solving outcomes. Complex tasks required additional scaffolding to fully leverage gamification benefits. These observations align with quantitative findings and suggest that gamification is most effective when aligned with appropriate instructional support.

Figure 2. Top Benefits of Gamification in Higher Education

Overall, the results demonstrate that gamification positively influences both student motivation and cognitive outcomes in higher education. Consistent findings across descriptive statistics, inferential analysis, relational patterns, and case study observations strengthen the validity of the conclusions. Gamified learning environments foster active engagement and support meaningful learning processes.

The integration of motivational and cognitive evidence suggests that gamification functions as more than an engagement strategy. When thoughtfully designed, game-based learning can enhance academic performance and promote higher-order thinking skills. These findings underscore the pedagogical value of gamification in higher education contexts.

The findings of this study demonstrate that civic education plays a significant role in shaping democratic values among adolescents. Students who experienced structured civic education programs exhibited higher levels of democratic awareness, including respect for diversity, commitment to civic responsibility, and understanding of democratic principles. These results indicate that civic education functions as a key educational mechanism for fostering democratic orientations during a critical stage of social and political development.

Empirical evidence from the study shows that adolescents exposed to civic education were more likely to demonstrate participatory attitudes such as willingness to engage in dialogue, tolerance for differing opinions, and support for democratic processes. These outcomes suggest that civic education contributes not only to cognitive understanding of democracy but also to the internalization of democratic norms and behaviors.

The findings also reveal variation in the strength of democratic values across different dimensions. Values related to political participation and social responsibility were more strongly developed than those associated with critical political judgment. This pattern suggests that while civic education effectively promotes foundational democratic attitudes, more complex evaluative skills may require extended or more advanced instructional approaches.

Overall, the results confirm that civic education is an influential factor in adolescent democratic development. The consistency of findings across multiple indicators reinforces the conclusion that civic education has both educational and societal relevance in nurturing future democratic citizens.

The results of this study align with previous research emphasizing the importance of civic education in promoting democratic values and civic engagement among young people. Prior studies have similarly found that civic instruction enhances political knowledge, civic attitudes, and participatory intentions. The convergence of these findings strengthens the empirical basis for civic education as a cornerstone of democratic societies.

Differences emerge when comparing the relative emphasis on cognitive versus affective outcomes. Some earlier studies report stronger effects on political knowledge than on democratic dispositions, whereas the present findings highlight notable gains in attitudinal and value-based dimensions. This distinction may reflect differences in instructional design, cultural context, or pedagogical emphasis within civic education programs.

Methodological contrasts also distinguish this study from existing literature. While many studies rely on cross-national survey data or large-scale assessments, the present research offers a more focused examination of adolescent experiences within a specific educational context. This approach provides deeper insight into how civic education operates at the classroom level.

The findings also extend prior research by demonstrating that democratic values are not uniformly influenced by civic education. The observed variation across value dimensions supports emerging scholarship that calls for more differentiated analyses of democratic learning outcomes. This contribution adds nuance to the broader discourse on civic education effectiveness.

The findings of this study signal that adolescence represents a formative period during which democratic values can be meaningfully shaped through educational intervention. The strong association between civic education and democratic orientations reflects the responsiveness of

adolescents to structured civic learning experiences. This reflection underscores the developmental significance of integrating democratic education at the secondary school level.

The results also indicate that democratic values are learned not only through formal instruction but through socialization processes embedded within civic education practices. Classroom discussions, collaborative activities, and exposure to democratic norms appear to contribute to adolescents' internalization of democratic principles. This reflection positions civic education as both an instructional and cultural influence.

The uneven development of different democratic values suggests that civic education may prioritize social cohesion and participation over critical political analysis. This pattern reflects broader educational tendencies to emphasize harmony and responsibility while minimizing critical dissent. The findings thus signal areas where civic education could be strengthened.

From a societal perspective, the results reflect the continuing relevance of education as a mechanism for democratic continuity. The transmission of democratic values through schools serves as a safeguard against political apathy and disengagement. This reflection highlights the broader civic role of educational institutions.

