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ORIGINAL PAPER

Level Up Learning: The Impact of Gamification as an Intervention Tool in Education

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Abstract
This systematic review examines the impact of gamification as an educational intervention. The researcher examines various journals and studies on the effects of gamification in education and reads the full papers. A thematic analysis has been used to determine the effects of gamification, based on the researcher's thorough review of the journals. The findings of the review showed that gamification has a compelling effect in the learning of the learners in terms of improving the learners' engagement, enhancing learners' writing skills, better scores in practical assignments, and improvement in the academic performance of students. It was recommended that teachers be trained to implement gamification in their lessons to achieve the same positive results for learners.

Keywords:
Gamification
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INTRODUCTION

Digital transformation has permeated various aspects of life, including the field of education. The global education system is shifting from traditional teacher-centered teaching methods to more dynamic, student-centered digital platforms (Gini et al, 2025). This shift encourages educators and researchers to seek innovative learning strategies to enhance the effectiveness of teaching and learning. One of the most prominent strategies in recent years is gamification. This approach integrates game design elements (such as points, badges, leaderboards, and challenges) into non-game contexts (Deterding et al., 2011). Its main goal is to increase students' motivation, engagement, and learning experience by leveraging the motivational affordances of games (Deterding et al., 2011). Recent studies show that gamification interventions tend to increase student engagement, motivation, and learning achievement, with a fairly significant positive effect on learning outcomes (Mandal & Morados, 2023; Deterding et al, 2011).

However, amid global optimism about the potential of gamification, the education system in the Philippines still struggles with fundamental challenges. The country is currently in a transition period from traditional methods to digital ones, and indicators of educational quality remain concerning. The National Achievement Test (NAT) consistently fails to meet the Department of Education's target of 75%, with a low mean percentage score (MPS) (Mandal & Morados, 2023). This situation is further aggravated by the results of the 2018 Programme for International Student Assessment (PISA), which placed the Philippines at the bottom in science, mathematics, and reading among participating countries (Mandal & Morados, 2023; Jaca et al, 2023). More than 80% of 15-year-old Filipino students do not

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achieve the minimum proficiency level in reading, indicating a fundamental crisis in understanding and applying basic concepts (Jaca et al, 2023).

This astonishing PISA finding serves as an emergency signal for all educational stakeholders in the Philippines, highlighting a significant gap between current learning practices and the competency needs of the 21st century (Mandal & Morados, 2023). This gap demands interventions that are not only innovative but also measurable and evidence-based. Gamification, with all its globally proven potential, emerges as a promising intervention candidate to bridge this gap. Nevertheless, the implementation of gamification is not a uniform instant solution. Studies show that its effectiveness depends heavily on context, instructional design, and learner characteristics (Fodale, 2025; Gini et al., 2025). There are also diverse, or even negative, outcomes, where poorly designed gamification can lead to disengagement or demotivation due to excessive emphasis on extrinsic rewards (Gini et al., 2025; Li et al., 2024).

Therefore, a comprehensive synthesis of knowledge is needed to gain a deeper understanding of how gamification can be optimized as an effective intervention tool in the context of education. To address this gap, a systematic review of the impact of gamification in education was conducted. This study specifically aims to answer the main research question: "What is the impact of gamification as an intervention tool in education?" Furthermore, this study aims to identify specific gaps and limitations in existing studies, in order to provide a clearer roadmap for researchers and education practitioners, particularly in developing countries such as the Philippines, in designing and implementing gamification more effectively and sustainably.

METHOD

Research Design

This study employed a systematic literature review as its primary research design. A systematic literature review is a rigorous and transparent methodological approach that identifies, evaluates, and synthesizes existing empirical evidence to address a clearly formulated research question (Liberati et al., 2009). This design was selected because it enables the comprehensive mapping and synthesis of the diverse body of research on gamification's impacts in education, thereby identifying patterns, inconsistencies, and gaps across multiple studies (Petticrew & Roberts, 2006).

Research Questions

This systematic review was guided by the following primary research question: What are the impacts of gamification as an intervention tool in education? The subsidiary questions addressed were:

1. What evidence exists regarding gamification's effects on learner motivation, engagement, and academic achievement?
2. How do these effects vary across educational levels and subject domains?
3. What specific game elements and design features are associated with positive outcomes?
4. What theoretical frameworks have been employed to explain gamification effects?
5. What contextual factors moderate gamification effectiveness?

