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Gamification in Elementary School Learning: Research Trends, Implementation Characteristics and Effectiveness Through Systematic Literature Review and Bibliometric Analysis

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ABSTRACT

Research on gamification in elementary school learning continues to grow, but syntheses integrating research trends, implementation, effectiveness, and research gaps remain limited. This study maps research trends and synthesizes the implementation, effectiveness, and research gaps of gamification in elementary school learning. The study employed a Systematic Literature Review guided by PRISMA 2020 and a bibliometric analysis of Scopus-indexed articles published from 2020 to 2026. A total of 41 included articles were analyzed through narrative synthesis and bibliometric mapping using VOSviewer. The findings indicate an increasing publication trend, while collaboration among authors, institutions, and countries remains relatively limited. Gamification implementation is primarily characterized by the use of points, rewards, and leaderboards through interactive digital platforms, supported by student-centered learning and immediate feedback. A total of 34 studies reported improvements in learning motivation and engagement, while 31 studies showed improvements in learning outcomes; effects on cognitive, social, and affective aspects were more varied. The effectiveness of gamification is influenced by pedagogical design, the appropriateness of game elements, and the implementation context. In practice, elementary school teachers need to align gamification strategies with learning objectives, student characteristics, and classroom conditions while providing timely feedback to continuously optimize motivation, engagement, and learning outcomes.

1. Introduction

Elementary school education continues to face challenges related to low student motivation, engagement, and active participation, despite the growing integration

of educational technology. Learning practices that remain largely teacher-centered have not yet fully succeeded in creating interactive and meaningful learning experiences. This condition indicates that technology needs to be integrated through more innovative instructional approaches that are appropriate to the characteristics of elementary school students. One approach that has increasingly been adopted in digital learning is gamification, which refers to the application of game design elements in non-game contexts to enhance students' motivation and engagement (Deterding, S et al., 2011). Elements such as points, badges, leaderboards, rewards, challenges, and levels are used to create more interactive and participatory learning experiences. The pedagogical value of gamification does not lie merely in the use of games, but in the design of learning experiences that encourage participation, feedback, and student engagement. In the elementary school context, this approach is relevant because it aligns with the characteristics of students who tend to enjoy exploratory, competitive, and game-based activities.

Previous studies have shown that gamification has the potential to improve students' motivation, engagement, and learning outcomes. Meta-analytic evidence indicates positive effects on cognitive, motivational, and behavioral learning outcomes, although its effectiveness is influenced by instructional design and the implementation context (Sailer & Homner, 2020). The implementation of gamification has also become increasingly widespread in digital learning environments (Khaldi et al. 2023). Systematic reviews have demonstrated its contribution to school engagement by increasing students' participation, motivation, and engagement (Ramirez Ruiz et al. 2024), as well as its potential to enhance motivation and academic performance (Jaramillo-Mediavilla et al., 2024). However, its effectiveness is not universal because it is influenced by instructional design, the game elements used, and the alignment of implementation with learning needs and contexts. Its implementation also varies in terms of game elements, digital platforms, and pedagogical approaches.

Although research on gamification continues to grow, the existing literature still presents several limitations. Some studies focus on learning effectiveness, while bibliometric studies primarily map publication trends, scientific productivity, collaboration networks, and research themes. These two lines of research operate at different levels of analysis and remain limited in integrating bibliometric structures with implementation characteristics at the study level. Consequently, evidence concerning research development, implementation characteristics, and learning outcomes tends to be presented separately. This condition highlights the need for studies that systematically integrate these three aspects within the context of elementary school education.

More specifically, bibliometric studies have been used to map publication trends, country-level productivity, citations, collaboration networks, and thematic development. (Nurkamilah, et al., 2024). identified eight collaboration networks, with Spain, the United States, and the United Kingdom as the dominant countries, along with emerging themes related to e-learning, educational technology, ICT, educational media, and chatbots (Saputra et al., 2025). also mapped publication trends, countries, collaboration patterns, methodologies, and gamification themes

in science education. In contrast, SLRs have more often revealed implementation characteristics, such as platforms, gamification elements, learning contexts, and effectiveness. (Prasetyo and Meiliasari, 2025) identified the use of Kahoot!, Quizizz, Google Classroom, Classcraft, mobile learning, as well as points, badges, levels, leaderboards, challenges, and instant feedback. Their review also showed that the effectiveness of gamification depends on the context, student characteristics, subject area, and implementation strategy. Although (Safitri et al., 2025) combined a systematic review with bibliometric analysis in the context of elementary school education, the two approaches were used complementarily and synthesized narratively. Therefore, direct relationships between bibliometric variables and implementation characteristics have not yet become a primary focus of analysis.

This gap indicates that previous studies have rarely provided an integrated synthesis linking research trends, implementation characteristics, and the effectiveness of gamification in elementary schools. The novelty of this study lies in the relational integration of variables derived from SLR and bibliometric analysis. Specifically, this study analyzes the relationships between country-level patterns and international collaboration and the platforms used; between thematic development and gamification elements; between subject areas and grade levels and implementation characteristics; and between combinations of platforms and gamification elements and outcomes such as motivation, engagement, participation, self-efficacy, and academic achievement. The predominance of short-term studies and the generally broad nature of implementation also indicate that the development of gamification toward adaptive learning and personalized learning requires further investigation (Ruiz et al., 2024; Jaramillo-Mediavilla Julieth et al., 2024). Thus, this study not only maps the development of gamification research but also explains the relationships among research structures, implementation, and learning outcomes.

