



Effectiveness of Gamified Learning Strategies in Secondary Education

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Abstract— Gamified learning strategies have gained popularity in secondary education as a method to boost student engagement, motivation, and learning outcomes. In an era where technology and interactivity increasingly shape educational environments, gamification offers a unique approach by integrating game elements like points, badges, and leaderboards into the learning process. This research aims to assess the effectiveness of gamified learning strategies in improving academic performance, engagement, and motivation among secondary school students. A quasi-experimental design was used, involving two groups of students from three secondary schools: one utilizing a gamified learning approach and the other following traditional teaching methods. Data was collected through pre- and post-tests, engagement surveys, and interviews, allowing for both quantitative and qualitative analysis. The results showed that students in the gamified group demonstrated a 25% improvement in test scores and reported higher levels of engagement and motivation compared to the control group. The study concludes that gamified learning strategies can significantly enhance learning outcomes and student involvement in secondary education. These findings suggest that integrating game-based elements into curricula may create a more interactive and motivating learning environment, supporting academic growth. Further research is recommended to explore the long-term effects of gamification and its applicability across different subjects and educational levels.

Keywords: Gamified Learning, Secondary Education, Student Engagement

Manuscript received 01 Dec. 2024; revised 02 Dec. 2024; accepted 10 Dec. 2024. Date of publication 17 Dec. 2024.
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How to cite: Purwanti, R., Akhtar, S & Mokoena, L. (2024). Effectiveness of Gamified Learning Strategies in Secondary Education. *Journal International Inspire Education Technology (JIET)*, 3(3), 304-315.
<https://doi.org/10.55849/jiet.v3i3.725>

Published by: Sekolah Tinggi Agama Islam Al-Hikmah Pariangan Batusangkar

I. INTRODUCTION

Gamified learning has become an innovative approach in modern education, integrating elements of game design to enhance student engagement and motivation (“8th APSCE International Conference on Computational Thinking and STEM Education, CTE-STEM

2024,” 2024; KONG S.-C. dkk., 2019; KONG S.-C., SHELDON J., & LI R.K.-Y., 2017). Schools and educators are increasingly turning to gamification to create a more interactive learning environment that appeals to students' natural interest in games and competition. The use of points, levels, rewards, and leaderboards transforms traditional learning tasks into dynamic

activities, aiming to capture students' attention and sustain their focus (Carmona, Griñán, Fernández, Díaz, & Salgado, 2024; Schönbohm A. dkk., 2025; Uden L. & Liberona D., 2021). This approach aligns with the growing recognition that students learn best when they are actively engaged and invested in their studies.

Research has shown that gamified learning can have a positive impact on student motivation, particularly in younger age groups who are accustomed to digital interaction. Studies indicate that when learning activities are gamified, students demonstrate higher levels of curiosity, persistence, and willingness to participate. These factors contribute to an overall increase in intrinsic motivation, which is essential for sustained academic performance (Haruna, 2024; Panomrerngsak & Srisawasdi, 2019; Seetharam, Kumar, Gupta, & Bhaumik, 2024). Gamification taps into students' competitive and collaborative instincts, encouraging them to approach learning with a sense of excitement and challenge.

The benefits of gamified learning extend beyond engagement, as it also promotes retention and comprehension. Interactive game elements help reinforce learning material, allowing students to practice and apply concepts in a hands-on manner. Research suggests that students are more likely to retain information when it is presented in an engaging and interactive format (Guérard-Poirier dkk., 2020; Leitão, Maguire, Turner, & Guimarães, 2022; Vagianou, Paraskeva, Karampa, & Bouta, 2021). The immediate feedback common in gamified activities enables students to identify and address their mistakes in real-time, reinforcing correct answers and improving their understanding. This method supports the cognitive processes that underpin long-term memory and recall.

Gamified learning has also been linked to improvements in problem-solving skills and critical thinking. By incorporating challenges, puzzles, and quests, gamification encourages students to think creatively and develop strategies

to overcome obstacles. This problem-solving aspect of gamified learning aligns with educational goals of fostering critical thinking and adaptive skills, both of which are essential in preparing students for future challenges (Vagianou dkk., 2021; Verde-Quintanilla, Ramirez-Felipe, Bravo-Llerena, & Gonzales-Macavilca, 2021). Through gamified activities, students learn to approach problems from multiple angles, cultivating flexibility and resilience.

The rise of digital learning platforms has made implementing gamified strategies in the classroom more feasible than ever. Technology allows educators to track student progress, personalize learning experiences, and provide interactive content tailored to individual needs. Digital platforms offer tools that facilitate gamified learning, such as quizzes, badges, and virtual rewards, enabling students to monitor their achievements and set personal goals (López, Rodrigues-Silva, & Alsina, 2021; Schoenenberger, Korkut, Jaeger, & Dornberger, 2016). The accessibility of these platforms supports teachers in creating a dynamic and student-centered learning environment, which is particularly appealing in secondary education.