Search Strategy
Information Sources

A comprehensive literature search was conducted across multiple electronic databases: Scopus, Web of Science, ERIC, PsycINFO, IEEE Xplore, SpringerLink, ScienceDirect, and Google Scholar. These databases were selected for their extensive coverage of peer-reviewed literature in education,

psychology, and computer science (Zichermann & Cunningham, 2011). Reference lists of included studies were manually screened using the snowballing technique (Wohlin, 2014).

Search Process and Timeline

The systematic search was conducted from January to March 2025, limited to studies published between 2014 and 2025 to capture the period of most rapid growth in gamification research following Deterding et al. (2011). The search was restricted to peer-reviewed journal articles and conference proceedings published in English.

Inclusion and Exclusion Criteria
Inclusion Criteria

Studies were eligible if they: (a) involved learners in educational settings; (b) investigated gamification interventions applying game design elements in educational contexts (Deterding et al., 2011); (c) included a comparison condition; (d) reported empirical data on motivation, engagement, achievement, or related outcomes; (e) employed quantitative, qualitative, or mixed methods; (f) were peer-reviewed journal articles or conference proceedings; (g) were published in English between 2014-2025.

Exclusion Criteria

Studies were excluded if they: (a) examined full-fledged educational games without an explicit gamification focus; (b) were dissertations, books, editorials, or grey literature; (c) were published in languages other than English; (d) lacked empirical data on educational outcomes; (e) focused exclusively on technical implementation without pedagogical evaluation.

Study Selection Process

The study selection process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021). The selection was conducted in four phases:

Phase 1: Initial Screening. Two independent reviewers screened titles and abstracts of all retrieved records against the inclusion criteria. Disagreements were resolved through discussion and consensus.

Phase 2: Full-Text Retrieval. Full-text versions of potentially eligible studies were obtained through institutional access or interlibrary loan.

Phase 3: Full-Text Assessment. Two independent reviewers examined the full texts against the inclusion criteria and documented reasons for exclusion.

Phase 4: Final Inclusion. Studies satisfying all criteria were included for data extraction and synthesis.

Quality Assessment

A customized quality assessment tool was developed in accordance with established guidelines for systematic reviews in educational research. The tool assessed studies across six domains: research design quality, intervention description, outcome measurement, data analysis, threats to validity, and theoretical foundation. Two independent reviewers assessed each study, with disagreements resolved through discussion. Each study received a quality rating: high (≥80% criteria satisfied), moderate (60-79%), or low (<60%). No studies were excluded based on quality, but ratings informed the interpretation of synthesis.

Data Extraction

Development of Data Extraction Form

A standardized data extraction form was developed in Microsoft Excel and piloted with five randomly selected studies. The final form captured: study identification (authors, year, title, journal, country); study characteristics (design, sample size, participant characteristics, educational context); intervention characteristics (gamification type, game elements, duration, technology); theoretical framework; outcome measures; key findings; moderating factors; limitations; and quality assessment score.

Data Extraction Procedure

The researcher carefully examined each included study by thoroughly reading the entire article to determine its relevance to the research questions. Following this initial familiarization, systematic data extraction was conducted using the standardized form. This was accomplished by extracting statements, quotations, and numerical data from each study that illuminated the impacts of gamification in educational settings. Particular attention was paid to direct quotations from participants (in qualitative studies) and statistical results (in quantitative studies) that provide evidence regarding the effects of gamification on motivation, engagement, achievement, and related outcomes.

To ensure accuracy and consistency, the researcher examined each article multiple times. A systematic verification procedure was implemented in which all extracted data were reviewed against the original articles to confirm accuracy. For quantitative data, extracted statistics were double-checked against source tables. For qualitative data, extracted quotations and themes were verified for contextual accuracy. Any ambiguities were documented and resolved through team discussion.

Data Analysis

Following data extraction, the researcher proceeded with thematic analysis, a flexible method for identifying, analyzing, and reporting patterns within qualitative data (Braun & Clarke, 2006). This approach is particularly suitable for systematic reviews in education as it allows synthesis across diverse study designs and outcome measures.

