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Paper review *Pregledni rad*

Bibliometric Mapping of Gamification Research in Education: A Scopus-Based Study (2016–2025)

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Abstract: *This study aims to map the development of research on gamification in education using a bibliometric approach. Data were obtained from the Scopus database using the keywords "gamification" and "student," which yielded 793 documents. After screening based on inclusion criteria, namely the 2016–2025 time frame (756 documents), restriction to journal articles (434 documents), and English-language articles (396 documents), 396 final articles were analyzed. The analysis was conducted in three main stages: Scanning Phase, Curating Phase, and Analyzing Phase. The analysis stage was carried out with the help of VOSviewer software to map publication trends per year, distribution based on journals, subject areas, institutions, countries, keywords, and patterns of collaboration between authors. The results of the study show that publications on gamification in education have continued to increase over the past decade, with the largest contributions coming from the fields of social sciences, computer science, and education. The most cited articles emphasize that gamification has a positive impact on motivation, engagement, and learning outcomes, although its effectiveness is highly dependent on the design of gamification elements, the learning context, and the characteristics of individual learners. Several studies also highlight the novelty effect, which is the strong impact of gamification at the beginning but less sustainable in the long term. This study concludes that gamification is an effective learning strategy when applied selectively, adaptively, and integrated with other pedagogical approaches. Recommendations for further research include exploring the long-term impact of gamification through longitudinal studies and developing a more systematic gamification design framework tailored to the needs of learners.*

Keywords: *Gamification, bibliometrics, learning motivation, student engagement, learning outcomes*

Introduction

In the last decade, gamification has emerged as one of the innovative strategies in modern education that utilizes game elements (points, badges, leaderboards, quests) to increase the motivation, engagement, and learning outcomes of students and university students (Bachiri, 2023; García-López, 2023; Schöbel, 2023; Taşkın, 2023; X. Zhao, 2024). This concept transfers the dynamics of games into the context of education, so that learning is not only instructional but also provides a more interactive and enjoyable learning experience (Al-Hafdi, 2024; Kashive, 2023; Mahat, 2023; Shi, 2022; Zainuddin, 2020; Zeng, 2020).

With the increasing adoption of digital technology, research on gamification in education has shown significant development since 2015 and experienced a surge in publications in 2020–2024, especially in higher education and online learning (Buil, 2020; Irwanto, 2023; Joy, 2023; Lampropoulos, 2024; Mustafa, 2021; Reinhardt, 2023). International studies report that gamification contributes to increased intrinsic motivation, collaboration, and Higher Order Thinking Skills (HOTS) such as analysis, evaluation, and creation (Kong, 2023; Kong et al., 2023; Cheng, 2023; Park, 2025; Salman, 2024; Glasserman-Morales, 2025; Affandy et al., 2024; Silitonga et al., 2020; Susilowati & Dahlan, 2021). However, some literature emphasizes challenges, such as the risk of increased cognitive load, dependence on rewards, and the need for more adaptive instructional design so that gamification is not merely entertainment (Joy, 2023; Kabilan, 2023; Affandy et al., 2024; Grabner-Hagen, 2023; Reinhardt, 2023).

Although many studies show the effectiveness of gamification, there are still gaps in the literature, especially regarding mapping global research trends, academic collaboration, and consistency in measuring its impact on long-term learning outcomes (Malik, 2025; AlGhamdi, 2025; Alzahrani, 2023; Lester, 2023; Ray, 2022; Grabner-Hagen, 2023; Joy, 2023). Several studies are also limited to the context of specific courses or disciplines, so the generalization of research results still needs to be expanded (Sudihartinih & Rachmatin, 2024; Cissna, 2025; de la Peña, 2021; Sáiz-Manzanares, 2021).

Based on this, this study aims to analyse trends, publication patterns, and thematic focuses of gamification research in the context of student education. Using a bibliometric approach, this study is expected to provide a comprehensive overview of the direction of gamification development, dominant academic actors, and its practical implications for learning transformation in the digital age.

Methodology

This study uses a bibliometric approach to analyze the development of research on gamification in education (Amin, 2024; Chow, 2024; Donthu et al., 2021; Frank & Maggio, 2022; Gusteti et al., 2025; Irwanto, 2023; Kim & Baik, 2014; Sharma, 2024; Yolandini et al., 2023). Data were obtained from the Scopus database using the keywords "gamification" and "student." The initial search yielded 793 documents consisting of journal articles, conference proceedings, and other types of publications.