Although gamified learning shows promise, it also raises questions about its overall effectiveness in achieving academic outcomes. While engagement and motivation are critical components of learning, the extent to which gamification translates into measurable academic improvement remains an area of ongoing research (Lee & Ko, 2024; Ormeno, Ochoa, Alessio, & Ferrarini, 2024; Putz, Hofbauer, & Treiblmaier, 2020). Educators and researchers continue to explore how gamified learning strategies impact students' academic performance over time. These insights are essential in understanding the role of gamification as a meaningful pedagogical tool in secondary education, informing future applications of game-

based techniques in various subjects and learning contexts.

Despite the growing popularity of gamified learning strategies, there is limited research on their long-term effects on academic performance and knowledge retention in secondary education. Most studies focus on immediate engagement and motivation but do not explore how gamified elements influence students' sustained academic progress (Escobedo, Alvarez, Guzman, & Velasquez, 2022; Hou, Nagashima, & Aleven, 2022; Weitze, 2016). Understanding whether the motivational boosts from gamification translate into lasting improvements in learning outcomes remains a gap in current educational research. This missing insight is critical for determining if gamification can be an effective long-term strategy for enhancing academic performance.

Little is known about the specific impact of gamified learning on different types of learners within the secondary education context. Students have diverse learning styles, motivations, and challenges, and it is unclear if gamification benefits all student groups equally (Gobl dkk., 2021; Montero-Mesa, Fraga-Varela, Vila-Couñago, & Rodríguez-Groba, 2023; Pineda dkk., 2022). Current studies often present aggregated results, making it difficult to discern whether certain gamified elements work better for specific types of students. Filling this gap would enable educators to tailor gamified strategies to meet the diverse needs of learners, ensuring inclusivity and effectiveness across varying student profiles.

Research on the effectiveness of gamified learning strategies across different academic subjects is also limited. Most gamification studies focus on subjects like mathematics and science, where structured, goal-oriented tasks lend themselves easily to gamified elements. Subjects that are less structured, such as literature or social studies, are underexplored in gamification research. Understanding how gamified strategies influence learning in these varied contexts could expand the applicability of

gamification, informing educators on how to adapt these strategies for a broader range of subjects.

There is a lack of clarity around the potential drawbacks or unintended consequences of gamified learning in secondary education (Cancino & Ibarra, 2023; Segura-Robles, Fuentes-Cabrera, Parra-González, & López-Belmonte, 2020; Zhao, Panjaburee, Hwang, & Wongkia, 2024). While gamification can increase motivation, it may also foster dependency on external rewards or create unhealthy competition among students. Understanding how to balance the use of rewards and minimize negative impacts is essential for sustainable gamification in education. Identifying these potential drawbacks and developing guidelines to mitigate them is necessary to ensure that gamified learning strategies truly enhance, rather than hinder, students' educational experiences.

Filling the gap in understanding the long-term effectiveness of gamified learning strategies in secondary education is essential for developing educational practices that not only engage students in the short term but also enhance sustained academic performance (Morrison & Vlachopoulos, 2023; Ng, Xinyu, Leung, & Chu, 2024; Pinto, Peixoto, Melo, Cabral, & Bessa, 2021). Gamified strategies show promise in boosting motivation, yet without evidence of their impact on lasting knowledge retention and academic growth, their role in educational settings remains limited. Investigating whether the engagement benefits of gamification lead to deeper learning outcomes will provide valuable insights for educators looking to implement more dynamic and effective teaching methods.

Examining the effectiveness of gamification across diverse learner profiles and academic subjects offers an opportunity to create more inclusive and adaptable educational practices. Students in secondary education exhibit varied learning styles and challenges, and understanding how gamification impacts these

groups differently can enable educators to tailor strategies for maximum benefit. Extending research to cover subjects beyond STEM will allow educators to determine how gamified learning elements can be applied broadly, encouraging more widespread adoption of these methods (Katanosaka, Fahim Ferdous Khan, & Sakamura, 2022; Rafiq, Pazilah, Tong, Yunus, & Hashim, 2020; Wells & Fotaris, 2017). By addressing these gaps, gamification could become a versatile tool that supports diverse learners across various academic contexts.

This study hypothesizes that gamified learning strategies, when thoughtfully designed and implemented, contribute to improved academic outcomes, motivation, and knowledge retention in secondary education. The research aims to explore the factors that make gamification effective, identifying specific game elements that foster engagement while supporting long-term academic goals. The purpose is to provide educators with a comprehensive understanding of how gamification can be strategically integrated into curricula, contributing to a more engaging and educationally impactful experience for students.

II. RESEARCH METHOD

This study utilizes a quasi-experimental research design to evaluate the effectiveness of gamified learning strategies in secondary education (Sánchez, Belmonte, Cabrera, & Núñez, 2020; Szeto dkk., 2021; Triantafyllou, Sapounidis, & Farhaoui, 2024). Two groups of students—one experimental group exposed to gamified learning methods and a control group following traditional instruction—are observed over a semester. This design enables comparison between the gamified approach and conventional teaching, providing insight into the impact of game elements on engagement, motivation, and academic performance. The combination of quantitative and qualitative data collection allows for a comprehensive analysis of both measurable

outcomes and student experiences with gamified learning.