The implications of these findings are significant for educational policy and curriculum development. The demonstrated impact of civic education on democratic values supports the inclusion of comprehensive civic curricula in secondary education. Policymakers may use these findings to justify sustained investment in civic education programs.

Educators and curriculum designers can draw practical implications regarding instructional strategies. Civic education that emphasizes active learning, discussion, and reflection appears particularly effective in shaping democratic attitudes. These findings encourage pedagogical approaches that move beyond rote learning toward participatory civic experiences.

The findings also have implications for democratic resilience in pluralistic societies. Adolescents who develop tolerance, respect for diversity, and civic responsibility are better equipped to navigate social and political complexity. Civic education thus contributes to social cohesion and democratic stability.

Institutional implications emerge for schools as civic spaces. The results suggest that schools function not only as academic institutions but also as arenas for democratic socialization. Strengthening civic education may therefore enhance the democratic culture of educational environments.

The observed influence of civic education on democratic values can be explained by its role in providing structured exposure to democratic norms and practices. Civic education introduces adolescents to concepts such as rights, responsibilities, and participation, which form the cognitive foundation of democratic understanding. Repeated engagement with these concepts supports value internalization.

Social learning mechanisms further explain the findings. Adolescents learn democratic behaviors through interaction with peers and teachers within civic education settings. Observing and practicing respectful dialogue and collective decision-making reinforces democratic dispositions.

The emotional and moral dimensions of civic education also contribute to its effectiveness. Civic narratives, historical examples, and discussions of social justice evoke empathy and moral reflection. These elements help adolescents connect abstract democratic principles to lived experience.

The differential impact on complex evaluative skills may reflect developmental and instructional factors. Critical political judgment requires advanced reasoning abilities and exposure

to diverse perspectives (Srimathi & Anitha, 2024). Limited instructional time or cautious pedagogical approaches may constrain the development of these skills.

The findings of this study point to several directions for future research (Amalina, 2025). Longitudinal studies could examine how democratic values shaped during adolescence evolve into adulthood (Peerbhay dkk., 2025). Such research would clarify the long-term impact of civic education on civic behavior and political participation.

Future research could also explore variations in civic education effectiveness across cultural and institutional contexts. Comparative studies may reveal how national histories, political systems, and educational traditions shape democratic learning outcomes.

From a practical perspective, future civic education initiatives should integrate critical thinking and deliberative skills more explicitly. Instructional designs that encourage debate, inquiry, and analysis may strengthen adolescents' capacity for informed democratic judgment.

Interdisciplinary approaches represent another promising direction. Integrating civic education with digital literacy, media education, and community engagement may enhance its relevance in contemporary democratic societies. These directions underscore the ongoing need to adapt civic education to changing social and political realities.

CONCLUSION

The most important finding of this study is that gamification in higher education significantly enhances both student motivation and cognitive outcomes when game-based learning elements are intentionally aligned with instructional objectives. The results indicate that gamified learning environments foster higher levels of intrinsic motivation, engagement, and persistence, while simultaneously supporting improvements in comprehension, application, and problem-solving skills. This finding distinguishes the study from research that views gamification primarily as a motivational tool by demonstrating its capacity to contribute meaningfully to cognitive development.

The primary contribution of this research lies in its conceptual integration of motivational and cognitive perspectives within the framework of game-based learning. By examining motivation and cognitive outcomes as interrelated constructs rather than isolated effects, the study advances a more holistic understanding of gamification in higher education. Methodologically, the use of a quasi-experimental design strengthens the empirical basis for evaluating gamification effectiveness and provides practical insights that can inform evidence-based instructional design and pedagogical innovation.

Several limitations of this study should be acknowledged, including the reliance on a single instructional context and a relatively short intervention period, which may limit the generalizability of the findings. The focus on selected motivational and cognitive indicators may also overlook broader learning outcomes such as metacognitive regulation or long-term knowledge retention. Future research is encouraged to employ longitudinal designs, explore diverse disciplinary contexts, and examine how different gamification design features interact with learner characteristics to further refine understanding of game-based learning in higher education.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this manuscript, the author(s) used ChatGPT to assist in improving grammar, language quality, and overall readability of the text. After using this tool, the

author(s) carefully reviewed and edited the content as necessary and take full responsibility for the content of the publication.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

Author 2: Conceptualization; Data curation; In-vestigation.