The research process was carried out in three main stages. The first stage was the Scanning Phase, which involved collecting initial documents from Scopus based on search keywords. The second stage was the Curating Phase, which involved filtering documents based on specific criteria: (1) limited to the 2016–2025 period, resulting in 75s6 documents remaining, (2) focused only on journal articles, reducing the number to 434 documents, and (3) limited to English- s, resulting in 396 documents. The third stage is the Analyzing Phase, which involves bibliometric analysis of the 396 selected documents using VOSviewer software. The analysis was conducted to map publication trends per year, distribution based on journals, subject areas, institutions, countries, keywords, and collaboration patterns between authors (Analysis et al., 2024; Gusteti et al., n.d.; Rogers et al., 2020).

With this approach, the study is expected to provide a comprehensive overview of the direction of gamification research in education, the factors that influence its effectiveness, and opportunities for further research in the future (Abbas, 2025; Donthu et al., 2021; Jazm et al., 2022; Lampropoulos, 2024; Mystakidis, 2022; Sendra, 2021; Sharma, 2024; Yang, 2023; C. Zhao, 2025)**.**

Search Procedure

The first step in this study was to search for literature through the Scopus database on July 16, 2025, using the keywords "Gamification and Student".

Bibliography Screening

After the initial identification process, the collected articles were further selected using inclusion and exclusion criteria to ensure their suitability for the research focus. A summary of these criteria is presented in Table 1.

Table 1. *Inclusion and Exclusion Criteria*

Inclusion Criteria	Exclusion Criteria
Articles published in Scopus-indexed journals	Publications that have not reached the final publication stage (*preprints*, *conference abstracts*)
Articles that have undergone peer review	Articles that have not undergone *peer review*
Articles in English	Articles published in languages other than English
Articles discussing gamification and students	Articles not relevant to the topic of gamification and students
Articles published within the specified research time frame	Articles published outside the research time frame

By applying these criteria, only articles that meet the standards of quality and relevance are retained for analysis in this study.

Bibliography Completeness

This stage was carried out to ensure that all documents that had passed the screening process were complete and could be used in the analysis. The completeness process included checking article metadata such as author name, title, year of publication, journal name, volume, issue, DOI, and full-text availability. Articles that do not have complete bibliographic information or cannot be accessed in full are excluded from the analysis list. With this step, researchers obtain a collection of literature that is valid, verified, and ready for further processing in the quantitative and qualitative analysis stages.

Bibliometric Analysis

The bibliometric analysis stage is carried out to identify research trends, publication distribution, collaboration networks, and the most frequently used keywords in the field of study. The data that has been declared complete is then extracted and analyzed using bibliometric software, one of which is VOSviewer, to visualize the distribution map of authors, institutions, countries, and keywords. This analysis allows researchers to understand publication patterns over time, the connections between authors and institutions, and the main themes that are the focus of research. Thus, this stage serves to present a comprehensive picture of the development of research related to gamification and students, both quantitatively (number of publications, temporal trends) and qualitatively (themes, collaboration, and research directions).

Research Process Flowchart

Figure 1 illustrates the bibliometric research flow consisting of three main stages. In the first stage (Scanning Phase), 793 documents were obtained from the Scopus database using the keywords "gamification" and "student," covering publications in the form of journal articles, conference proceedings, and books from various disciplines. Next, in the second stage (Curating Phase), screening was carried out using several criteria, namely the time range 2016–2025, resulting in 756 documents remaining; restriction to journal articles, resulting in 434 documents; and restriction to English, resulting in 396 final documents. The third stage (Analyzing Phase) used 396 documents that passed the screening to be analyzed using bibliometric methods through techniques such as bibliographic coupling, citation analysis, co-word analysis, and document clustering. This process ensured that only articles that were relevant, credible, and in line with the research focus were analyzed further.