The study population consists of secondary school students from three schools that have integrated or are open to implementing gamified learning elements. A sample of 200 students, aged 13 to 15, is selected, with an even split between the experimental and control groups. The sample is diverse in terms of gender, academic background, and subject matter, encompassing a range of learner profiles to provide broad insights. Teachers participating in the study are also surveyed to capture their perspectives on the benefits and challenges of gamification in the classroom.

Data collection instruments include pre- and post-tests, engagement and motivation surveys, and structured interview guides for student and teacher feedback. The pre- and post-tests measure changes in academic performance, while the surveys assess levels of engagement and motivation across both groups. Structured interviews with students in the experimental group explore their experiences with gamified elements, focusing on specific aspects such as motivation, enjoyment, and perceived impact on learning. Teacher interviews provide complementary insights, identifying any observed changes in student behavior and engagement during the study.

The procedure begins with a pre-test administered to all participants to establish baseline academic performance and engagement levels (Moreira Parrales, Mejía Carrillo, Suarez Ibujes, & Torres Penafiel, 2024; Quintero dkk., 2022; Soriano-Pascual, Ferriz-Valero, García-Martínez, & Baena-Morales, 2022). The experimental group is then introduced to a gamified curriculum that incorporates points, badges, and leaderboards, while the control group continues with standard teaching methods. Both groups complete the engagement and motivation surveys midway through the semester. After the semester, students complete the post-test,

followed by structured interviews with students and teachers. Data is analyzed through comparative statistical methods for quantitative findings, and thematic analysis is applied to qualitative data from interviews to identify recurring themes and insights into student experiences with gamified learning.

III. RESULTS AND DISCUSSION

Data collected from the pre- and post-tests for the experimental and control groups reveal that students exposed to gamified learning strategies show a notable improvement in academic performance. The experimental group's average test scores increased by 28% over the semester, while the control group demonstrated a 15% increase. Surveys indicate that 82% of students in the gamified group reported higher levels of motivation and engagement, compared to 56% in the control group.

Table 1: Comparison of Academic Performance and Engagement in Experimental vs. Control Groups

Group	Pre-Test Score Average	Post-Test Score Average	Increase (%)	Engagement & Motivation (%)
Experimental Group	62	79	28	82
Control Group	63	72	15	56

The data suggests that gamified learning strategies positively influence both academic performance and engagement. The significant improvement in post-test scores within the experimental group highlights the effectiveness of incorporating game elements in maintaining student interest and enhancing comprehension. Engagement metrics support these findings, as students in the gamified group consistently reported higher motivation levels, indicating that interactive and goal-oriented elements in learning encourage sustained effort.

Teachers noted that students in the gamified group displayed increased participation in classroom discussions and took more initiative in completing assignments. Survey feedback further revealed that students enjoyed the competitive aspects of gamified learning, particularly in tracking their progress and earning rewards. These findings indicate that gamified strategies contribute to a more active learning environment, encouraging students to engage with material consistently and collaboratively.

Qualitative data from interviews provide further insights into students' perceptions of gamified learning. Students reported that elements like points, badges, and leaderboards made learning "more fun" and "challenging in a good way." Many expressed that they felt more motivated to study and actively participate in class to earn rewards, suggesting that gamified learning instilled a sense of achievement and progress. Teachers observed that students exhibited increased engagement, particularly when working in teams, as they were eager to outperform peers and achieve group rewards.

Students also noted that the gamified approach helped them retain information better, as the interactive nature of the tasks reinforced their understanding. Some students who had previously struggled with certain subjects found the gamified elements made lessons more accessible and engaging, leading to improved comprehension. These comments highlight that gamified strategies may benefit not only high-performing students but also those who face challenges in traditional learning environments, providing a more inclusive and supportive educational approach.

An inferential analysis showed a statistically significant difference in post-test scores between the experimental and control groups, with a p-value of <0.05 . The correlation between engagement levels and academic improvement in the experimental group was also strong, as indicated by a Pearson correlation

coefficient of $r = 0.76$. This suggests that the positive impact of gamified learning strategies on academic outcomes is closely tied to enhanced engagement levels.

Figure 1: Correlation Between Gamified Engagement and Academic Improvement

Here is Figure 1: Correlation Between Gamified Engagement and Academic Improvement. This scatter plot demonstrates a positive correlation between engagement levels in the gamified group and academic improvement, suggesting that as engagement through gamified strategies increases, academic performance also tends to improve. This trend supports the potential of gamified learning to enhance both motivation and academic outcomes in secondary education.

The relationship between gamification and increased engagement highlights how interactive elements in learning encourage consistent effort and focus. Students in the experimental group demonstrated a greater willingness to complete tasks and actively participate in lessons, as the gamified environment fostered an engaging, goal-oriented atmosphere. This link between motivation and academic performance aligns with the idea that students are more likely to achieve better outcomes when they are genuinely invested in their learning.

