

Translated effect on the integration of gamification to students' learning engagement

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Abstract

This study explores the perceived effects of integrating gamification into science education and examines how these effects translate into and enhance student engagement and understanding of scientific concepts. Using a phenomenological approach, data were collected from 20 students through open-ended questionnaires to gain insights into their experiences with gamification. The study followed rigorous procedures, including question validation, securing school authority permissions, and systematic data analysis. Findings reveal that gamified elements, such as point scoring, significantly boost motivation and make learning more engaging. Gamification also fosters critical thinking by prompting students to analyze and apply complex scientific concepts, enhances problem-solving through strategic, competitive learning, and promotes collaboration by creating a community-driven educational experience. These perceived benefits lead to greater participation, interactive engagement, and student autonomy, cultivating intrinsic motivation and positive attitudes toward science learning. The study recommends future research on comparative gamification strategies and encourages educators to adopt these techniques to improve student engagement and academic outcomes.

Keywords: *science, gamification, learning engagement, motivation*

Article History:

Received: March 3, 2025

Accepted: May 25, 2025

Revised: May 20, 2025

Published online: May 31, 2025

Suggested Citation:

Alburo, S.M.C., Montibon, C.A., Petrasanta, R.M.R. & Sotomayor, C.K.R. (2025). Translated effect on the integration of gamification to students' learning engagement. *International Student Research Review*, 2(1), 19-33. <https://doi.org/10.53378/isrr.170>

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1. Introduction

In this modern era, web-based games have become more innovative, piquing youngsters' interest. As the world continues to grow, along with technology, web-based games have become engaging tools for educators to enhance student learning experiences. In 2010, the term "gamification" entered the mainstream vocabulary; a year later, it became a trend. Beliefs emerge that web-based games can potentially foster motivation, behavioral changes, friendly competition, and collaboration in different contexts, which is why it became so popular (Dichev & Dicheva, 2017). Stimulated by the effects that game elements can produce, many researchers have looked into the influence of gamification in an educational context, getting favorable results, such as the increase in engagement, user retention, knowledge, and cooperation (Hakulinen & Auvinen, 2014; Tvarozek & Brza, 2014; Smiderle et al., 2020; Riar et al., 2022; Hellín et al., 2023; Kalogiannakis et al., 2021; Sailer & Homner, 2020; Rodrigues et al., 2019; Khoshnoodifar et al., 2023).

A noticeable decline in student engagement in traditional science education is attributed to students' growing disinterest potentially influenced by the limitations of conventional teaching methods to capture their attention and foster a deep understanding of complex scientific concepts. It was discovered that teachers struggle to motivate students effectively as they need a varied lesson that speaks their youthful language. In the current technological era, schools and instructors must adapt to meet students' preferences for interactive learning experiences. Disinterest in the teacher, the class, the studies, and the school is undoubtedly caused by the frequent use of the brush and chalkboard (Goulart, 2022). This shift towards incorporating technology and contemporary teaching methods is crucial in addressing disinterest in traditional learning approaches and enhancing students' engagement.

The problem lies in the mismatch between traditional teaching methodologies and the evolving needs of contemporary students. Research has shown that the mismatch between students' learning styles and teacher teaching styles contributes to a lack of motivation and engagement in class (Azman & Mustaffa, 2014). This disconnect hampers students' comprehension of scientific concepts, ultimately affecting the quality of education in these subjects. As an emerging educational approach, gamification offers a promising solution by aligning learning experiences with students' preferences for interactive, technology-based methods.

This study explores the perceived impact of integrating gamification into science education, focusing on how these integrations influence students' learning engagement. By examining how game elements translate into real-world learning outcomes, this study aims to highlight the role of gamification in fostering a more engaging and effective learning environment for students in science education.