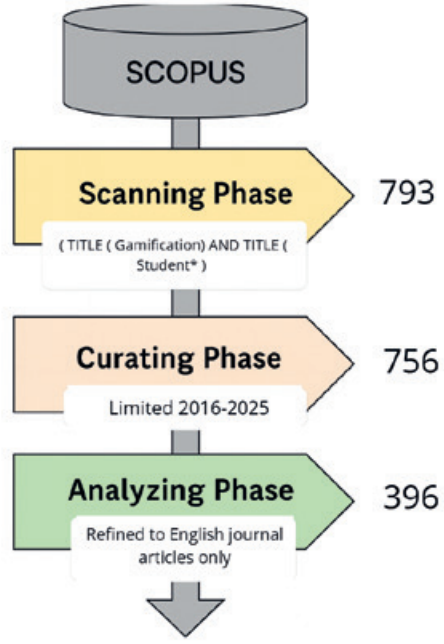


Figure 1. *Four-Stage Data Extraction and Filtering Process Flowchart (Vedula, 2024)*

This process consists of three main stages, starting with the Scanning Phase, which produced 793 documents from Scopus, then moving on to the Curating Phase with screening based on the 2016–2025 time frame (756 documents), restrictions on journal articles (434 documents), and restrictions on English-language articles, leaving 396 documents. The final stage is the Analyzing Phase, where 396 documents are analyzed using bibliometric methods such as bibliographic coupling, citation analysis, co-word analysis, and clustering. This flow ensures that only articles that meet the criteria and are credible are retained for further analysis.

Results

Number of Documents Found and Filtered

An initial search of the Scopus database using the keywords "gamification" and "student" yielded 793 documents from various types of publications. After filtering based on the criteria of publication years 2016–2025, the

number of documents was reduced to 756. Furthermore, by limiting the search to articles published in journals, the number of documents was reduced to 434. The final stage was language restriction, where only English-language articles were retained, leaving 396 documents that were then used for further bibliometric analysis.

Analysis Based on Document Type

Figure 2 shows the distribution of document types obtained from the Scopus database. The majority of publications were journal articles with a percentage of 94.7%, indicating that research on this topic was mostly published in the form of primary scientific works. In addition, there were reviews (3.8%) as an effort to summarize previous findings, while other types of documents such as data papers (0.5%), notes (0.5%), conference papers (0.3%), and erratums (0.3%) only contributed a small portion. These findings confirm that studies in this field rely more on Scopus-indexed scientific articles as the basis for analysis, thus ensuring their academic credibility and relevance.