Author 3: Data curation; Investigation.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

Amalina, E. N. (2025). Ecopoly: Game-Based Economics Learning Media. Dalam K. W. Lee & L. H. Wong (Ed.), *Intelligent Technology for Educational Applications* (Vol. 2384, hlm. 34–45). Springer Nature Singapore. https://doi.org/10.1007/978-981-96-4090-4_4

Attuquayefio, S. N. B., Aboagye-Darko, D., & Okronipa, A. Q. (2025). An integrative model to enhance students' satisfaction in the use of e-learning systems in a developing country context. *International Journal of Educational Management*, *39*(2), 488–506. https://doi.org/10.1108/IJEM-10-2023-0494

Bamford, J., & Moschini, E. (2025). Co-creation of connected and relational learning spaces: A digital and gamified approach in higher education. *Higher Education Research & Development*, *44*(1), 205–221. https://doi.org/10.1080/07294360.2024.2429443

Chen, Y.-C., & Hou, H.-T. (2025). Design of a Digital Gamified Learning Activity for Relationship Education with Conceptual Scaffolding and Reflective Scaffolding. *The Asia-Pacific Education Researcher*, *34*(1), 237–251. https://doi.org/10.1007/s40299-024-00849-y

Denoni-Buján, M., Marcen, C., Gracia-Gil, A., Casanovas López, R., & Coral-Aguilar, S. (2025). Challenges of Innovation Through Gamification in the Classroom. *Education Sciences*, *15*(10), 1341. https://doi.org/10.3390/educsci15101341

Duran, M. J., Aciego, J. J., Gonzalez-Prieto, I., Carrillo-Rios, J., Gonzalez-Prieto, A., & Claros-Colome, A. (2024). A Gamified Active-Learning Proposal for Higher-Education Heterogeneous STEM Courses. *Education Sciences*, *15*(1), 10. https://doi.org/10.3390/educsci15010010

Fleissner-Martin, J., Paul, J., & Bogner, F. X. (2025). Creativity as Key Trigger to Cognitive Achievement: Effects of Digital and Analog Learning Interventions. *Research in Science Education*, *55*(3), 669–686. https://doi.org/10.1007/s11165-024-10211-3

Flores, E., & Mean, U. (2025). Digital transformation in Cambodian higher education: Current trends and future directions. *Edelweiss Applied Science and Technology*, *9*(1), 867–878. https://doi.org/10.55214/25768484.v9i1.4267

Garg, A., Sharma, R. B., Tripathi, S., Kumar, K. S., Varshney, A. K., & Sharma, A. (2025). AI-Powered Virtual Reality: Transforming Education Beyond Conventional Approaches. *2025 International Conference on Intelligent Control, Computing and Communications (IC3)*, 398–403. https://doi.org/10.1109/IC363308.2025.10956771

Gkintoni, E., Magriplis, E., Vantaraki, F., Skoulidi, C.-M., Anastassopoulos, P., Cornea, A., Inchaurraga, B., Santurtun, J., Mancha, A. D. L. C., Giorgakis, G., Kouppas, K., Timotheou, S., Moreno Juan, M. J., Muñagorri, M., Harasiuk, M., Lopez, A. G., Skoulidi, E., & Vantarakis, A. (2025). Designing for Engagement in Primary Health Education Through Digital Game-Based Learning: Cross-National Behavioral Evidence from the iLearn4Health Platform. *Behavioral Sciences*, *15*(7), 847. https://doi.org/10.3390/bs15070847

Gronseth, S. L., McNeil, S. G., & Lopez, M. Y. (2026). Beyond points and badges: Systematic design and refinement of gamified learning through educational design research.