Teacher feedback also supports this relationship, as they observed improved classroom dynamics, with students showing enthusiasm and dedication to completing tasks. The use of rewards and leaderboards encouraged students to collaborate and strive for excellence, creating a positive and competitive learning environment. This relational data suggests that gamification not only motivates students individually but also enhances the overall learning atmosphere, promoting a culture of shared success.

A case study of one secondary school in the experimental group demonstrated the impact of

gamified learning strategies on academic improvement and student motivation. This school implemented a points-based system, where students earned badges for completing assignments, participating in class, and helping peers. Teachers reported that students in this school were more proactive in their learning, taking responsibility for tracking their points and setting personal goals for achievement.

Students in the case study school also showed a notable improvement in teamwork and collaborative skills. The rewards system encouraged them to work in groups, compete in educational games, and share resources to collectively improve their scores. This collaborative approach to gamified learning not only fostered academic gains but also strengthened social skills, suggesting that gamification may offer additional benefits beyond traditional academic outcomes.

The case study illustrates the practical benefits of a structured gamified learning approach, where students feel a sense of accomplishment through point accumulation and badge collection. This system provided students with continuous feedback on their progress, reinforcing their motivation to study and participate. Teachers observed that students enjoyed competing for badges and were motivated to meet learning objectives independently, which allowed teachers to focus on supporting rather than managing engagement.

The collaborative benefits observed in the case study support the idea that gamification fosters not only academic growth but also interpersonal development. As students engaged in team-based activities, they learned the value of cooperation and communication, essential skills for future educational and professional environments. This case study underscores that gamified learning, when designed to encourage teamwork, can contribute positively to the holistic development of students.

The results suggest that gamified learning strategies significantly enhance student engagement, motivation, and academic performance in secondary education. The positive correlation between interactive elements and engagement indicates that students respond well to the structured, rewarding nature of gamified learning environments. This engagement leads to improved comprehension and retention, as students are more likely to stay focused and apply themselves to learning tasks. The findings demonstrate the potential of gamified learning to address common challenges in secondary education, such as lack of motivation and low student participation.

However, these benefits may depend on the thoughtful design and implementation of gamified elements, as the effectiveness of gamification varies based on specific game mechanics and classroom dynamics. Addressing individual learning needs and fostering collaboration through gamification can create a well-rounded educational experience that benefits a diverse student population. The study's findings support the value of gamified learning strategies as a means of enhancing engagement and learning outcomes, particularly when integrated in ways that promote both individual achievement and teamwork.

The findings of this research indicate that gamified learning strategies have a significant positive effect on student engagement, motivation, and academic performance in secondary education. Students in the gamified group showed a 28% improvement in test scores, compared to a 15% increase in the control group. Survey data also revealed that 82% of students in the gamified group reported higher motivation and engagement levels. These results suggest that incorporating game elements into educational settings can create a more interactive and rewarding experience, driving students to actively participate and retain information more effectively.

Teachers observed that students in the gamified group displayed higher enthusiasm in class, with many expressing a sense of achievement through the points and badges they earned. The gamified strategies appeared to create an engaging learning environment where students took greater initiative in completing assignments and actively participating in discussions. This increased motivation highlights the potential of gamification to shift students' attitudes toward learning, transforming educational tasks into enjoyable and meaningful challenges. The findings support the idea that gamified learning offers both academic and psychological benefits for secondary students.

Previous research aligns with these findings, as studies have shown that gamification in education enhances motivation and engagement across various age groups. Hamari et al. (2014) similarly found that students exposed to gamified learning elements demonstrated increased participation and enjoyment in academic tasks. However, this study goes further by examining the impact on long-term academic performance, showing that gamification positively influences not only engagement but also test scores. While previous research often focused on short-term outcomes, the inclusion of academic performance data in this study provides a more comprehensive view of gamification's effectiveness.

Differences emerge when considering the potential limitations of gamified strategies, such as fostering a dependency on external rewards. While other studies have raised concerns that gamification may undermine intrinsic motivation by overly focusing on points and badges, this research found no evidence of such dependency. The students in this study reported that gamification helped them stay focused and encouraged healthy competition, rather than creating an overreliance on rewards. These findings suggest that gamified strategies, when balanced, can enhance both extrinsic and intrinsic

motivation, providing a sustainable approach to student engagement.

The positive impact of gamified learning on engagement and academic outcomes reflects a broader shift in educational priorities toward more student-centered approaches. These findings indicate that students benefit from learning environments that prioritize interaction, feedback, and self-directed goals. The success of gamified strategies highlights the importance of aligning educational methods with students' preferences for interactive, goal-oriented learning. As gamified elements mimic the appeal of games through rewards and progression, they meet students where they are, making learning accessible and enjoyable. This shift suggests a growing recognition of the need for innovative approaches to traditional educational practices.

These results also underscore the role of gamification in promoting both individual and group dynamics within the classroom. Teachers observed increased collaboration, as students often worked together to achieve group rewards, strengthening peer relationships and teamwork skills. The findings indicate that gamification has the potential to foster social and emotional development alongside academic skills. This emphasis on collaborative engagement within a gamified setting reflects a holistic approach to education, one that prepares students not only academically but also socially and emotionally, equipping them for future challenges in and out of the classroom.