Based on this background and the identified research gap, this study aims to map research trends, synthesize the implementation characteristics and effectiveness of gamification in elementary school learning, analyze the relationships among the structure and development of the research field, platforms, gamification elements, implementation contexts, and learning outcomes, and identify research gaps through the integration of a Systematic Literature Review (SLR) and bibliometric analysis. The integration of these two approaches is expected to provide a comprehensive and systematic understanding of the relationships among research development, implementation characteristics, and gamification outcomes, while also providing a foundation for future research and the implementation of gamification in elementary schools. Based on these objectives, this study addresses the following three research questions:

RQ1. How have research trends in gamification in elementary school learning developed in terms of publication trends, countries, collaboration networks, citations, keywords, and research themes based on bibliometric analysis?

RQ2. What are the implementation characteristics of gamification in elementary school learning in terms of platforms, gamification elements, subject areas, grade

levels, and implementation approaches based on the findings of the Systematic Literature Review?

RQ3. How effective is gamification in improving elementary school learning outcomes, including motivation, engagement, participation, self-efficacy, and academic achievement, and how is its effectiveness related to variations in implementation characteristics based on the findings of the Systematic Literature Review?

2. Methodology

This study employed a Systematic Literature Review (SLR) combined with bibliometric analysis to examine research trends, implementation characteristics, and the effectiveness of gamification in elementary school learning. The SLR process followed the PRISMA 2020 guidelines, which include the identification, screening, eligibility, and inclusion stages, to ensure that the literature search and selection process was conducted systematically, transparently, and traceably (Page et al., 2021). Bibliometric analysis was used to map publication trends, patterns of scientific collaboration, and relationships among keywords in gamification research in education Van Eck & Waltman, (2010).

Instrument

The research instruments included the PRISMA 2020 protocol, a data extraction form, the Scopus database, and VOSviewer. PRISMA 2020 was used as a guideline for article identification and selection, while the data extraction form recorded the authors, publication year, country of study, research design, research objectives, and key findings related to gamification in learning. VOSviewer was used for bibliometric mapping and visualization.

Data Collection

The literature search was conducted using Scopus because it provides broad international publication coverage and is widely used in bibliometric research and educational literature reviews (Baas et al., 2020). The search covered articles published from January 2020 to the final search date of April 13, 2026. The search was conducted in the title, abstract, and keywords fields using TITLE-ABS-KEY. The Boolean operator AND was used to connect different concepts, while OR was used to accommodate variations of terms within the same concept. The search formula used was: TITLE-ABS-KEY ("gamification" AND ("elementary school" OR "primary school") AND ("learning" OR "education")) AND PUBYEAR > 2019 AND PUBYEAR < 2027 AND LIMIT-TO (DOCTYPE , "ar") AND LIMIT-TO (SRCTYPE , "j") AND LIMIT-TO (LANGUAGE , "English").

The inclusion criteria comprised Scopus-indexed journal articles published from January 2020 to April 13, 2026, written in English, available in full text, focused on gamification in elementary school learning (elementary school or primary school), and containing empirical or conceptual findings relevant to the research

focus. The exclusion criteria included conference proceedings, books, book chapters, editorials, duplicate articles, articles without full-text access, articles written in languages other than English, and publications that were not relevant to gamification or did not specifically address elementary education. The identification stage yielded 153 articles. After screening the titles and abstracts based on the inclusion and exclusion criteria, 102 articles were excluded, and 51 articles proceeded to the eligibility stage. Full-text assessment was conducted based on the relevance of the content, context, and research focus. A total of 10 articles were excluded because they did not align with the research focus, resulting in 41 articles that met all criteria and were used as data sources at the inclusion stage. The selection process is presented in the PRISMA 2020 flow diagram in Figure 1.

Data Analysis

Data from the selected articles were extracted using a data extraction form. To maintain consistency and accuracy, the extraction process involved repeated checking and re-verification. The data were then categorized according to the research focus to support the narrative synthesis and bibliometric analysis. The data were synthesized using narrative synthesis by grouping, comparing, and interpreting the findings based on three main focuses: research trends, characteristics of gamification implementation, and learning effectiveness. This approach was used to identify patterns in the findings, compare results across studies, and develop an integrated understanding of the implementation of gamification in elementary schools.