2. Literature Review

2.1. Gamification

As the world continues to grow, along with technology, the word gamification has emerged and is being introduced in the educational landscape. Gamification is adding games or game-like aspects to anything (such as a task) to encourage involvement. It is a broad term encompassing technological, economic, cultural, and sociological trends that make reality more game-like, intentionally or as a result of an emergent transformation (Hamari, 2019). Furthermore, Malahito and Quimbo (2020) introduced the concept of gamification, which was developed as a result due to growth of technology to retain or improve the students' academic performance, or incorporating game aspects into learning situations, is a relatively recent notion in the educational industry. As children become more exposed to and hooked to video/mobile games, teachers and educators must view this as an opportunity, not a threat, to capture the students' attention during the learning process.

2.2. Impacts of Gamification on Students in Learning Engagement

Gamification, defined as applying game elements such as points, badges, and leaderboards in non-gaming contexts, has emerged as a promising approach to boosting student motivation and learning engagement. Traditional teaching methods often fail to capture the interest of contemporary learners, but integrating game-like features in educational environments has shown significant potential for improving student involvement and enthusiasm. Alsawaier (2018) highlights how gamification enhances motivation and engagement, suggesting its effectiveness in counteracting student disinterest in conventional educational settings. Similarly, Carmo et al. (2020) observed that students who engaged with gamified content exhibited longer engagement durations, higher grades, and increased interaction with course materials, which points to the substantial influence of gamification on academic performance and learning behavior. However, the effectiveness of gamification is

not uniform across all students. Smiderle et al. (2020) revealed that the impact of gamification on learning engagement can vary based on individual personality traits and preferences. This underscores the need for a nuanced application of gamification techniques that account for student diversity. Similarly, Hamari et al. (2014) demonstrated that achievement points and badges are crucial in positively influencing student outcomes, emphasizing the significance of carefully selecting gamification elements tailored to specific educational goals.

The application of gamification in subjects like Earth and Life Sciences has been explored extensively, with notable positive impacts on student engagement. For instance, Cabello et al. (2021) identified several key benefits, including sustained motivation, avenues for further exploration, and opportunities to refine the implementation process to maximize teaching effectiveness. Additionally, incorporating game elements can create more dynamic and interactive learning environments. Bouchrika et al. (2021) provided further empirical support by investigating the long-term effects of gamification over ten months. Their findings indicated that gamification not only enhances student engagement with e-learning platforms but also fosters greater interactivity and adoption of educational systems, contributing to better academic outcomes.

Cruz and Palaoag (2019) demonstrated that gamification significantly improves student interaction with course content, reinforcing its role as a transformative tool in modern education. While debates around its effectiveness remain, particularly regarding the consistency of its impact across different learning contexts, the accumulated evidence suggests that when thoughtfully designed and implemented, gamification can lead to meaningful improvements in student engagement and academic success. Integrating gamification into educational practices holds considerable promise for enhancing student engagement. However, future research should continue exploring how individual differences influence the outcomes of gamified learning to ensure the strategy's efficacy across diverse learner populations. Maximizing gamification's benefits lies in balancing game mechanics with pedagogical goals to create engaging and effective learning experiences.

2.3. Translation of Perceived Impacts on Students' Learning Engagement

Gamification in education has been found to benefit learning, as it enhances students' motivation and understanding of the material (Rakasiwi et al., 2021). Despite the challenges

of maintaining students' motivation in education, gamification has gained attention due to its ability to inspire and improve student engagement (Dichev & Dicheva, 2017). In addition, gamified learning applications provide a more interactive approach to teaching and support classroom instructions that enhance engagement and interest in concepts, socialization skills, and collaboration with other students (Macayan et al., 2022). Research has shown that students are driven to enjoy games in education as it enriches the learning environment in the classroom and provide them with the development of critical cognitive elements like imagination and motor enrichment that are correctly transposed to be experienced with the body, in person, promoting playfulness (Mee et al., 2022; Godtsfriedt & Cardoso, 2022).