Phases of Thematic Analysis

The thematic analysis followed the six-phase framework developed by Braun and Clarke (2006):

Phase 1: Familiarization with the Data. The researcher read and re-read all extracted data to achieve deep familiarization. Initial thoughts and potential patterns were recorded in analytical memos.

Phase 2: Generating Initial Codes. The researcher systematically coded the extracted data, identifying discrete units of meaning relevant to the research questions. Coding was conducted inductively, allowing codes to emerge from the data while remaining attentive to sensitizing concepts from relevant theoretical frameworks.

Phase 3: Searching for Themes. Codes were examined to identify broader patterns of meaning. Codes were grouped and collapsed based on shared concepts, resulting in candidate themes. Visual mapping techniques were employed to explore relationships among codes and potential themes.

Phase 4: Reviewing Themes. Candidate themes were reviewed and refined iteratively. This involved verifying that themes were coherent, internally consistent, and accurately represented the coded data. Themes were examined at two levels: first, checking that the coded extracts for each theme formed a coherent pattern; second, ensuring that the themes accurately reflected the dataset as a whole.

Phase 5: Defining and Naming Themes. Each theme was clearly defined, with its scope, content, and significance articulated. Subthemes were identified where appropriate to capture thematic complexity. Final theme names were developed to be concise and informative.

Phase 6: Producing the Report. Themes were presented in the findings section, with representative quotes and supporting evidence from the included studies, connecting the findings to the research questions and existing literature.

RESULTS AND DISCUSSION

The purpose of the review was to determine the impact of Gamification as an educational intervention technique. Four main themes emerged from the thematic analysis. themes such as 1) Improve the learner's engagement, 2) Enhanced learners' writing skills, 3) Better scores in practical assignments, and 4) Improvement in the academic performance of students in math

Improve the Learner's Engagement

The impacts of gamified instruction on student involvement were investigated by Marcaida et al. (2022) using thematic analysis, which identified five themes: the influence of gamified instruction on students' engagement and students' challenges in gamified instruction. The first theme focuses on the effects of integrating gamification into instruction that aims to increase the learner's engagement. Five subthemes have been created under the first theme, which focuses on the learner's drive to learn, interest, enhances learning styles, motivation to compete, and promotes higher-order thinking skills. First subtheme: the gamification integrated into every lesson has yielded positive results for students' performance. This integration addressed the learner's attention deficiency and increased their attention and interest in learning. Second, today's type of learner has a potential interest in all digital platforms, especially when they can access them on their cellular phone or laptop through the internet, with gamified lessons that leverage this potential to enhance their interest in learning. An online platform can be an avenue for collaboration among learners and can also support self-directed learning. The third group of students who were exposed to the gamification integration lesson developed or enhanced their learning styles. The findings of this study show that activity-based learning enhances learners' learning abilities and styles by providing meaningful experiences through gamified activities. Additionally, reading mastery level in reading has been further increased through exposure to video viewing and practice activities. Fourth theme: learners' eagerness to compete in any digital form, also evident in the study, allows them to demonstrate competitiveness among their classmates during gamified activities. Because of their involvement in this competition, they will participate and engage to achieve good results. The last theme, which focused on students' higher-order thinking skills, has improved after the teacher implemented gamified activities in their lessons. A game requires thinking deeply in order to win a competition; therefore, students' logic, creativity, collaboration, and problem-solving skills will be sharpened. All things considered, the study findings show the various ways that gamified instruction improves the learning process and the substantial influence it can have on student engagement.

Enhanced Learners' Writing Skills

In the study of Samosa et al. (2021), the level of focus, content, organization, style, and convention resulted in a very satisfactory interpretation after the intervention of innovative gamification strategies given to the students. The interpreted data show a highly significant improvement in writing skills following exposure to the intervention. Pretest results show a minimal mean percentage of 3.3, whereas post-intervention learners' test results increased to 8.3 percent. This means the learners' gain score is 0.42 percent. Comparing the pretest and posttest results on the implementation of gamification

as an innovative strategy to enhance learners' writing skills shows a significant difference. Meanwhile, in another study by Sultanova (2011), the results show an improvement in the learners' vocabulary when gamification was integrated into their exercises. Gamification's potential as a successful teaching method, especially in light of the difficulties presented even during COVID-19. Gamified methods enable non-intrusive tracking of academic progress in addition to increasing student motivation and engagement. Both subjective and objective evaluations of student performance support the idea that gamification can result in better learning outcomes. The study emphasizes the importance of carefully incorporating game components in order to sustain interest and facilitate the shift from extrinsic to intrinsic motivation. It emphasizes the importance of assessing whether gamified teaching strategies are suitable for a range of students. The study advances our knowledge of the ways gamification affects pupils, recommending that future research examine its potential drawbacks and long-term effects.