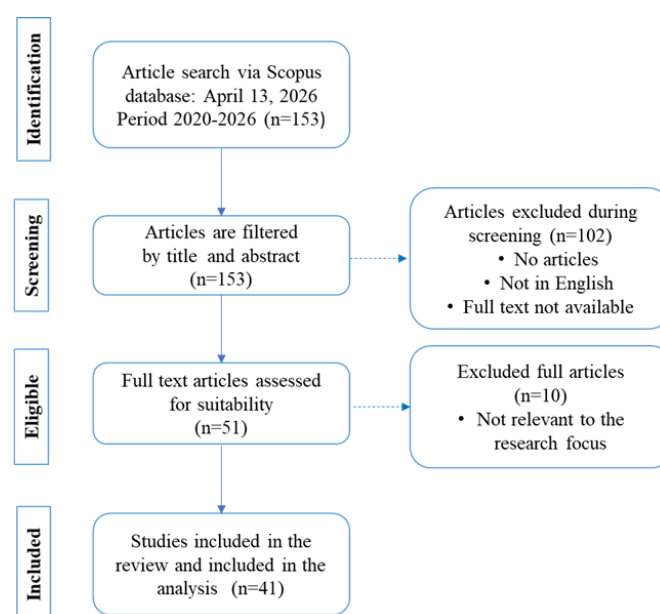


Figure 1. Information Flow of Systematic Literature Review using PRISMA 2020

Bibliometric analysis was used to map publication trends, patterns of author collaboration (co-authorship), and relationships among keywords (co-occurrence). Metadata from the selected articles were exported from Scopus in CSV format and analyzed using VOSviewer with the full counting method. Because the number of

articles was relatively limited, a minimum threshold of two keyword occurrences was established to produce representative visualizations and reduce data noise. The results were visualized as scientific networks to illustrate patterns in the development of gamification research in elementary school learning. Details of the article selection process are presented in Figure 1 through the PRISMA 2020 flow diagram.

3. Results and Discussion

Trends in the Development of Research on Gamification in Elementary School Learning Through Bibliometric Analysis

Analyzing publication trends in articles on the effectiveness of gamification in elementary school learning is important for understanding the dynamics of scholarly attention to this topic. The distribution of articles by publication year is presented in Figure 2.

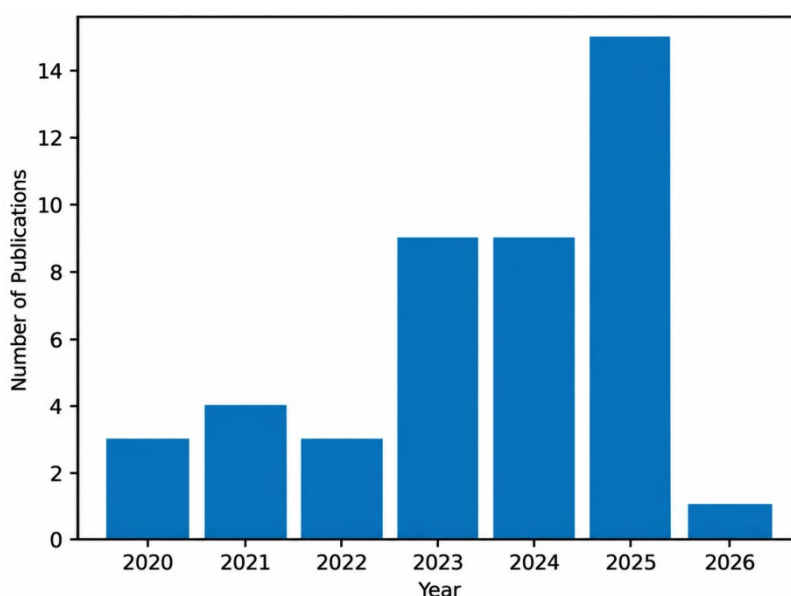


Figure 2. Annual Distribution of Publications on Gamification in Elementary School Learning During 2020-2026

The results of the systematic literature review show that the number of publications fluctuated with an overall increasing trend, reaching its peak during the 2023–2025 period. This development indicates growing academic interest in gamification as a learning innovation that is oriented not only toward technology but also toward creating learning experiences that are more interactive, engaging, and involving for students. This finding is consistent with Biyatmoko et al., (2025), who explained that gamification has a positive impact on motivation, concentration, engagement, and learning outcomes through more engaging learning experiences. Saputra (2025), also explained that the increase in publications during 2020–2025 was associated with the development of digital learning following the COVID-19 pandemic, which encouraged more intensive use of technology in elementary schools. Thus, the increase in publications reflects not only the popularity of the

topic but also the need to understand the implementation, mechanisms, and effectiveness of gamification across various elementary school learning contexts. An overview of author productivity and collaboration patterns is presented in Figure 3.