Research further supports the positive aspects of gamification. For instance, based on the study conducted by Uyar (2019), when gamification is implemented properly, it can enhance learning and improve the environment in educational settings for students. The influence of gamification on the achievement of the students should be taken into account when creating lectures since developing the achievement of the students and educating them toward the goals of the curriculum is the main aim of educational settings. Furthermore, according to Kalogiannakis et al. (2021), gamification can potentially improve both the amount and quality of knowledge, providing additional insights into how students learn and engage. Although it is debatable, scientific education frequently uses a competition strategy to minimize students' negative feelings and experiences and improve learning outcomes. The three main learning outcomes that were shown to be most impacted were social interaction, learning achievements, and motivation and engagement.

Gamification emerges as a transformative educational strategy, using game elements to boost motivation, engagement, and skill development. Research indicates that gamification enhances students' motivation, deepens understanding of lessons, and improves both the quality and retention of knowledge. Additionally, it fosters critical thinking and promotes active participation and collaboration among students, offering a more dynamic and engaging learning experience.

2.4. Theoretical Framework

This part presents the relevant theories aligned with this study that aim to deepen the understanding of the concept of gamification and how this affects the students' engagement.

Gamification Learning Theory (GLT) by Zaric et al. (2021) suggests that gamification influences learning-related behaviors rather than directly affecting learning. This study explores how learning tendencies enhance academic participation, engagement, and experience in gamification. Gamification Learning Theory defines gamification as applying game attribute categories outside of a game to influence learning-related behaviors or attitudes (Landers, 2014). This theory aligns with the study's focus on demonstrating gamification impacts on students' behavior, specifically learning-related outcomes.

On the other hand, the Gamification Effectiveness Theory (GET) model by Amir and Ralph (2014) explores how intrinsic motivation, extrinsic motivation, game mechanics, and immersive dynamic influence gamification effectiveness. Intrinsic motivation depends on autonomy, competence, and relatedness, while extrinsic motivators like points and badges drive engagement. Game mechanics and immersive dynamics shape user experiences. Additionally, the theory emphasizes the importance of use, user alignment, and purpose in determining gamification effectiveness.

3. Methodology

3.1. Research Design

This research aimed to investigate the translated impact of gamification and its integration for students learning engagement in the context of science education. This study used a phenomenological approach—a qualitative research method that aims to capture the essence of human experience, and it involves exploring the subjective meaning and significance of phenomena through in-depth interviews, observation, and reflections. The design is appropriate for this study in the reason of understanding the experiences of students in engaging in a modernized way of teaching. The findings of this research contribute to the understanding of how gamification could enhance learning outcomes and foster transformative experiences in science education, informing the development of effective instructional strategies in this field.

3.2. Research Participants

This study was conducted at one of the public secondary schools in Candelaria East District in the province of Quezon, Philippines. Furthermore, the students in the said locale have experienced using gamification in their science subject to foster learning while

engaging into an in-game context that motivates learners to achieve certain goals, enhance participation and productivity. The research involved 20 students from the selected school during the School Year 2023-2024. These students were chosen based on specific criteria: they must have experienced gamification in their Earth and Life Science classes and have demonstrated active engagement during those sessions. The selection ensured that the participants could provide detailed and relevant insights into the impact of gamified learning on their academic and motivational experiences.

3.3. Corpus of the Study

This study employs a corpus consisting of twenty distinct collections of text data, each meticulously curated to address specific research inquiries. Rigorous transcription protocols were followed to ensure the corpus integrity and reliability. The utilization of the constructed corpus serves as the primary data source, enabling in-depth analysis and the extraction of meaningful insights into the phenomena under examination.

3.4. Research Instrument

The primary instrument used for data collection was a standardized open-ended questionnaire, divided into two sections. The first section contained questions designed to elicit insights about the integration of gamification in Earth and Life Science education and its impact on students' engagement and motivation. The second section focused on academic learning outcomes, asking participants to describe how gamification influenced their comprehension and retention of scientific concepts. The open-ended nature of the questions allowed participants to express their perspectives in depth, capturing the nuances of their experiences.

3.5. Data Gathering Procedure

Initially, the survey questions and interview compilation were validated and approved by the teacher. Secondly, the researchers seek permission from the principal of the school to conduct the study. Thirdly, the researchers distributed the study materials to the selected participants. Fourthly, the completed questionnaires of the participants were collected directly by the researchers. Fifthly, the information gathered from the participants were

coded, analyzed, and interpreted. Finally, the researchers compiled a summary encompassing their findings, conclusions, and ideas.