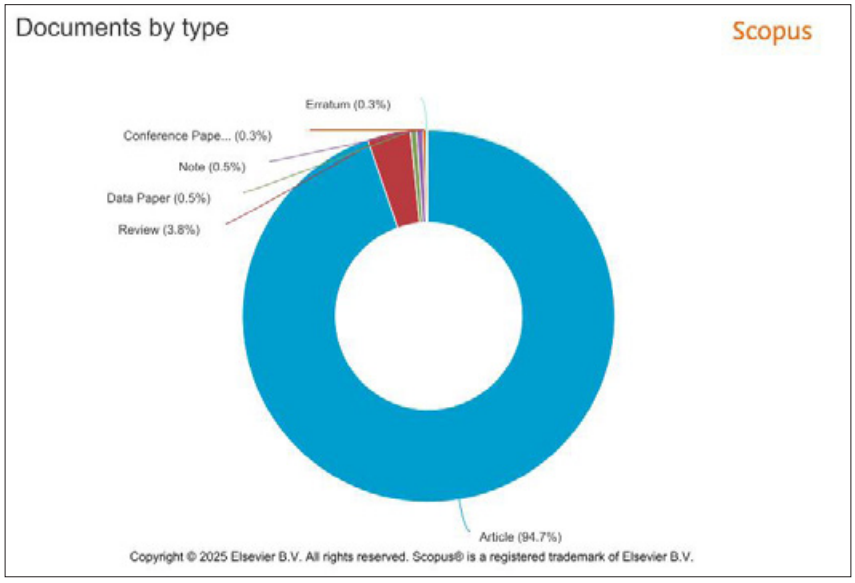


Figure 2. *Document Types*

Analysis of Publication Trends per Year

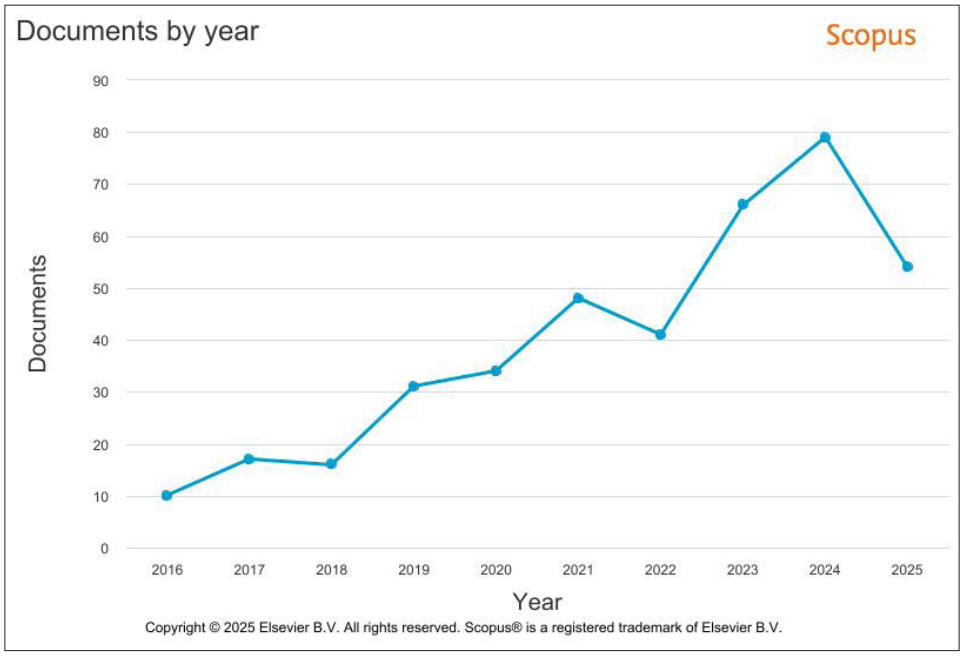


Figure 3: *Publication Trends from 2016 to 2025*

Figure 3 shows the publication trend from 2016 to 2025. The number of documents shows a fairly consistent increase from around 10 publications in 2016 to a peak of nearly 80 publications in 2024. This pattern indicates a significant growth in research interest, particularly since 2019, which was marked by a surge in publications from year to year. The sharpest increase occurred in the 2022–2024 period, which can be attributed to the widespread adoption of digital technology in education and research. However, in 2025, there was a decline in the number of publications to around 55 documents, which was most likely due to the fact that the data for that year had not yet been fully accumulated. Overall, this trend confirms that this research topic has continued to gain widespread attention and has developed rapidly over the past decade.

Analysis Based on Journal Sources

Figure 4 shows publications related to the research topic spread across various journal sources with fluctuating trends but a tendency to increase since 2019. The journals Education and Information Technologies and BMC Medical Education occupy a dominant position with consistent contributions, even reaching a peak in 2024 with three documents. Meanwhile, the International Journal of Environmental Research and Public Health shows a significant surge in 2019, while Interactive Learning Environments and Sustainability Switzerland are active in the 2020–2022 period. Several other journals, such as the International Journal of Information and Education Technology, Education Sciences, and IEEE Access, provided stable contributions with an average of one to two publications per year. Overall, this pattern shows that research results are not concentrated in just one journal but are spread across various sources with a tendency toward publication diversification in the 2023–2024 period.