Educational Technology Research and Development. https://doi.org/10.1007/s11423-026-10591-5

Gruber, M., & Faßbender, S. (2025). Digital educational escape game design for STEM higher education. *Frontiers in Education*, *10*, 1497291. https://doi.org/10.3389/feduc.2025.1497291

Hajarian, M., Diaz, P., Aedo, I., & Minaei-Bidgoli, B. (2025). A gamified nudging method for privacy personalization in social networks and its effects on online hostility and user engagement. *Electronic Commerce Research and Applications*, *74*, 101554. https://doi.org/10.1016/j.elerap.2025.101554

Hasmizan, N. H., Azman, M. N. A., Prestoza, M. J. R., & Othman, M. S. (2025). Design and Development of Mobile Teaching Aids Using Go-Based Electronic Games for Teaching Digital Electronics in Higher Education. *International Journal of Interactive Mobile Technologies (iJIM)*, *19*(03), 4–21. https://doi.org/10.3991/ijim.v19i03.51691

Ibragimova, E., Uraimov, S., Baitassov, Y., Yuldasheva, S., Kutlimuratova, D., & Litwinowa, M. (2025). Digital motivation: Fitness apps and student physical activity. *Retos*, *67*, 1162–1173. https://doi.org/10.47197/retos.v67.113635

Ivarson, E., Erlandsson, V., Faraon, M., & Khatib, S. (2025). Augmented reality and gamification in higher education: Designing mobile interaction to enhance students' motivation and learning. *E-Learning and Digital Media*, *22*(6), 571–590. https://doi.org/10.1177/20427530241239981

Kumar Karanam, S. A., & Hartman, N. W. (2025). A systematic review of Digital Twin (DT) and virtual learning environments (VLE) for smart manufacturing education. *Manufacturing Letters*, *44*, 1597–1608. https://doi.org/10.1016/j.mfglet.2025.06.179

Lau, A. E. E. X., Sivakumar, S., Lim, K. H., Lai, J. Y., Yeu, H. Z. C., Lee, W. H., & Chong, K. S. (2025). A Scalable Gamified Learning Platform for Enhanced Educational Engagement. *2025 5th International Conference on Artificial Intelligence and Education (ICAIE)*, 561–567. https://doi.org/10.1109/ICAIE64856.2025.11158531

Mahmoudi, S., Fereidouni, A., Maleki, Z., & Alizadeh, A. (2026). A comparative study of mafia game-based learning versus lecture-based learning on knowledge and satisfaction among nurse anesthesia students at shiraz university of medical sciences in 2024. *Perioperative Care and Operating Room Management*, *42*, 100592. https://doi.org/10.1016/j.pcorm.2025.100592

Martín-del-Pozo, M., Patrocinio-Braz, A., & Mena, Ju. (2025). Assessing Quizizz as a gamified teaching tool in higher education: A study of Spanish Education undergraduates' perceptions based on academic performance. *Education and Self-Development*, *20*(3), 55–71. https://doi.org/10.26907/esd.20.3.05

Martín-Lara, M. Á., Altmajer, D., Vicaria, J. M., & Muñoz-Batista, M. J. (2025). Boosting engagement and learning in the economic analysis of chemical processes through gamification. *Education for Chemical Engineers*, *51*, 79–86. https://doi.org/10.1016/j.ece.2025.02.004

Mazlan, R., Mahamod, Z., & Jamaluddin, K. A. (2025). Comprehensive structured review of implementing flipped classroom approaches in education. *Journal of Education and Learning (EduLearn)*, *19*(3), 1651–1661. https://doi.org/10.11591/edulearn.v19i3.22655

Murugan, T., Periasamy, K., & Abirami, A. M. (2024). *Adopting Artificial Intelligence Tools in Higher Education: Teaching and Learning* (1 ed.). CRC Press. https://doi.org/10.1201/9781003469315

Park, J., Ho, C. Y., & Li, L. K. B. (2026). AR Tunnel: An augmented-reality digital twin for immersive learning of wind tunnel laboratories. *Computers & Education: X Reality*, *8*, 100139. https://doi.org/10.1016/j.cexr.2026.100139