3.6. Data Analysis

The data analysis utilized a structured seven-phase approach adapted from Lochmiller and Lester (2017), specifically designed for thematic analysis to generate comprehensive insights aligned with the research questions. First, the data were prepared and organized, involving tasks such as converting audio recordings into digital format, typing up observational notes, and scanning paper documents to create a comprehensive dataset. Next, transcription of the data was conducted using either verbatim or summarized transcripts, a step that facilitated a deeper understanding of participant perspectives and familiarized the researcher with the content. The third phase involved becoming thoroughly familiar with the data through a preliminary analysis that noted key observations, participant experiences, and initial reactions while identifying any gaps or limitations.

Reflective memoing followed, capturing early interpretations, potential biases, and significant data points, serving as a foundation for further exploration. Coding was then undertaken in a multi-step process: initial descriptive coding across the entire dataset, refining codes for deeper analytical inference, and linking these codes to the study's main research objectives. From these codes, categories were developed, which were then synthesized into broader themes by identifying patterns, connections, and contrasts within the data. This thematic analysis provided a structure that connected the themes to the study's analytical goals and research questions. Finally, the analysis process was made transparent through the creation of an audit trail and process map, detailing the relationships between data sources, codes, categories, and themes. Coding frequencies were documented, and qualitative analysis software assisted in organizing and validating the themes, ensuring clarity and giving readers a sense of the representativeness of each theme in relation to the overall dataset.

3.7. Ethical Considerations

In every research study the security of the respondents is essential, thus the researchers guarantee the relevant ethical standards are followed. The data collected during the research is handled with proper confidentiality and respondents remain protected from

adverse impacts to well-being. The respondents are informed of the goal of the study and the significance of their participation in the research. Moreover, the anonymity of the locale study has been taken into account ensuring no one would be able to determine the locale of the study personally. No personally identifying information is collected. Additionally, the researchers also adhered to the concern raised by the Data Privacy Act 2012, safeguarding the fundamental human rights of privacy and communication while maintaining free flow of information. Furthermore, the researchers have cited their sources and references properly to avoid plagiarism and intellectual theft, contributing to the credibility of the research.

4. Findings and Discussion

4.1. *Perceived Impact on the Integration of Gamification*

The integration of gamification in science education is perceived to have a profound impact on several key themes, including motivation, critical thinking, problem-solving, and collaboration. Participants reported that gamified elements, such as point scoring, significantly stimulate interest in scientific concepts, making the learning process more enjoyable and engaging. This gamification approach shifts the learning environment from a traditional model to an interactive way of learning, enhancing student motivation to explore and understand scientific material. These positive effects are reflected further in the answers of the interviewed students who indicated that gamification can lead to improved learning outcomes and improved academic performance. Another emphasized that interaction of enjoyment and learning often leads to better retain or grasp the lesson. Through gamification, they are more dedicated and motivated to put effort into their time and their learning endeavor while still maintaining an element of fun, resulting in improved academic performance. This integration of engaging elements in the educational process not only enhances the motivation and learning engagement of the students, but also fosters deeper understanding and long-term retention of the material, creating a more valuable and effective learning experience overall. Additionally, gamification promotes critical thinking by requiring students to analyze and apply complex scientific concepts in various contexts, fostering deeper cognitive engagement. As noted, *“in terms of comprehending complex concepts in Science, the integration of gamification has really a big impact on it. It helps every student to be more motivated, understand the topic easily, and be more efficient.”* This encourages students to think critically by making learning interactive and challenging,

wherein it motivates them to analyze problems, solve puzzles, and apply scientific principles in a dynamic way.