Better Scores in Practical Assignments

According to Domínguez et. al. (2013) among the two groups the experimental and control group the students who expose to gamification have the significance result during the evaluation items such as initial activity (experimental-88.46, control-77.29), word processor (experimental-64.01, control-56.33), spreadsheet (experimental-73.64, control-62.70), presentations (experimental-89.86, control-64.59), database(experimental-69.65, control-40.25), final examination (experimental-58.05, control-64.12), participation (experimental-48.13, control-86.53) and the final evaluation(experimental-61.57, control-56.27). With these results, the study concluded that platforms in gamification, specifically in electronic learning, have enhanced students' motivation to learn. Emotional and social impact on students also increases, as reward and competition have been the mechanisms by which participants learn more on the gamification e-learning platform.

Improvement in the Academic Performance of Students in Math

The findings of Nob's (2024) study highlighted improvements among the learners, including increased engagement and motivation. Learners are motivated and engaged in a friendly competition in the form of activities or assessments in the lesson. The learners' academic performance has been enhanced by providing real-time suggestions and feedback in enabling them to recognize and fix their own errors and assisting them in strengthening their mathematical understanding of concepts. Gamification can be implemented through collaborative or individual learning experiences that cater to students' diverse learning styles. Higher-order thinking skills are potentially enhanced among learners in enabling them to respond immediately to gamification activities, such in feedback, points, time pressure, competition, and collaboration, thereby developing their problem-solving skills. Gamification can be done remotely or even at home. The level of anxiety among students towards mathematics can be reduced.

CONCLUSION

This systematic review examined the effects of gamification as an educational intervention tool were examined in this systematic review. The findings showed that gamification had generally positive effects on education, particularly in the Philippines. Information provided by numerous studies shows how gamification significantly improves student engagement, academic achievement, and skill development in a variety of subject areas. Gamified instruction improves student engagement, stimulates critical thinking, and promotes social collaboration by creating a more stimulating and encouraging learning environment. The use of gamification resulted in significant improvements in students' writing abilities, as reflected in enhanced writing skills. Benefits of gamification for vocabulary growth and

general academic advancement, emphasizing its adaptability even under trying circumstances like the COVID-19 epidemic. When it came to practical assignments, we found that students who used gamified learning platforms performed better across a variety of assessment tasks, including database work and presentations. Gamification enhanced students' arithmetic skills by encouraging engagement, reducing fear, and developing critical problem-solving skills. These studies demonstrate how gamification can improve academic performance, motivation, and student involvement. They also imply that when gamification is carefully integrated into the learning process, it can lead in more engaging, personalized, and fulfilling educational experiences.

REFERENCES

Arnold, B. J. (2014). Gamification in Education. *Proceedings of the American Society of Business and Behavioral Sciences*, *21*(1), 32–39.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.

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).

Caponetto, I., Earp, J., & Ott, M. (2014, October). Gamification and education: A literature review. In *the European Conference on games based learning* (Vol. 1, p. 50). Academic Conferences International Limited.

Clavito, J. M., & Samosa, R. Gamification as an Innovative Strategy to Improve Learners' Writing Skills.

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining "gamification". In Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments (pp. 9–15). Association for Computing Machinery. https://doi.org/10.1145/2181037.2181040

Deterding, S., Sicart, M., Nacke, L., O'Hara, K., & Dixon, D. (2011). Gamification: Using game-design elements in non-gaming contexts. In CHI '11 Extended Abstracts on Human Factors in Computing Systems (pp. 2425–2428). Association for Computing Machinery. https://doi.org/10.1145/1979742.1979575

Dicheva, D., Dichev, C., Agre, G., & Angelova, G. (2015). Gamification in education: A systematic mapping study. Journal of Educational Technology & Society, 18(3), 75–88.