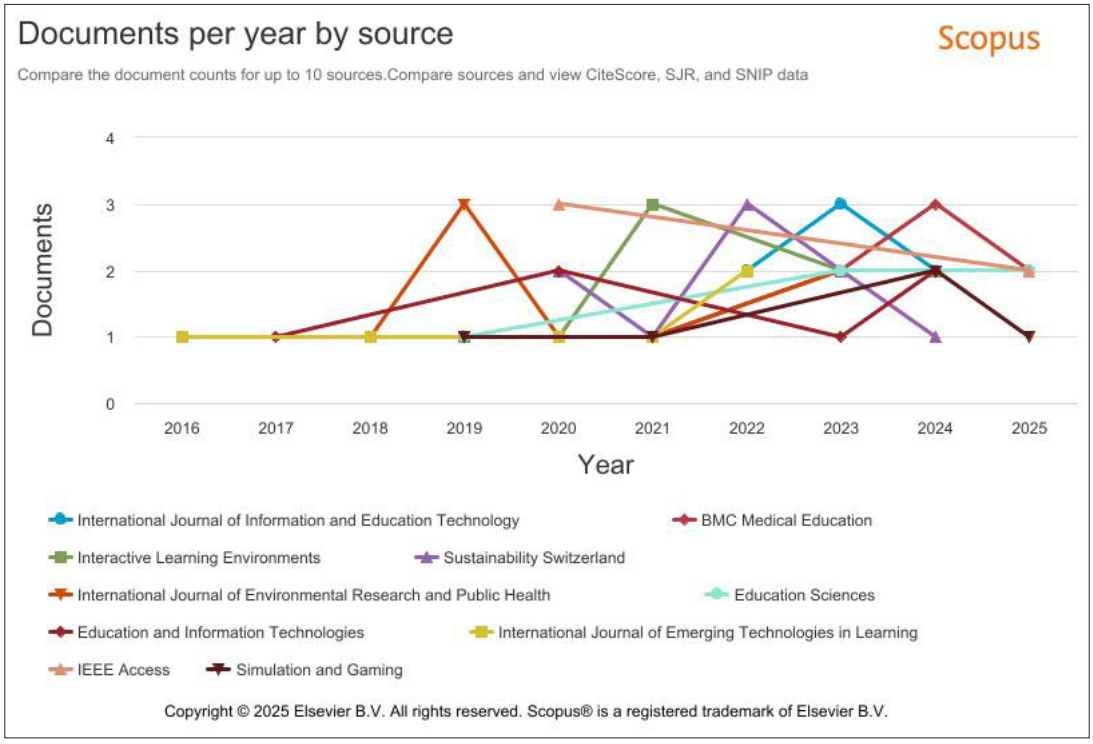


Figure 4: *Analysis Based on Journal Sources*

Analysis by Institution

Figure 5 shows the distribution of documents based on institutional affiliation, with The University of Hong Kong ranking first as the main contributor with the highest number of publications, reaching nearly 20 documents. In second place is Malang State University with around 11 documents, followed by the University of Granada, which produced more than 7 documents. Meanwhile, several other institutions, such as Universiti Teknologi MARA and Universiti Teknikal Malaysia Melaka, also made significant contributions, with around 6 documents each. Other institutions such as the University of Auckland, Universitat d'Alacant, Universidad de Extremadura, The Education University of Hong Kong, and Universidad Rey Juan Carlos contributed around 4-5 documents. Overall, it can be

seen that research contributions are not only dominated by universities in the Asian region, but also involve international collaboration from institutions in Europe and Oceania.