Furthermore, it facilitates the development of problem-solving skills, as students are encouraged to strategize learning creatively and strategically within a competitive framework. As noted, *“If you can have a way to enjoy learning, then studying complex topics can be less of a hassle as you're open to more ideas and by gamification, you'd also be able to create strategies that may aid you to learn in a more plausible way”*. This highlights how gamification can not only enhance the motivation and learning engagement of the students, but also promote a more flexible approach towards challenges. Incorporating game elements can help the students to refine their approaches and experience success that reinforce problem-solving abilities in addressing complex concepts in science education. Ultimately, integration of gamification helps the students develop competencies that can be applied to practical situations, aligning with the key learning goals of developing critical thinking and applying knowledge to solve problems effectively, contributing to successful academic outcomes of the students. Lastly, gamification encourages collaboration among students, fostering a sense of community and shared learning that enriches the educational experience. Likewise, the interviewed student stated that *“it helps me to be comfortable in socializing, having teamwork with other students and of course it really helps in terms of remembering concepts while studying.”* This underscores the significance of gamification to help them to actively participate in a group of students, effectively and efficiently and stimulate learners' curiosity to deepen their understanding of the subject matter.

In agreement with the claim of Carmo et al. (2020), gamification is widely employed in educational settings to increase student engagement and improve the learning process through the use of learning paths. This integration not only enhances student behavior and performance but also provides meaningful learning experiences, leading to improved academic performance and better retention of lessons. By creating an enjoyable learning environment and promoting class participation, gamification makes learning more engaging and interesting for students. Similar to this, Buljan (2021) stated that gamification is beneficial because games instill lifelong skills such as problem-solving, critical thinking, social awareness, cooperation, and collaboration, as well as increasing interest in certain subjects, improving grades, and enhancing cognitive abilities.

4.2. Translation of Perceived Effects on Students' Learning Engagement

The perceived effects of gamification translate into students' learning engagement through enhanced participation, interactive learning experiences, and increased autonomy. Specifically, the gamified approach encourages students to actively participate in their learning, as they are motivated to engage with the content through game-like activities. This interactive learning environment keeps students focused and involved, as they experience a sense of competitiveness when they complete tasks or reach milestones. One of the examples of web games is Kahoot!. It is a game-based learning platform that allows to easily create, share, and play learning games and trivia quizzes in minutes. According to Pratama (2020), Kahoot! students had more opportunity to interact with their teacher, peers, and learning content. It also helped to create a fun learning environment, which led to effective classroom participation. Students felt Kahoot! grabbed their attention and interest throughout the course while also providing opportunities for breaks. Students admitted to using Kahoot! in class improved their knowledge and skills. Students reported that the desire to improve their attention, focus, interaction, and participation really aided their learning in the course. Furthermore, gamification fosters student autonomy by allowing them to set personal goals. This ownership of the learning process leads to intrinsic motivation, as students are more likely to invest effort when they feel in control of their educational journey. As noted, *“gamification makes one focus on the game. It will result in them comprehending what the question about Science is because they have a goal to gain or achieve a high score.”* This highlights that educational content when modified into a game, students are more likely to focus which is driven by their desire to achieve a high score and understand the material. The integration of gamification results in a more engaging and supportive learning atmosphere, which not only enhances students' understanding of scientific concepts but also cultivates positive attitudes toward learning.

5. Conclusion

This study highlights the significant benefits of integrating gamification into science education. The perceived impacts include enhanced motivation, improved engagement, and the development of essential skills such as critical thinking and problem-solving. Participants noted that gamification creates a dynamic learning atmosphere that encourages collaboration and interaction among students. This collaborative spirit not only fosters learning

associations but also leads to a deeper understanding of scientific concepts. The sense of achievement associated with gamified learning further motivates students, encouraging them to delve into science with increased enthusiasm and confidence. Ultimately, these findings underscore the effectiveness of gamification in transforming traditional science education into a more engaging and impactful learning experience.

This research highlights the effectiveness of gamification as a transformative approach in science education. It provides valuable insights for educators and curriculum developers seeking to create more engaging and impactful learning environments. Future studies could explore the long-term effects of gamification on student outcomes and investigate its application across different subjects and educational contexts. By embracing gamification, educators can cultivate a generation of motivated learners equipped with critical thinking and problem-solving skills necessary for success in an increasingly complex world.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was made possible through the support of the Academic Inquisitive Mind Society (AIMS) of Sta. Catalina National High School.