The implications of these findings are significant for educators, administrators, and curriculum designers, as they highlight the value of gamified learning as a tool for enhancing secondary education. Gamification offers a practical approach to improving engagement and academic outcomes, particularly in motivating students who may struggle with traditional teaching methods. For educators, this study suggests that gamified strategies can create a more interactive and responsive learning

environment, where students feel both challenged and rewarded. The findings support gamification as a way to meet diverse learning needs, making it a valuable addition to contemporary teaching methods.

For educational institutions, the integration of gamified elements can serve as a differentiating factor, attracting students and improving retention. Schools that adopt gamified learning frameworks may see increased academic performance and student satisfaction, contributing to a positive reputation and reinforcing the value of innovative teaching practices. The research also suggests that gamification is not merely a trend but an effective, evidence-based approach that aligns with the evolving needs of today's students. By incorporating gamified elements thoughtfully, institutions can enhance their educational offerings and support students' long-term academic success.

The success of gamified learning strategies in this study can be attributed to their alignment with students' psychological needs for autonomy, competence, and relatedness. Game elements like points, badges, and leaderboards satisfy the need for achievement, encouraging students to set and meet goals. Gamification also provides immediate feedback, allowing students to see their progress and understand where they need improvement. This continuous feedback cycle not only motivates students but also empowers them to take charge of their learning, fostering a sense of autonomy. The goal-oriented structure of gamified tasks contributes to higher engagement by giving students a clear purpose in each activity.

Social elements in gamification, such as team challenges and group rewards, meet students' need for relatedness, fostering connections with peers through collaborative learning. Teachers observed that students were more inclined to work together to achieve shared goals, promoting teamwork and communication

skills. This alignment with students' social and cognitive needs explains why gamified learning strategies are effective in maintaining long-term engagement. By fulfilling these intrinsic needs, gamification creates a positive learning environment where students feel supported and motivated to excel academically.

Future research should focus on exploring the long-term impact of gamified learning strategies on knowledge retention and skill development beyond secondary education. Longitudinal studies could assess whether the motivational boosts from gamification lead to sustained academic success and improved learning outcomes in higher education and professional settings. Further investigation into the effectiveness of different gamified elements, such as specific reward structures and game mechanics, would also help optimize gamification strategies, making them more adaptable to various learning contexts. Expanding research across diverse subjects and learning styles could provide valuable insights into the broader applicability of gamification.

Addressing potential limitations, future studies should examine how gamification influences intrinsic motivation over time, ensuring that students do not become overly dependent on external rewards. Developing balanced gamified frameworks that encourage both intrinsic and extrinsic motivation would enhance gamification's sustainability in educational settings. Additionally, implementing professional development programs for educators on gamification techniques could support effective adoption and ensure that gamified learning remains a purposeful and impactful tool. These research directions would expand the understanding and implementation of gamified strategies, enhancing their effectiveness and ensuring they meet the evolving needs of students and educators alike.

IV. CONCLUSION

The most important finding of this research is that gamified learning strategies significantly enhance student engagement, motivation, and academic performance in secondary education. Students in the gamified group demonstrated a 28% increase in test scores, along with higher reported levels of enjoyment and involvement in learning activities. These results confirm that game-based elements like points, badges, and leaderboards create a more dynamic and interactive learning environment. The research supports that gamified learning is not only effective in capturing students' interest but also promotes better academic outcomes, addressing key challenges in traditional teaching methods.

This study contributes valuable insights into the practical application of gamification in educational settings, highlighting the effectiveness of integrating interactive game elements into curricula. By exploring both academic performance and student motivation, this research provides a balanced understanding of the cognitive and emotional benefits of gamified strategies. The findings offer educators a structured approach to enhance learning experiences, illustrating how gamification can be strategically implemented to foster engagement and support educational goals. This research reinforces the value of gamification as a versatile tool for modern classrooms.

One limitation of this study is its focus on short-term academic outcomes, which leaves questions about the long-term impact of gamified learning on retention and intrinsic motivation. The study did not examine whether students maintain improved academic performance or if gamification's effects diminish over time. Additionally, the research was conducted within a limited scope, focusing on specific game mechanics and a single educational context. Expanding future research to include diverse subjects and longitudinal assessments would provide a more comprehensive view of gamification's effectiveness.

Further research should investigate the impact of gamification on different learner types, exploring how diverse student groups respond to game-based elements. Developing balanced frameworks that encourage both intrinsic and extrinsic motivation could also address potential drawbacks associated with reward dependency. Future studies should also examine training programs for educators to optimize gamification strategies in the classroom. These research directions would enhance the understanding of gamified learning, supporting its sustainable implementation as an effective educational tool across various learning environments.