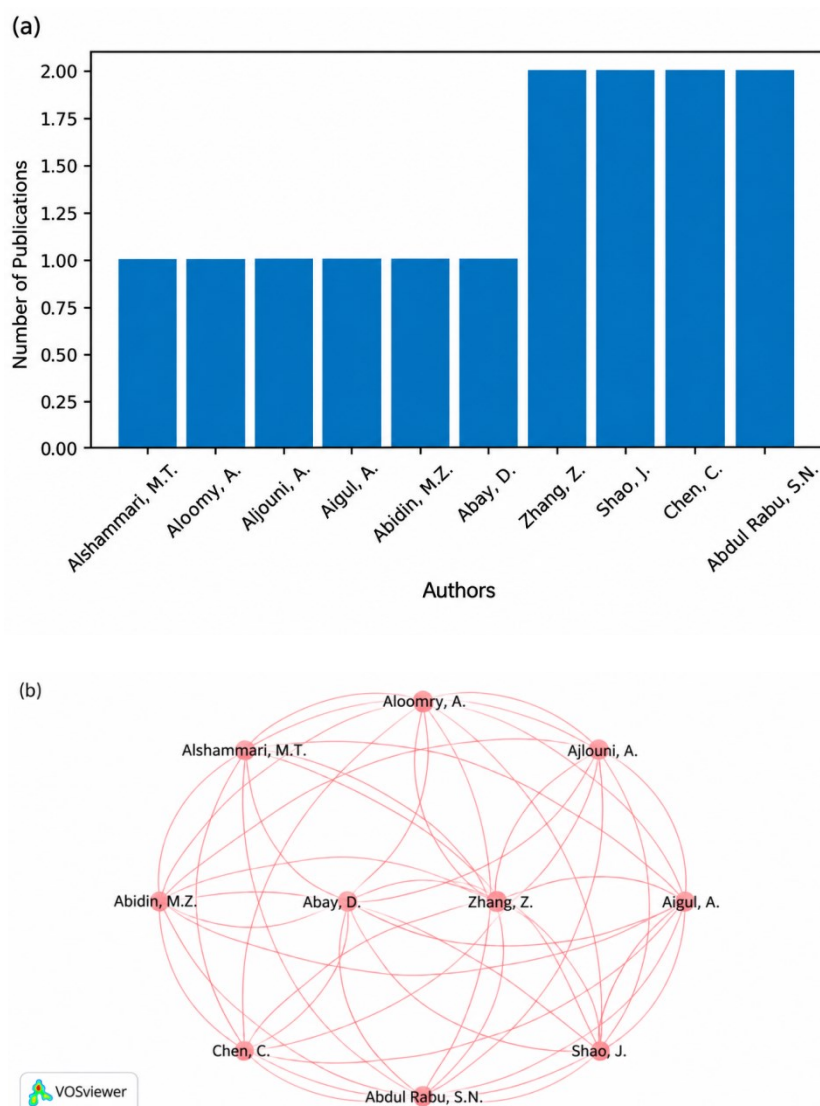


Figure 3. Author productivity and collaboration patterns in the analyzed publications: (a) distribution of the number of publications by author and (b) the co-authorship network visualized using VOSviewer.

Author productivity remains dispersed and is not yet concentrated among particular researchers. Abdul Rabu, S.N., Chen, C., Shao, J., and Zhang, Z. are the most productive authors, each with two publications, while the other authors contributed one publication each. The co-authorship visualization also shows connections among authors, but these connections have not yet formed a centralized collaboration network. This condition indicates that gamification research is developing through contributions from many researchers, while the intensity of collaboration remains limited. This finding is consistent with Biyatmoko et al.,

(2025). who demonstrated the diversity of research focuses in gamification, including motivation, engagement, learning outcomes, and digital learning media. Kim et al., (2025) stated that the development of gamification requires the integration of instructional design, technology, and motivational strategies, which can be strengthened through academic collaboration. Yusri and Zainal, (2025) also highlighted the strengthening of collaboration networks in the development of digital learning. Dispersed author productivity, a co-authorship network that is not yet centralized, and an increasing publication trend indicate the characteristics of a research field that is still developing (emerging research area). The distribution of publications and international collaboration networks is presented in Figure 4.