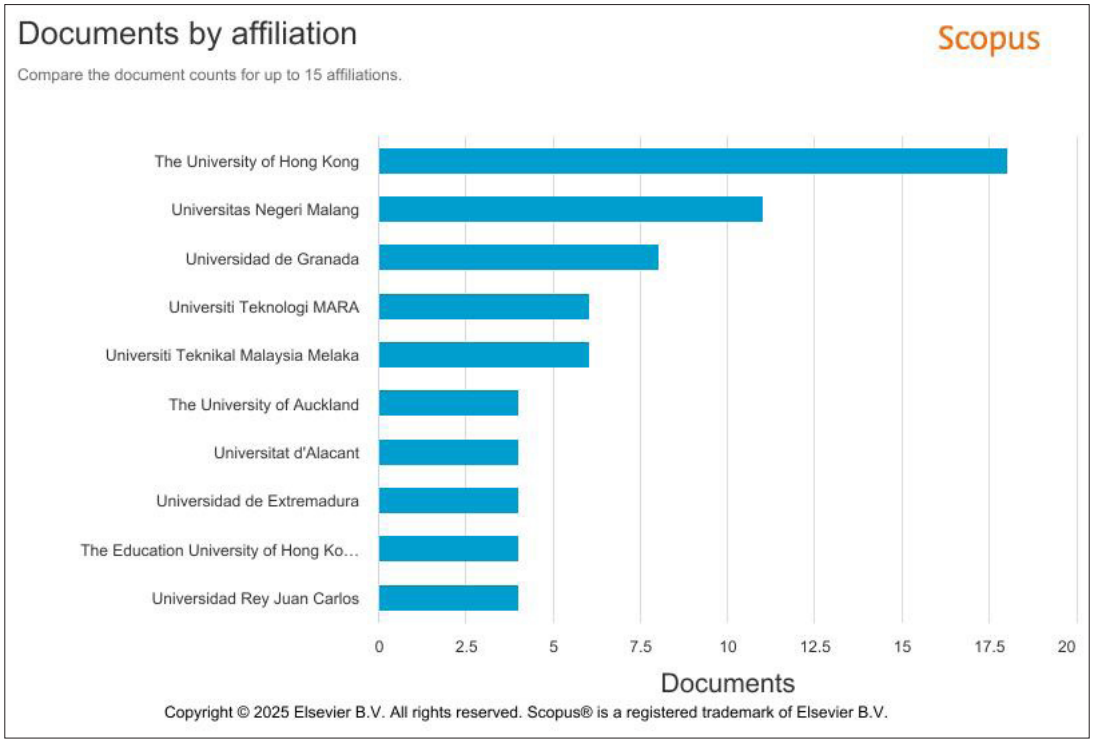


Figure 5. *Analysis by Institution*

Analysis by Country

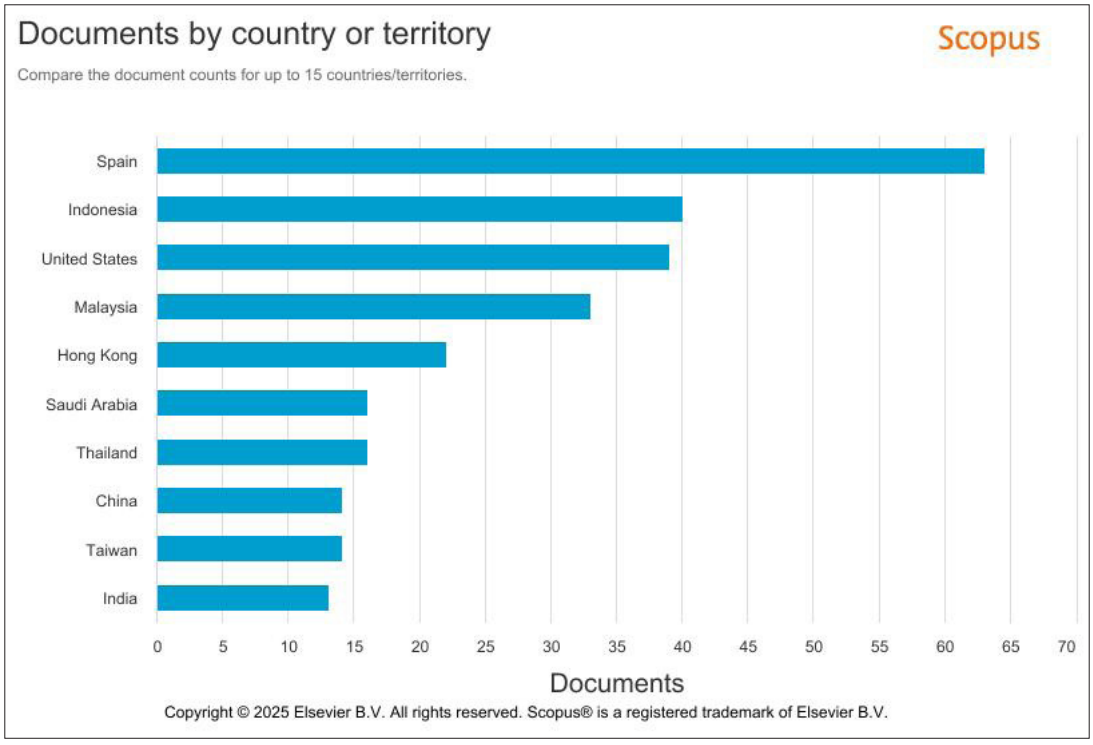


Figure 6. *Distribution of Documents by Country*

Figure 6 shows the distribution of documents by country, with Spain ranking first with the highest contribution of more than 65 documents. Indonesia ranks second with around 40 documents, followed by the United States with a similar number. Malaysia also made a significant contribution with more than 30 documents. Furthermore, Hong Kong contributed around 22 documents, while other countries such as Saudi Arabia, Thailand, China, Taiwan, and India had lower publication numbers, ranging from 12 to 18 documents. Overall, it can be seen that research on this topic is dominated by European and Asian countries, with significant contributions from Spain, Indonesia, and the United States as the main centers of publication.

Analysis Based on Keywords

Figure 7 shows a visualization of the keyword network divided into several main clusters with different colors. The red cluster is dominated by keywords related to experimental methodology, such as participant, group, intervention, test, score, control group, and significant difference, which describe the research focus on experimental design and evaluation of results. The green cluster emphasizes aspects of student engagement, achievement, game elements, points, recommendations, and positive effects, indicating the research orientation towards the impact of gamification in increasing student engagement and achievement. The blue cluster is related to educators, articles, factors, acquisition, competence, and autonomy, emphasizing the role of educators, learning theory, and the context of higher education. Meanwhile, the yellow cluster highlights keywords such as student engagement, insight, gap, and variable related to factor analysis and the context of gamification implementation. Overall, this keyword map shows that research related to gamification in education does not only focus on experimental results but also on pedagogical factors, student engagement, and the role of educators in supporting the effectiveness of gamification-based learning.