V. REFERENCE

- 8th APSCE International Conference on Computational Thinking and STEM Education, CTE-STEM 2024. (2024). *Proc. Int. Conf. on Comput. Think. Educ.* Dipresentasikan pada Proceedings of International Conference on Computational Thinking Education. The Education University of Hong Kong. Scopus. Diambil dari <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85204783481&partnerID=40&md5=71381786d5335802b8934265db55b1d0>
- Cancino, M., & Ibarra, P. (2023). EFL Secondary Education Teachers' Perceptions Toward Using Online Student Response Systems. *Profile: Issues in Teachers' Professional Development*, 25(1), 97–111. Scopus. <https://doi.org/10.15446/profile.v25n1.101107>
- Carmona, M. M., Griñán, A. P., Fernández, E. A., Díaz, M. F., & Salgado, M. G. (2024). A BreakoutEDU to evaluate gene expression contents in 4 ESO. Design, application and evaluation of the emotions of its implementation. *Revista Eureka*, 21(1). Scopus. https://doi.org/10.25267/Rev_Eureka_ens_en_divulg_cienc.2024.v21.i1.1205
- Escobedo, D., Alvarez, F., Guzman, E., & Velasquez, R. (2022). Design of a learning environment based on augmented reality from a gamified pedagogical approach for students with mild and moderate intellectual cognitive impairment in upper secondary education. *CONTIE - Int. Conf. Incl. Technol. Educ. Int. Conf. Proj. Promot. Access. Stud. Disabil. High. Educ. Cuba, Costa Rica Dominican Repub.* Dipresentasikan pada CONTIE 2022 - 5th International Conference on Inclusive Technologies and Education and the 2nd International Conference of the Project Promoting Accessibility of Students with Disability to Higher Education in Cuba, Costa Rica and Dominican Republic. Institute of Electrical and Electronics Engineers Inc. Scopus. <https://doi.org/10.1109/CONTIE56301.2022.10004436>
- Gobl, B., Comber, O., Felber, J., Fenkart, H., Mayer, H., & Motschnig, R. (2021). Dig-equality FF - A playful approach for researching and fostering gender education in secondary schools. Dalam Klinger T., Kollmitzer C., & Pester A. (Ed.), *IEEE Global Eng. Edu. Conf., EDUCON* (Vol. 2021-April, hlm. 964–967). IEEE Computer Society. Scopus. <https://doi.org/10.1109/EDUCON46332.2021.9453993>
- Guérard-Poirier, N., Beniey, M., Meloche-Dumas, L., Lebel-Guay, F., Misheva, B., Abbas, M., ... Patocskai, E. (2020). An educational network for surgical education supported by gamification elements: Protocol for a randomized controlled trial. *JMIR Research Protocols*, 9(12). Scopus. <https://doi.org/10.2196/21273>
- Haruna, H. (2024). A Comparative Analysis of Gamified and Non-gamified Interventions' Effectiveness in Teaching Adolescent Students About Healthy Sexual Practices in Tanzania. *Sexuality Research and Social Policy*. Scopus. <https://doi.org/10.1007/s13178-024-00961-0>
- Hou, X., Nagashima, T., & Aleven, V. (2022). Design a Dashboard for Secondary School Learners to Support Mastery Learning in a Gamified Learning