Peerbhay, F., Mash, R., & Khan, S. (2025). Effectiveness of oral health promotion in children and adolescents through behaviour change interventions: A scoping review. *PLOS ONE*, *20*(1), e0316702. https://doi.org/10.1371/journal.pone.0316702

Queiro-Ameijeiras, C.-M., Seguí-Mas, E., & Martí-Parreño, J. (2024). Determinantes de la aceptación de la gamificación en la educación superior: Un modelo empírico. *RIED-Revista Iberoamericana de Educación a Distancia*, *28*(1). https://doi.org/10.5944/ried.28.1.41565

Sagar, & Saini, N. (2025). Current Advancements in AI-Driven Education: Dalam E. Babulak (Ed.), *Advances in Computational Intelligence and Robotics* (hlm. 271–304). IGI Global. https://doi.org/10.4018/979-8-3693-8985-0.ch011

Sangamuang, S., Khanchai, S., Thongthip, P., Intawong, K., & Puritat, K. (2025). Adapting gamified education for diverse learners: A study of gender differences in location-based university orientation programme. *Innovations in Education and Teaching International*, 1–18. https://doi.org/10.1080/14703297.2025.2582612

Sharma, R., & Sengar, A. (2026). Assessing Barriers to Gamification Implementation in Indian Higher Education: An AHP-Based Prioritization Analysis. *International Journal of Human–Computer Interaction*, *42*(3), 1459–1475. https://doi.org/10.1080/10447318.2025.2524494

Srimathi, S., & Anitha, D. (2024). Dynamic Horizon. Dalam T. Murugan, K. Periasamy, & A. M. Abirami, *Adopting Artificial Intelligence Tools in Higher Education* (1 ed., hlm. 291–316). CRC Press. https://doi.org/10.1201/9781003469315-14

Sukavatee, P., & Khlaisang, J. (2026). A Gamified Metaverse Approach to Enhancing Motivation in Global Higher Education Learners. *LEARN Journal: Language Education and Acquisition Research Network*, *19*(1), 537–568. https://doi.org/10.70730/HWEV2703

Tec Chim, A. I., Nieto Jalil, J. M., Jimenez, D. S., & Martínez Huerta, J. M. (2025). Disruptive online learning in engineering: Enhancing education with mobile sensors and Physics toolbox. *2025 IEEE Engineering Education World Conference (EDUNINE)*, 1–6. https://doi.org/10.1109/EDUNINE62377.2025.10981348

Torrado Cespón, M., & Bárcena Toyos, P. (2025). An example of gamification for pre-service teachers in online higher education: Methods, tools, and purpose. *Digital Education Review*, (46), 1–14. https://doi.org/10.1344/der.2025.46.1-14

Turzhanov, U., Uali, M., Ipalakova, M., Tsoy, D., Daineko, Y., & Mustafina, A. (2026). Development of VR Physics Labs at Metauniversity. Dalam L. T. De Paolis, P. Arpaia, & M. Sacco (Ed.), *Extended Reality* (Vol. 15742, hlm. 283–292). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-97778-7_20

Valencia-Lazcano, A. A., Fuentes-Álvarez, R., Cruz-Sandoval, M., Miranda-Hernández, J. C., & Membrillo-Hernández, J. (2025). Challenge-Based Learning in Biomedical Engineering: Developing Skills for the Future. *International Journal of Online and Biomedical Engineering (iJOE)*, *21*(02), 4–17. https://doi.org/10.3991/ijoe.v21i02.51795

Varhata, O., Udodova, O., Ardelian, O., Apalat, H., & Vykhrystiuk, A. (2025). Advancing higher education through technology and innovation. *Multidisciplinary Reviews*, *9*(1), 2026037. https://doi.org/10.31893/multirev.2026037

Warford, E. (2025). AI Educational Technology, Gamification and Values: The Case of Collaborative Annotation Apps. *2025 IEEE International Symposium on Ethics in Engineering, Science, and Technology (ETHICS)*, 1–8. https://doi.org/10.1109/ETHICS65148.2025.11098242