Institutional Review Board Statement

This study was conducted in accordance with the ethical guidelines set by f Sta. Catalina National High School. The conduct of this study has been approved and given relative clearance(s) by f Sta. Catalina National High School.

AI Declaration

The author declares the use of Artificial Intelligence (AI) in writing this paper. In particular, the author used Grammarly in finding literature and other materials. The author takes full responsibility in ensuring that research idea, analysis and interpretations are original work.

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References

- Alsawaier, R. S. (2018). The effect of gamification on motivation and engagement. *The International Journal of Information and Learning Technology*, 35(1), 56–79. <https://doi.org/10.1108/IJILT-02-2017-0009>
- Amir, B., & Ralph, P. (2014). Proposing a theory of gamification effectiveness. In *Proceedings of the 2014 ACM International Conference on Information Systems for Crisis Response and Management* (pp. 1–10).
- Azman, H., & Mustaffa, R. (2014). A match or mismatch between learning and teaching styles in science education. *International Journal of Education and Research*, 2(3), 45–56.
- Bouchrika, I., Harrati, N., Wanick, V., & Wills, G. (2021). Exploring the impact of gamification on student engagement and involvement with e-learning systems. *Interactive Learning Environments*, 29(8), 1244–1257. <https://doi.org/10.1080/10494820.2019.1636086>
- Buljan, M. (2021). *Gamification for learning: Strategies and examples*. Elearning Industry. <https://elearningindustry.com/gamification-for-learning-strategies-and-examples>
- Cabello, C. A., Abadiano, M. N., Mabitad, A., Pulma, D. B., & Hipe, A. (2021). Gamification in education: The motivation-exploration-implementation theory. *Turkish Online Journal of Qualitative Inquiry*, 12(7).
- Carmo, D.Ê. P., Klock, A. C. T., de Oliveira, E. H. T., & Gasparini, I. (2020). A study on the impact of gamification on students' behavior and performance through learning paths. *IEEE 20th International Conference on Advanced Learning Technologies (ICALT)* (pp. 84–86). IEEE. <https://doi.org/10.1109/ICALT49669.2020.00029>
- Cruz, C. S. D., & Palaoag, T. D. (2019). An empirical study of gamified learning application engagement to exceptional learners. *Proceedings of the 8th International Conference on Informatics, Environment, Energy and Applications* (pp. 263–267).
- Dichev, C., & Dicheva, D. (2017). Gamifying education: What is known, what is believed, and what remains uncertain: A critical review. *International Journal of Educational Technology in Higher Education*, 14(1), 9. <https://doi.org/10.1186/s41239-017-0042-5>
- Godtsfriedt, J., & Cardoso, F. L. (2022). Webgames and the four pillars of education. *Journal of Physical Education*, 33, e3309. <https://doi.org/10.4025/jphyseduc.v33i1.3309>