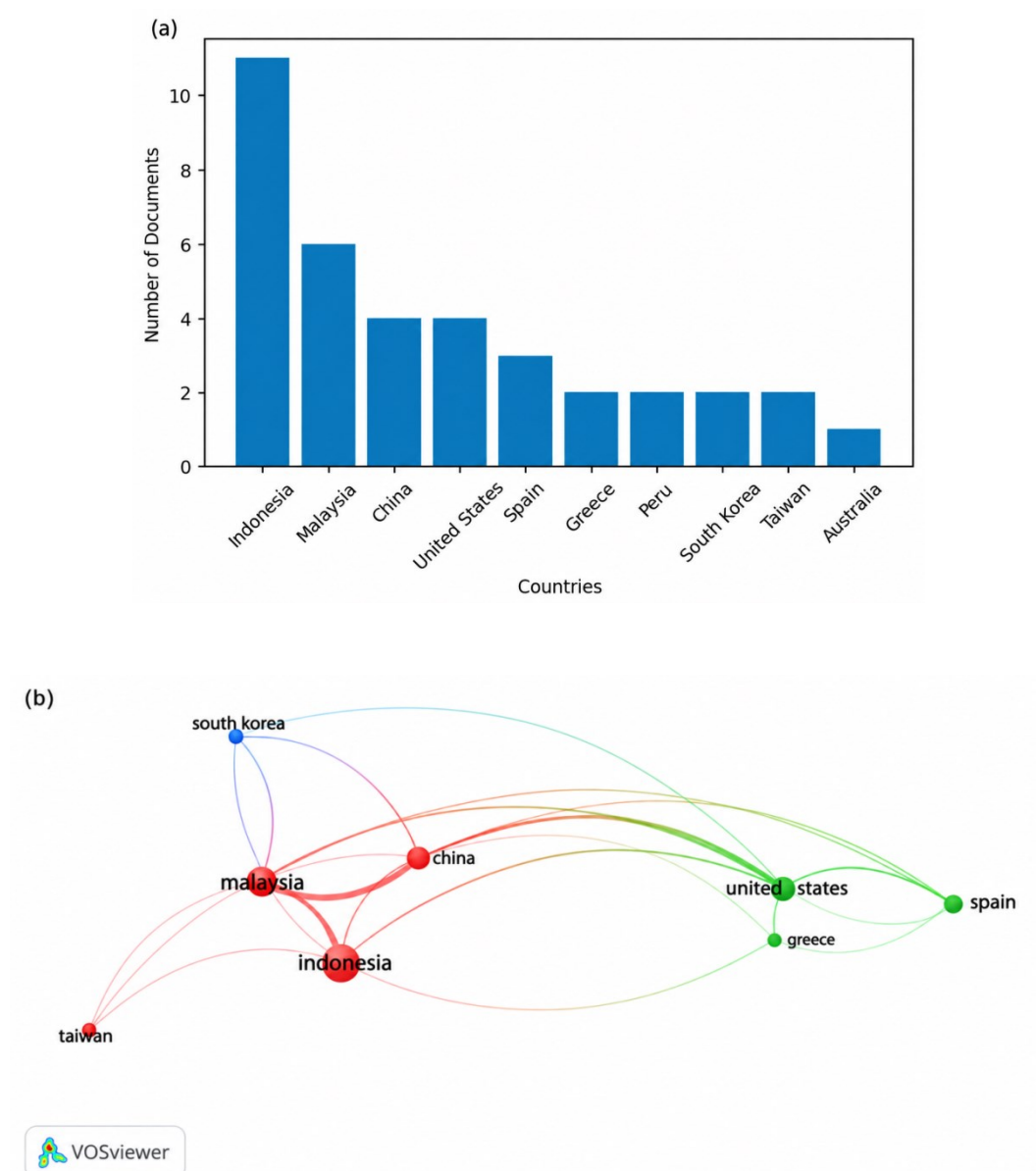


Figure 4. Distribution of publications and international collaboration patterns in the analyzed publications: (a) distribution of the number of publications by country and (b) the co-authorship network among countries visualized using VOSviewer.

Among the 41 articles that met the inclusion criteria, Indonesia had the highest number of publications, with 11 documents, followed by Malaysia with 6 documents, China and the United States with 4 documents each, and Spain with 3 documents. This distribution indicates a concentration of publications in several country contexts within the dataset and does not represent the entire body of gamification research globally. The co-authorship by country visualization shows connections among countries, but these connections have not yet formed a strong international collaboration network. Several clusters were identified, including Indonesia, Malaysia, and China, as well as the United States, Spain, and Greece. These findings indicate that collaboration has developed among certain groups of countries with varying levels of relationship intensity.

This concentration of publications is consistent with Karnilah et al. (2024), who showed that gamification publications have developed across various countries. Goodyear et al., (2023), also emphasized the need to strengthen international collaboration in technology-based learning innovation. When considered together with publication trends and author productivity, these findings support the interpretation that gamification research in elementary education is still developing. The keyword network visualization is presented in Figure 5.

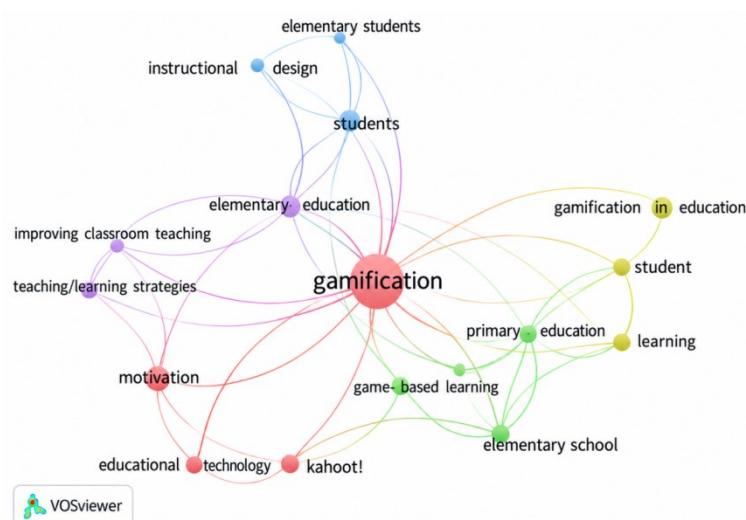


Figure 5. Keyword network visualization

The co-occurrence keyword visualization shows that gamification is the keyword with the highest frequency and is connected to elementary education, motivation, game-based learning, primary education, and learning. Several clusters also indicate relationships between motivation and educational technology, game-based learning and elementary school, instructional design and students, as well as learning and student engagement. This indicates that gamification research is developing multidimensionally across pedagogical, technological, and learning experience aspects. These findings are consistent with Aji et al. (2025), who stated that gamification has been widely developed to improve motivation, engagement, and learning outcomes among elementary school students. Karnilah et al. (2024), showed developments in game-based learning, educational technology, and motivation, while Park & Kim, (2021) linked gamification to motivation,

engagement, and instructional design. (Panjaitan et al. 2026), further strengthened this pattern by identifying gamification as a central node closely associated with motivation and learning outcomes. Thus, the keyword network indicates that the field is beginning to shift from the use of technology toward understanding the pedagogical and psychological mechanisms that connect game elements with learning processes and outcomes.

Characteristics of Gamification Implementation Based on the Systematic Literature Review Results

The characteristics of gamification implementation include game elements, platforms, and learning approaches, as presented in Table 1.

Table 1. Characteristics of Gamification Implementation in Elementary School Learning.