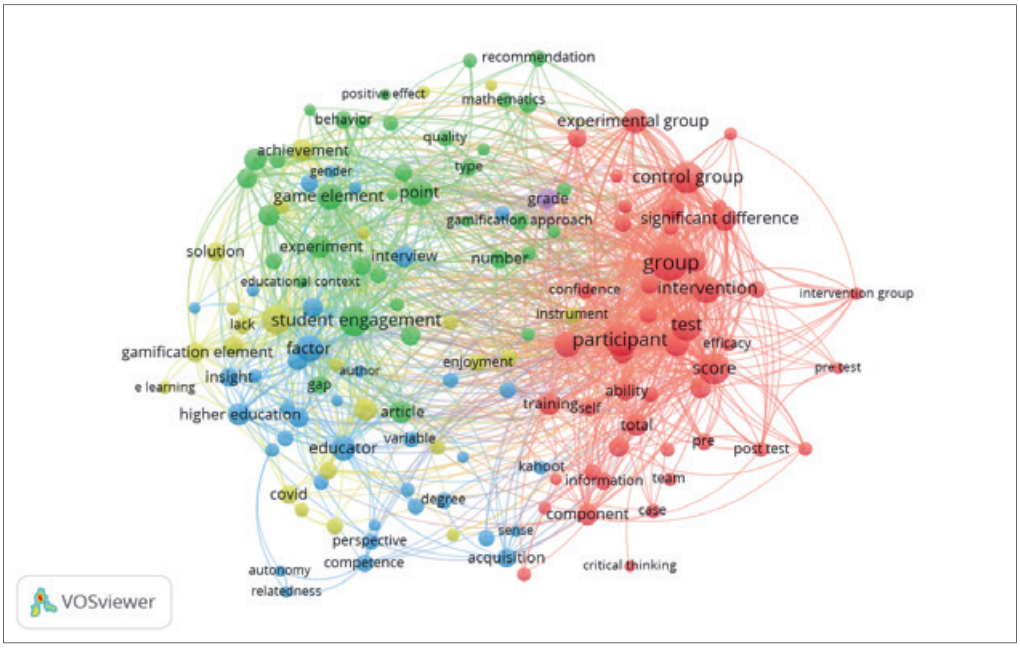


Figure 7. *Keyword Visualization*

Analysis of Collaboration Between Authors

Figure 8 shows the collaboration network between authors who form strong relationships through joint publications. Several authors, such as anastas p.t., mills m., voutchkova-kostal a., and simcox n., are at the center of the network with dense connections, indicating their central role in research collaboration. In addition, other authors such as Coish P., Zimmerman J.B., Mellor K.E., and Brooks B.W. also have close connections with many colleagues, reflecting their significant contributions to this research network.

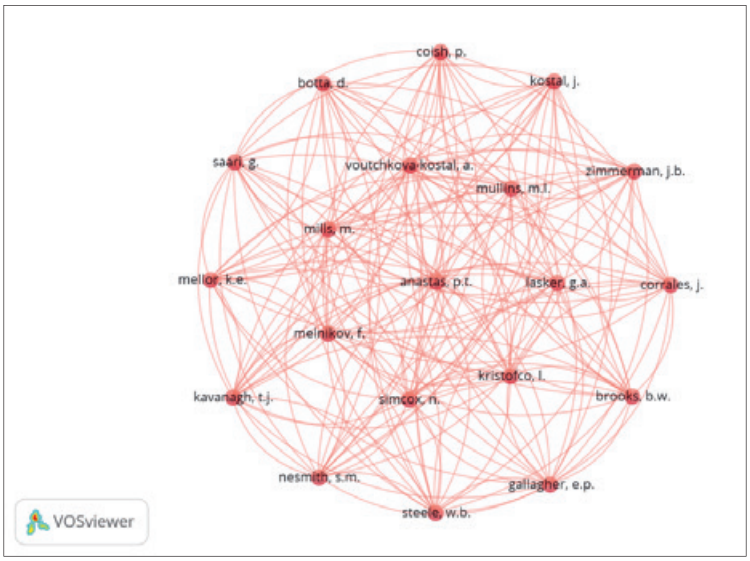


Figure 8. *Author Collaboration*

Table 2. *Most five-Cited Articles on Gamification Research in Education: A Scopus-Based Study (2016–2025)*