- Goulart, J. (2022). School disinterest: In search of an understanding. *Revista Científica Multidisciplinar Núcleo do Conhecimento*, 07(1), 89–110.
- Hakulinen, L., & Auvinen, T. (2014). The effect of gamification on students with different achievement goal orientations. *International Conference on Teaching and Learning in Computing and Engineering* (pp. 9–16). IEEE. <https://doi.org/10.1109/LaTiCE.2014.10>
- Hamari, J. (2019). Gamification. In G. Ritzer & C. Rojek (Eds.), *The Blackwell Encyclopedia of Sociology*. Wiley. <https://doi.org/10.1002/9781405165518.wbeos1321>
- Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work? A literature review of empirical studies on gamification. *47th Hawaii International Conference on System Sciences* (pp. 3025–3034). IEEE. <https://doi.org/10.1109/HICSS.2014.377>
- Hellín, C.J., Calles-Esteban, F., Valledor, A., Gómez, J., Otón-Tortosa, S., & Tayebi, A. (2023). Enhancing student motivation and engagement through a gamified learning environment. *Sustainability*, 15(19), 14119. <https://doi.org/10.3390/su151914119>
- Kalogiannakis, M., Papadakis, S., & Zourmpakis, A. I. (2021). Gamification in science education: A systematic review of the literature. *Education Sciences*, 11(1), 22. <https://doi.org/10.3390/educsci11010022>
- Khoshnoodifar, M., Ashouri, A., & Taheri, M. (2023). Effectiveness of gamification in enhancing learning and attitudes: A study of statistics education for health school students. *J Adv Med Educ Prof.*, 11(4), 230-239. <https://doi.org/10.30476/JAMP.2023.98953.1817>
- Landers, R. N. (2014). Developing a theory of gamified learning: Linking serious games and gamification of learning. *Simulation & Gaming*, 45(6), 752–768. <https://doi.org/10.1177/1046878114563660>
- Lochmiller, C. R., & Lester, J. N. (2015). *An introduction to educational research: Connecting methods to practice*. Sage Publications.
- Macayan, V. D., Baguistan, D. C., & Golias, J. B. (2022). Game-based activities and gamification in the mastery of science process skills: A systematic literature review. *EPRA International Journal of Multidisciplinary Research (IJMR)*, 8(7), 388–398.
- Malahito, J. A. I., & Quimbo, M. A. T. (2020). Creating G-Class: A gamified learning environment for freshman students. *E-Learning and Digital Media*, 17(2), 94–110. <https://doi.org/10.1177/2042753019882567>

- Mee, R. W. M., Rao, Y. S., Pek, L. S., Abd Ghani, K., Von, W. Y., Ismail, M. R., & Shahdan, T. S. T. (2022). Gamifying education for classroom engagement in primary schools. *International Journal of Evaluation & Research in Education*, 2252(8822), 1361.
- Pratama, G. A. (2020). Students' perception of gamification to promote classroom engagement and motivation in senior high school. *Language Research Society*, 1(1).
- Rakasiwi, D., Tanzarez, S., & Simanjuntak, R. R. (2021,). Gamification for improving students' comprehension in learning history. *3rd International Conference on Cybernetics and Intelligent System (ICORIS)* (pp. 1–5). IEEE. <https://doi.org/10.1109/ICORIS52787.2021.9649625>
- Riar, M., Morschheuser, B., Zarnekow, R. & Hamari, J. (2022). Gamification of cooperation: A framework, literature review and future research agenda. *International Journal of Information Management*, 67, 102549. <https://doi.org/10.1016/j.ijinfomgt.2022.102549>
- Rodrigues, L.F., Oliveira, A. & Rodrigues, H. (2019). Main gamification concepts: A systematic mapping study. *Heliyon*, 5(7), e01993. <https://doi.org/10.1016/j.heliyon.2019.e01993>
- Sailer, M. & Homner, L. (2020). The gamification of learning: a meta-analysis. *Educ Psychol Rev*, 32, 77–112. <https://doi.org/10.1007/s10648-019-09498-w>
- Smiderle, R., Rigo, S. J., Marques, L. B., Peçanha de Miranda Coelho, J. A., & Jaques, P. A. (2020). The impact of gamification on students' learning, engagement, and behavior based on their personality traits. *Smart Learning Environments*, 7(1), 3. <https://doi.org/10.1186/s40561-019-0098-x>
- Tvarozek, J., & Brza, T. (2014). Engaging students in online courses through interactive badges. *International Conference on e-Learning*, (pp. 89–95).
- Uyar, G. (2019). *Effects of gamification on students' motivation and vocabulary development*. Master's thesis, Eğitim Bilimleri Enstitüsü.
- Zaric, N., Roepke, R., Lukarov, V., & Schroeder, U. (2021). Gamified learning theory: The moderating role of learners' learning tendencies. *International Journal of Serious Games*, 8(3), 71–91. <https://doi.org/10.17083/ijsg.v8i3.431>