Aspect	Characteristics	Implementation Focus	Studies (n)	Percentage (%)
Gamification Elements	Points and rewards	Motivation and participation	30	75
	Leaderboard	Positive competition	24	60
	Badge	Strengthening achievement	22	55
	Points and rewards	Learning engagement	20	50
	Progress bar	Monitoring progress	15	37.5
	Narrative and role-play	Learning experience	12	30
	Other interactive digital platforms	Feedback and interaction	32	80
Gamification Platforms	Kahoot!	Quizzes and evaluations	18	45
	Quizizz	Training and assessment	15	37.5
	LMS/e-learning	Online learning	14	35
	Mobile applications	Learning flexibility	10	25
	Blended/non-digital approaches	Digital and non-digital integration	8	20
Learning Approaches	Student-centered learning	Active learning	28	70
	Direct feedback	Learning feedback	26	65
	Game-based learning	Game-based activities	24	60
	MDA Framework	Learning experience	20	50
	Collaborative activities	Social interaction	18	45

Note. Percentages are based on the 41 included studies. Characteristics were coded independently; therefore, percentages within an aspect may exceed 100% in total.

The analysis results show the dominance of reward systems, competition, and challenges. Points and rewards are the most commonly used elements. This finding is consistent with Aji et al., (2025), who described the dominance of points, quizzes,

and direct feedback, as well as Luis et al., (2021), who showed the supportive role of reward systems and feedback in learning outcomes. Mohammed et al. (2024) stated that badges and leaderboards are associated with motivation, while Karnilah et al., (2024) showed the use of competition, rewards, and challenges. The presence of challenges, levels, progress bars, narratives, and role-play indicates that gamification also supports learning experiences and the monitoring of student progress.

The dominance of points and rewards in 30 of the 41 studies (75%) can be explained through Self-Determination Theory. (Ryan & Deci, 2020), stated that the quality of motivation is related to autonomy, competence, and relatedness. Points, levels, progress bars, and feedback can support competence when they provide information about progress, whereas overly controlling rewards and leaderboards may reduce autonomy. Therefore, the use of reward elements needs to be balanced with meaningful challenges, opportunities to correct mistakes, informational feedback, and collaborative activities.

Regarding the platform aspect, gamification is dominated by interactive digital media, followed by Kahoot!, Quizizz, LMS or e-learning, mobile applications, and blended approaches. These platforms primarily support quizzes, assessments, interaction, and feedback. Balaskas et al. (2023) linked Kahoot! to motivation, engagement, and learning satisfaction. Zhang and Crawford (2024) explained the relationship between Quizizz in gamified formative assessment and motivation, engagement, and learning performance, while Zhang and Crawford., (2024), showed that adaptive gamified assessment supports motivation, satisfaction, and participation. Barradas et al. (2024) also demonstrated the contribution of game-based media to computational thinking and digital literacy. (Lesmana et al. 2026), showed that Kahoot-based Team Quiz encourages active participation through group discussions, questions, competition, and direct feedback, which are associated with a constructivist approach. Sani et al. (2025), showed that Quizizz-assisted Game-Based Learning is associated with improvements in cognitive learning outcomes, motivation, and engagement, but still requires teacher facilitation, time management, explanation of rules, and management of student focus. Thus, the effectiveness of these platforms depends on the pedagogical strategies that accompany their use.

Regarding the learning approach aspect, student-centered learning and direct feedback are the dominant patterns, followed by game-based learning, the MDA framework, and collaborative activities. Balaskas et al. (2023), linked Kahoot!-based game-based learning to motivation, engagement, and satisfaction, while Zhang and Huang. (2024), showed the relationship between adaptive gamified assessment and motivation and engagement. Putra and Yasin. (2021), explained the use of MDA to create interactive learning, whereas Quintas et al. (2020), demonstrated the contribution of collaborative activities to social interaction. Yusri and Zainal. (2025), also showed the contribution of gamification to academic performance, motivation, and student engagement. These findings indicate that gamification is more appropriately understood as the design of learning experiences, with teachers serving as facilitators and activity designers.

The patterns of student-centered learning, game-based learning, direct feedback, and visual media can be associated with the cognitive development of elementary school students. Piaget and Inhelder (1969), explained that children aged approximately 7–11 years are in the concrete operational stage, in which logical reasoning develops through objects, actions, and concrete representations, in line with (Marinda. 2020), who explained the relevance of this stage in the cognitive context of elementary school children. (Chasanah et al. 2025) provided empirical support through Game-Based Learning based flashcards for second-grade students that utilize visual representations, manipulative activities, collaborative games, and a concrete-to-abstract transition. (Chasanah et al. 2025) also linked visual and manipulative representations to Bruner's representational learning. Thus, gamification can package concepts and challenges into learning experiences that are concrete, visual, interactive, and gradually progress toward abstract understanding.

Effectiveness and Implementation of Gamification in Elementary School Learning Based on the Literature Review Results

A summary of the effectiveness of gamification is presented in Table 2.

Table 2. Effectiveness of Gamification Across Learning Aspects

Learning Aspects	Description	Number of Research	Effectiveness
Motivation and learning engagement	Increased student participation, enthusiasm and involvement during learning	34	Very high
Learning outcomes and conceptual understanding	Improved learning outcomes and understanding of material, especially mathematics and science	31	High
Cognitive skills	Improving students' thinking and problem-solving skills	20	Currently
Social skills and collaboration	Improvement of students' communication, cooperation and social interaction	16	Currently
Self-confidence and positive attitude	Increased self-esteem, learning satisfaction, and positive attitudes towards learning	14	S Currently

Note. Percentages were calculated based on the 41 studies analyzed. The numbers and percentages indicate the frequency of studies reporting positive findings for each aspect and do not represent standardized effect sizes or the results of a meta-analysis.