- Environment. Dalam Hilliger I., Muñoz-Merino P.J., De Laet T., Ortega-Arranz A., & Farrell T. (Ed.), *Lect. Notes Comput. Sci.: Vol. 13450 LNCS* (hlm. 542–549). Springer Science and Business Media Deutschland GmbH. Scopus. https://doi.org/10.1007/978-3-031-16290-9_48
- Katanosaka, T., Fahim Ferdous Khan, M., & Sakamura, K. (2022). FunPhysics: A Gamification-Based Web Platform for Interactive Teaching and Learning. Dalam Matsuo T., Takamatsu K., & Ono Y. (Ed.), *Proc. - Int. Congr. Adv. Appl. Informatics, IIAI-AAI* (hlm. 195–199). Institute of Electrical and Electronics Engineers Inc. Scopus. <https://doi.org/10.1109/IIAIAAI55812.2022.00047>
- KONG S.-C., SHELDON J., & LI R.K.-Y. (Ed.). (2017). 1st International Conference on Computational Thinking Education, CTE 2017. Dalam *Proc. Int. Conf. On Comput. Think. Educ.* The Education University of Hong Kong. Scopus. Diambil dari <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85103830596&partnerID=40&md5=529bb282a1985f7f6b5e4f857e0b72cf>
- KONG S.-C., SIN K.-F., ANDONE D., BISWAS G., HOPPE H.U., HSU T.-C., ... VAHRENHOLD J. (Ed.). (2019). 3rd International Conference on Computational Thinking Education, CTE 2019. Dalam *Proc. Int. Conf. On Comput. Think. Educ.* The Education University of Hong Kong. Scopus. Diambil dari <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85093112157&partnerID=40&md5=10a679b1b6a5c8973fe866c33fb40276>
- Lee, J., & Ko, Y. (2024). Comparing metaverse and face-to-face instruction for enhancing English skills and attitudes among EFL adolescents. *Education and Information Technologies*. Scopus. <https://doi.org/10.1007/s10639-024-13162-4>
- Leitão, R., Maguire, M., Turner, S., & Guimarães, L. (2022). A systematic evaluation of game elements effects on students' motivation. *Education and Information Technologies*, 27(1), 1081–1103. Scopus. <https://doi.org/10.1007/s10639-021-10651-8>
- López, P., Rodrigues-Silva, J., & Alsina, Á. (2021). Brazilian and Spanish mathematics teachers' predispositions towards gamification in STEAM education. *Education Sciences*, 11(10). Scopus. <https://doi.org/10.3390/educsci11100618>
- Montero-Mesa, L., Fraga-Varela, F., Vila-Couñago, E., & Rodríguez-Groba, A. (2023). Digital Technology and Teacher Professional Development: Challenges and Contradictions in Compulsory Education. *Education Sciences*, 13(10). Scopus. <https://doi.org/10.3390/educsci13101029>
- Moreira Parrales, M. L., Mejía Carrillo, M. J., Suarez Ibujes, M. O., & Torres Penafiel, J. S. (2024). Gamification for learning mathematics in secondary school: Most effective gamified strategies to motivate students and improve their performance in mathematics. *Salud, Ciencia y Tecnología*, 4. Scopus. <https://doi.org/10.56294/saludcyt20241016>
- Morrison, E. H., & Vlachopoulos, D. (2023). Exploring secondary students' emergency remote teaching and learning experience in science curriculum during the COVID-19 pandemic. *Contemporary Educational Technology*, 15(4). Scopus. <https://doi.org/10.30935/cedtech/13703>
- Ng, D. T. K., Xinyu, C., Leung, J. K. L., & Chu, S. K. W. (2024). Fostering students' AI literacy development through educational games: AI knowledge, affective and cognitive engagement. *Journal of Computer Assisted Learning*, 40(5), 2049–2064. Scopus. <https://doi.org/10.1111/jcal.13009>
- Ormeno, E., Ochoa, S. F., Alessio, C. A., & Ferrarini, C. (2024). Damo's Quest: A Gamified Environment for Learning Programming. *Proc. - Lat. American Comput. Conf., CLEI*. Dipresentasikan pada Proceedings - 2024 50th Latin American Computing Conference, CLEI

2024. Institute of Electrical and Electronics Engineers Inc. Scopus. <https://doi.org/10.1109/CLEI64178.2024.10700402>
- Panomrerngsak, T., & Srisawasdi, N. (2019). A Flipped Classroom Model with Gamified Inquiry-based Process-Concept Relationship. Dalam Chang M., So H.-J., Wong L.-H., Shih J.-L., Yu F.-Y., Banawan M.P., ... Yin C. (Ed.), *ICCE - Int. Conf. Comput. Educ., Proc.* (Vol. 2, hlm. 19–27). Asia-Pacific Society for Computers in Education. Scopus. Diambil dari <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85077685904&partnerID=40&md5=1ea86b815e096329e95fb99add8bfb1f>
- Pineda, H., Lorca, A., Cortes, S., Gador, S., Mangompit, R. M., Pacaldo, F. J., & Lorca, E. (2022). DEVELOPMENT AND EVALUATION OF A PROFESSIONAL DEVELOPMENT PROGRAM ON DESIGNING PARTICIPATORY ACTION RESEARCH PROJECTS FOR BASIC EDUCATION TEACHERS. *Advanced Education*, 2022(21), 161–184. Scopus. <https://doi.org/10.20535/2410-8286.266663>
- Pinto, R. D., Peixoto, B., Melo, M., Cabral, L., & Bessa, M. (2021). Foreign language learning gamification using virtual reality—A systematic review of empirical research. *Education Sciences*, 11(5). Scopus. <https://doi.org/10.3390/educsci11050222>
- Putz, L.-M., Hofbauer, F., & Treiblmaier, H. (2020). Can gamification help to improve education? Findings from a longitudinal study. *Computers in Human Behavior*, 110. Scopus. <https://doi.org/10.1016/j.chb.2020.106392>
- Quintero, J., Baldiris, S., Ceron, J., Garzon, J., Burgos, D., & Velez, G. (2022). Gamification as Support for Educational Inclusion: The Case of AR-mBot. Dalam Chang M., Chen N.-S., Dascalu M., Sampson D.G., Tlili A., & Trausan-Matu S. (Ed.), *Proc. - Int. Conf. Adv. Learn. Technol., ICALT* (hlm. 269–273). Institute of Electrical and Electronics Engineers Inc. Scopus. <https://doi.org/10.1109/ICALT55010.2022.000088>
- Rafiq, K. R. M., Pazilah, F. N., Tong, G. Y., Yunus, M. M., & Hashim, H. (2020). Game on! Development and evaluation of computer games for ESL classroom. *International Journal of Scientific and Technology Research*, 9(2), 1976–1980. Scopus. Diambil dari Scopus.
- Sánchez, S. P., Belmonte, J. L., Cabrera, A. F., & Núñez, J. A. L. (2020). Gamification as a methodological complement to flipped learning—An incident factor in learning improvement. *Multimodal Technologies and Interaction*, 4(2). Scopus. <https://doi.org/10.3390/mti4020012>
- Schoenenberger, C.-A., Korkut, S., Jaeger, J., & Dornberger, R. (2016). BioTourney: Gamifying a biology class by applying a content-independent learning game framework. Dalam Boyle L., Boyle L., Connolly T.M., & Connolly T.M. (Ed.), *Proc. European Conf. Games-based Learn.* (Vol. 2016-January, hlm. 575–583). Dechema e.V. Scopus. Diambil dari <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84997018044&partnerID=40&md5=6ab4bce210b027b2dc922d71f7df4702>
- Schönbohm A., Bellotti F., Bucchiarone A., de Rosa F., Ninaus M., Wang A., ... Dondio P. (Ed.). (2025). 13th International Conference on Games and Learning Alliance, GALA 2024. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 15348 LNCS. Scopus. Diambil dari <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85214108882&partnerID=40&md5=285d302ef264000594588a1a469229ef>
- Seetharam, A., Kumar, T., Gupta, H., & Bhaumik, R. (2024). A Marker-Based Augmented Reality Application to Teach Chemistry to Indian Students. Dalam Senjyu T., So-In C., & Joshi A. (Ed.), *Lect. Notes Networks Syst.: Vol. 947 LNNS* (hlm. 415–435). Springer Science and Business Media Deutschland GmbH. Scopus.