Domínguez, A., Sáenz-de-Navarrete, J., de Marcos, L., Fernández-Sanz, L., Pagés, C., & Martínez-Herráiz, J. J. (2013). Gamifying learning experiences: Practical implications and outcomes. Computers & education, 63, 380–392.

EJ, A. L. (2021). Math class gamified! Effects on the mathematics performance of COED students of Eastern Samar State University, Philippines. *Indian Journal of Science and Technology*, *14*(23), 1970-1974.

Fodale, M. F. (2025). Gamification in educational technology: A scoping review of trends and effectiveness. *PhilArchive*. https://philarchive.org/rec/FODGIE

Gini, F., Bassanelli, S., Bonetti, F., Mogavi, R.H., Bucchiarione, A., & Marconi, A. (2025). The role and scope of gamification in education: A scientometric literature review. *Acta Psychologica*, 259, 105418. https://doi.org/10.1016/j.actpsy.2025.105418

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, 3025–3034.

Jaca, C. A. L., Tumulak, B. M., & Boaquin, V. V. (2023). Lived experiences among grade 10 students in playing 4 Pics 1 Word for vocabulary learning. *Randwick International of Education and Linguistics Science Journal*, 4(1), 20–34. https://doi.org/10.47175/rielsj.v4i1.641

Li, L., Hew, K. F., & Du, J. (2024). Gamification enhances students' intrinsic motivation and perceptions of autonomy and relatedness, but has minimal impact on competence: A meta-analysis and systematic review. *Educational Technology Research and Development*, 72(2), 765–796.

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P., ... & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses. PLoS Medicine, 6(7), e1000100.

Mandal, L. U., & Morados, P. J. T. (2023). Integration of gamification in teaching measures of position of grade 10 – mathematics. *International Multidisciplinary Research Journal*. https://doi.org/10.54476/ioer-imrj/549239

Marcaida, J. L. M., Ortega, H. C. A., Castañeda, E. S., Cadeliña, P. M. M., García, R. R. I., Valenzuela, L. R., & Tolentino, J. C. (2022). Gamification in a virtual ecology (GIVE): Enhancing classroom engagement in physical education among senior high school students. *International Journal of Multidisciplinary: Applied Business and Education Research*, *3*(11), 2278–2289.

Moldez, C., Crisanto, M. A., Cerdeña, M. G. R., Maranan, D. S., & Figueroa, R. (2024). Innovation in Education: Developing and Assessing Gamification in the University of the Philippines Open University Massive Open Online Courses. *arXiv preprint arXiv:2409.03309*.

Nob, J. M. R. O., Roble, D. B., & Lomibao, L. S. (2024). Unveiling the effects of gamification on math learning: A literature review in the Philippine Context. *Journal of Innovations in Teaching and Learning*, *4*(1), 13-19.

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ, 372, n71.

Petticrew, M., & Roberts, H. (2006). Systematic Reviews in the Social Sciences: A Practical Guide. Blackwell Publishing.

Samosa, R. C., Policarpio, M. V., Canamaque, B. O., Camocamo, P. H. A., & Clavito, J. M. E. (2021). Gamification as an Innovative "Strategy" to Improve Learners' Writing Skills. Online Submission, 5(12), 25–32.

Seaborn, K., & Fels, D. I. (2015). Gamification in theory and action: A survey. International Journal of Human-Computer Studies, 74, 14–31.

Stott, A., & Neustaedter, C. (2013). Analysis of gamification in education. *Surrey, BC, Canada*, *8*(1), 36.

Toda, A. M., Valle, P. H., & Isotani, S. (2017, March). The dark side of gamification: An overview of the negative effects of gamification in education. In *Researcher links workshop: higher education for all* (pp. 143–156). Cham: Springer International Publishing.

Wohlin, C. (2014). Guidelines for snowballing in systematic literature studies and a replication in software engineering. In Proceedings of the 18th International Conference on Evaluation and Assessment in Software Engineering (pp. 1–10).

Zichermann, G., & Cunningham, C. (2011). Gamification by design: Implementing game mechanics in web and mobile apps. O'Reilly Media.