No.	Author(s)	Article title	Number of citations	Journal Name	Key Findings/Recommendations
1	Buckley, P., Doyle, E.	Gamification and student motivation	531	Interactive Learning Environments	The study demonstrates that gamified learning interventions significantly enhance students' knowledge and engagement, with the strongest impact observed among those with intrinsic motivation and identified extrinsic motivation. (Buckley & Doyle, 2016).
2	Bai, S., Hew, K.F., Huang, B.	Does gamification improve student learning outcomes? Evidence from a meta-analysis and synthesis of qualitative data in educational contexts	424	Educational Research Review	This meta-analysis shows that gamification has a significant medium positive effect on student academic performance (Hedges' g = 0.504, $p < 0.001$). Students value gamification for its ability to foster enthusiasm, provide feedback, recognition, and goal setting, though some report drawbacks such as limited utility and anxiety. (Bai et al., 2020).
3	Zainuddin, Z., Shujahat, M., Haruna, H., Chu, S.K.W.	The role of gamified e-quizzes on student learning and engagement: An interactive gamification solution for a formative assessment system	283	Computers and Education	The study shows that both gamified e-quizzes (Socrative, Quizizz, iSpring Learn LMS) and paper-based quizzes effectively supported formative assessment in Science classes. Gamified tools provided added benefits by boosting student engagement, creativity, and competitive spirit (Zainuddin, 2020).
4	Da Rocha Seixas, L., Gomes, A.S., De Melo Filho, I.J.	Effectiveness of gamification in the engagement of students	269	Computers in Human Behavior	The study finds that using gamification tools such as ClassDojo and ClassBadges significantly improves student engagement, motivation, and performance in elementary education. Students receiving more rewards showed higher participation and collaboration, while teachers benefited from better monitoring of behaviors and skills (Da Rocha Seixas et al., 2016).
5	Huang, B., Hew, K.F., Lo, C.K.	Investigating the effects of gamification- -enhanced flipped learning on undergraduate students' behavioral and cognitive engagement	266	Interactive Learning Environments	The study finds that gamification-enhanced flipped learning significantly boosts students' behavioral and cognitive engagement, leading to higher task completion, persistence, and better-quality work. Students in the gamified group also achieved significantly higher post-test scores, reflecting deeper learning outcomes (Huang et al., 2019).

Table 2 summarizes the five most cited articles on the application of gamification in education. The findings show that gamification is effective in increasing motivation, engagement, and academic achievement, but cannot be viewed as a universal solution. The effectiveness of gamification is highly dependent on the design of gamification elements, student characteristics, and the learning context. Therefore, most articles recommend that gamification be applied selectively, adaptively, and integrated with other pedagogical strategies to ensure a sustainable impact that is relevant to the needs of learners.

Conclusion

This study confirms that gamification in education has great potential to increase student motivation, engagement, and learning outcomes. A synthesis of the ten most cited articles shows that gamification can provide various benefits, including fostering enthusiasm, supporting formative evaluation, improving affective attitudes toward learning, and encouraging active student participation. However, the effectiveness of gamification is not universal, but is influenced by various factors such as the type of gamification elements used (e.g., badges, leaderboards, interactive quizzes), the educational context (e.g., flipped classroom or blended learning), and individual student characteristics, including intrinsic motivation and personality type. Several meta-analyses also confirm a positive effect with small to moderate effect sizes, although limitations such as the novelty effect and low long-term sustainability are still found.

This study has limitations in the scope of the articles analyzed, which only include English-language publications indexed by Scopus and within a specific time frame, so the results do not fully represent all research on gamification. In addition, most of the studies reviewed used quasi-experimental designs with diverse contexts and showed a novelty effect, which meant that the impact of gamification tended to be strong at the beginning but diminished in the long term. Therefore, further research is recommended to be conducted longitudinally, covering more contexts and databases, and developing adaptive and personalized gamification approaches to align with the characteristics of learners and provide a sustainable impact on motivation and learning outcomes.

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Generative AI Statement

As the authors of this work, we used the ChatGPT AI tool to help compile, summarize, and improve the text so that it is more systematic and in line with academic writing styles. This tool was also used to summarize previous research findings, compile tables, and provide alternative narratives in both English and Indonesian. However, all analysis, data interpretation, and final conclusions remain the sole responsibility of the authors.

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