The results of the systematic literature review indicate an association between gamification and improvements in motivation, engagement, and learning outcomes. Elements such as points, badges, leaderboards, challenges, and direct feedback create more interactive experiences and encourage participation. Mohammed et al. (2024), linked badges and leaderboards to intrinsic and extrinsic motivation, Balaskas et al. (2023) demonstrated the contribution of Kahoot! to engagement, motivation, and satisfaction, while Zhang and Huang, (2024) showed an association between adaptive gamified assessment and motivation and engagement. These findings indicate that gamification works not only through entertainment but also through pedagogical and feedback mechanisms.

A total of 34 studies reported improvements in motivation and learning engagement, while 31 studies reported improvements in learning outcomes and conceptual understanding. Within Self-Determination Theory, appropriate feedback and challenges can strengthen competence, meaningful choices support autonomy, and collaborative activities support relatedness (Ryan & Deci, 2020). (Juraidah et al. 2025), found a significant increase in mathematics learning motivation among third-grade students after the use of Wordwall, while (Julaikum et al. 2025), showed that Battle Math increased motivation through attention, relevance, confidence, and satisfaction. Therefore, motivation in gamification arises not only from entertainment but also from experiences of success, task relevance, feedback, social interaction, and active engagement.

Gamification is also associated with learning outcomes and conceptual understanding, particularly in learning contexts that require visualization, practice, and interactive assessment. Rezeki and Amelia. (2025), explained that Wordwall supports mathematics learning outcomes. Mubarrat et al. (2026), showed an association between gamified interactive e-books and reading motivation and mathematical understanding, (Rayan and Watted, 2024), described the contribution of Kahoot! to motivation and science understanding, while Arlinwibowo et al. (2023) demonstrated a positive effect of gamification on learning outcomes.

These mechanisms are further supported by (Sani et al. 2025), who showed that Quizizz provides opportunities to practice concepts through interactive activities and direct feedback. (Chasanah et al. 2025), showed that flashcards, visual symbols, and games help students understand numerical operations concretely before progressing to abstract representations. These findings are consistent with the concrete operational stage described by Piaget and Inhelder (1969). Thus, the cognitive contribution of gamification lies in providing concrete representations, practice, feedback, and opportunities to apply concepts. The effectiveness of gamification is not uniform across all aspects of learning. Studies more frequently report motivation and academic performance than social, affective, and skill-related aspects that require more complex processes. Patras et al. (2025), showed that gamification can support multicultural competence, social interaction, computational thinking, and digital literacy. Yusri and Zainal, (2025), also explained its association with academic performance, motivation, and engagement.

Differences in findings indicate that effectiveness is influenced by students' age, subject area, level of difficulty, type of feedback, duration of the intervention, and the balance between competition and collaboration. (Ryan & Deci. 2020), emphasized that rewards can support motivation when they function as informational feedback, but they may reduce autonomy when they are controlling. Therefore, the dominance of points, rewards, and leaderboards cannot be interpreted to mean that more rewards will always result in higher motivation. The quality of pedagogical design remains an important factor. Overall, the contribution of gamification lies in its integration as a pedagogical strategy that supports active and meaningful learning and is aligned with the characteristics of elementary school students. Its implementation across various subjects is presented in Table 3.

Table 3. Implementation of Gamification in Learning

School Subject	Implementation Focus	Studies (n)	Common Gamification Forms
Mathematics	Improving learning motivation, conceptual understanding, and problem-solving skills	12	Interactive quizzes, gamified e-books, gamified assessments
Science	Improving learning outcomes, understanding of science concepts, and student engagement	9	Educational games, gamified assessments, mobile applications
English	Improving student motivation, reading skills, and engagement	7	Quizizz, role-play, storytelling, gamified e-books
Physical Education	Improving self-esteem, learning satisfaction, and motor skills	4	Exergames
Character Education	Developing collaboration, communication, and positive student attitudes	4	Role-play, storytelling
Thematic Learning	Enhancing student engagement and learning experiences	4	Educational games, interactive quizzes

The implementation of gamification in elementary schools is adjusted to the characteristics of the subject matter and learning objectives. Its use is not only directed toward increasing motivation and engagement but also toward supporting conceptual understanding and interactive learning experiences. In learning that emphasizes concepts and problem-solving, gamification is implemented through interactive activities, game-based assessments, and direct feedback. Rezeki and Amelia, (2025), showed that Wordwall supports mathematics learning outcomes, while Shao et al., (2025), found that gamified interactive e-books contribute to reading motivation and mathematical understanding. Rayan and Watted. (2024), also showed that gamification supports motivation and understanding of science concepts. These findings indicate that gamification is used to strengthen engagement and academic performance through active and structured learning.

In learning that is oriented toward experience, social interaction, and affective aspects, forms such as exergames, role-play, and storytelling are more commonly used. Quintas et al. (2020) explained that gamified exergaming supports student engagement and interaction, while Patras et al. (2025), showed the contribution of gamification to multicultural competence and social interaction. Overall, the implementation of gamification across different subjects is determined more by the alignment of design and pedagogical objectives than by any particular form of game.