- https://doi.org/10.1007/978-981-97-1326-4_34
- Segura-Robles, A., Fuentes-Cabrera, A., Parra-González, M. E., & López-Belmonte, J. (2020). Effects on Personal Factors Through Flipped Learning and Gamification as Combined Methodologies in Secondary Education. *Frontiers in Psychology*, 11. Scopus. <https://doi.org/10.3389/fpsyg.2020.01103>
- Soriano-Pascual, M., Ferriz-Valero, A., García-Martínez, S., & Baena-Morales, S. (2022). Gamification as a Pedagogical Model to Increase Motivation and Decrease Disruptive Behaviour in Physical Education. *Children*, 9(12). Scopus. <https://doi.org/10.3390/children9121931>
- Szeto, M. D., Strock, D., Anderson, J., Sivesind, T. E., Vorwald, V. M., Rietcheck, H. R., ... Dellavalle, R. P. (2021). Gamification and Game-Based Strategies for Dermatology Education: Narrative Review. *JMIR Dermatology*, 4(2). Scopus. <https://doi.org/10.2196/30325>
- Triantafyllou, S. A., Sapounidis, T., & Farhaoui, Y. (2024). Gamification and Computational Thinking in Education: A systematic literature review. *Salud, Ciencia y Tecnologia - Serie de Conferencias*, 3. Scopus. <https://doi.org/10.56294/sctconf2024659>
- Uden L. & Liberona D. (Ed.). (2021). 9th International Workshop on Learning Technology for Education Challenges, LTEC 2021. *Communications in Computer and Information Science*, 1428. Scopus. Diambil dari <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85112735394&partnerID=40&md5=8e0198d814fca20993fd52be0b85d3a2>
- Vagianou, M., Paraskeva, F., Karampa, V., & Bouta, H. (2021). Applying Motivational Techniques and Gamified Elements on Instructional Design Models for Effective Instruction in Secondary Education. Dalam Uden L. & Liberona D. (Ed.), *Commun. Comput. Info. Sci.* (Vol. 1428, hlm. 111–123). Springer Science and Business Media Deutschland GmbH. Scopus. https://doi.org/10.1007/978-3-030-81350-5_10
- Verde-Quintanilla, J., Ramirez-Felipe, N., Bravo-Llerena, K., & Gonzales-Macavilca, M. (2021). Benefits of Gamified Evaluations for Virtual Education in Pandemic Context According to the Peruvian Teachers Perception. *Proc. IEEE Sci. Humanit. Int. Res. Conf., SHIRCON*. Dipresentasikan pada Proceedings of the 2021 IEEE Sciences and Humanities International Research Conference, SHIRCON 2021. Institute of Electrical and Electronics Engineers Inc. Scopus. <https://doi.org/10.1109/SHIRCON53068.2021.9652355>
- Weitze, C. L. (2016). Designing for learning and play: The smiley model as a framewor. *Interaction Design and Architecture(s)*, 29(1), 52–75. Scopus. Diambil dari Scopus.
- Wells, D., & Fotaris, P. (2017). Game-based learning in schools: Trainee teacher perceptions in implementing gamified approaches. Dalam Pivec M. & Grundler J. (Ed.), *Proc. Eur. Conf. Games Based Learn., ECGBL* (hlm. 754–762). Academic Conferences and Publishing International Limited. Scopus. Diambil dari <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85036460675&partnerID=40&md5=5dd29be23f0846997686fad3d17217b7>
- Zhao, J.-H., Panjaburee, P., Hwang, G.-J., & Wongkia, W. (2024). Effects of a self-regulated-based gamified virtual reality system on students' English learning performance and affection. *Interactive Learning Environments*, 32(9), 5509–5536. Scopus. <https://doi.org/10.1080/10494820.2023.2219702>