Research Gaps in Studies on Gamification in Elementary School Learning

The analysis results indicate several research gaps. Although the number of publications has increased, most studies are still short-term studies using quantitative approaches that focus on motivation, engagement, and learning outcomes. The long-term effects on critical thinking, collaboration, self-efficacy, and the sustainability of motivation have not yet been comprehensively understood.

Mannan and Annisa. (2025), explained that the effectiveness of gamification is influenced by context and may change over time. (Habib et al. 2024), highlighted the limitations of longitudinal research, Supnoon and Chonchaiya. (2024), emphasized the need for mixed methods to understand the effects on critical thinking and self-efficacy, while Yusri and Zainal. (2025), stressed the importance of longitudinal studies on motivation and skill development.

A research gap is also evident in the quality of motivation. Future research needs to distinguish whether points, rewards, and leaderboards primarily promote autonomous motivation or controlled motivation, as well as assess the sustainability of their effects when reward elements are reduced. The Self-Determination Theory perspective can be used to examine the roles of autonomy support, competence feedback, and relatedness in the long-term effects of gamification (Ryan & Deci, 2020). The research context remains concentrated on STEM, particularly mathematics and science, with a predominance of themes related to motivation, game-based learning, student engagement, and educational technology. Romero et al. (2024), showed that gamification in elementary education is more commonly found in STEM than in the humanities and social sciences. The bibliometric results also indicate dispersed author productivity, a co-authorship network that is not yet centralized, and international collaboration that is still developing. Kim et al. (2025) explained that the development of gamification requires the integration of instructional design, technology, motivational strategies, and academic collaboration.

Goodyear et al., (2023), emphasized the need to strengthen cross-country and interdisciplinary collaboration. Research on digital literacy, digital numeracy, and 21st-century skills also remains limited. Barradas et al. (2024), linked coding education tools, robotics, and games to computational thinking, problem-solving, and digital literacy. Sahronih et al. (2026), showed that gamification-based Moodle is associated with more interactive digital numeracy learning, while Patras et al. (2025), linked it to social interaction and 21st-century skills. Most studies also still use relatively simple designs that focus on points, badges, leaderboards, and rewards, while adaptive gamification and personalized learning have not yet been widely implemented. Romero et al. (2024), explained that simple elements are commonly used because they are easy to implement, but excessive competition may affect students' comfort and collaboration. Habibi et al. (2025), showed that educational technology still largely relies on general digital media without adaptive systems, while Lavoue et al. (2019), explained that adaptive systems allow challenges, rewards, and activities to be adjusted according to students' characteristics.

The dominance of simple elements in Table 1 indicates opportunities for developing more adaptive and personalized designs by adjusting challenges, feedback, and rewards to students' characteristics and development. Christopoulos and Mystakidis, (2023), emphasized that the success of gamification depends on the alignment of the design with learners' needs and the learning context. Nurhayati and Fathurrohman. (2025), showed that autonomy support, meaningful challenge, and collaboration have the potential to strengthen intrinsic engagement. Putra and

Yasin. (2021), explained the use of MDA to build interactive experiences, while Quintas et al. (2020), showed the contribution of collaborative activities to interaction and engagement. Overall, the research gaps include the need for longitudinal studies, expansion of research contexts beyond STEM, stronger academic collaboration, exploration of social, affective, and digital outcomes, and the development of adaptive gamification that is more closely aligned with the developmental characteristics and learning needs of elementary school students.

4. Conclusion

Based on the findings of the Systematic Literature Review (SLR) and bibliometric analysis, research on gamification in elementary school education shows a growing publication trend, with particular emphasis on motivation, student engagement, and educational technology, although academic collaboration remains relatively limited. Gamification is implemented through game elements, digital platforms, and pedagogical strategies centered on students' learning experiences. Most studies report positive outcomes for motivation, engagement, and learning achievement, while findings on cognitive, social, and affective dimensions remain inconsistent. These results indicate that reported effectiveness depends not only on game elements but also on their alignment with learning objectives, student characteristics, instructional design quality, and implementation context. These findings also highlight the need to strengthen academic and international collaboration to broaden evidence exchange and support development of this field. Overall, integrating SLR and bibliometric analysis provides a comprehensive synthesis of research trends, implementation characteristics, reported effectiveness, and research gaps in elementary school gamification.

From a pedagogical perspective, elementary school teachers should integrate gamification into instructional design rather than use it merely as a reward mechanism. Elements such as points, badges, levels, challenges, leaderboards, and feedback should be aligned with learning objectives, subject characteristics, and students' needs and abilities. Teachers should also balance competition and collaboration and regularly evaluate student engagement and learning progress to support contextual, inclusive, adaptive, and meaningful learning experiences. This study is limited by its exclusive use of the Scopus database and by the predefined search strategy and selection criteria, which may have excluded relevant studies indexed elsewhere. The reviewed literature is also dominated by short-term studies and studies employing quantitative approaches, limiting evidence on long-term effects, twenty-first-century skills, and adaptive gamification. Future research should use multiple databases, longitudinal and mixed-methods designs, and further develop and evaluate adaptive, context-sensitive gamification across diverse elementary school learning settings.

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