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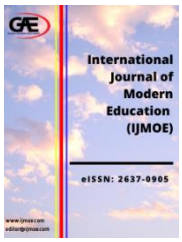

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EXPLORING GAMIFICATION ELEMENTS IN EDUCATION: A BIBLIOMETRIC STUDY

Nor Zaitul Shahira Zakaria[1], Hanifah Mahat[2]

[1] Faculty of Human Science, Universiti Pendidikan Sultan Idris, Tanjung Malim, 35900, Malaysia
Email: Shahiraphd@gmail.com
[2] Faculty of Human Science, Universiti Pendidikan Sultan Idris, Tanjung Malim, 35900, Malaysia
Email: hanifah.mahat@fsk.upsi.edu.my
[*] Corresponding Author

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Abstract:

This bibliometric study examines the integration of gamification elements within educational contexts, highlighting trends, influential research, and collaborative networks in the field. Gamification, increasingly recognized for its potential to enhance student engagement and motivation, has become a focal point in educational research. However, there remains a need for a comprehensive analysis to map its development, identify key contributors, and evaluate its impact. This study addresses these gaps by analyzing 1,637 documents from the Scopus database, focusing on publications related to gamification in education. Methodologically, Scopus Analyzer was used to identify publication trends, while VOSviewer software facilitated keyword mapping and co-authorship network analysis. The results reveal a steady increase in research activity, particularly since 2020, reflecting a growing acceptance of gamification as a viable educational tool. Key findings reveal that "gamification," "engagement," and "motivation" are frequently occurring keywords, indicating core themes within the field. The United States, Spain, and the United Kingdom emerged as the leading contributors in terms of publications and collaborations, highlighting significant international interest. Additionally, prominent authors have contributed substantially to advancing theoretical and practical knowledge on gamification's application in diverse educational settings. Despite this progress, gaps remain in standardized frameworks and longitudinal studies assessing gamification's long-term impact. In conclusion, the study underscores the extensive research interest in gamification within education, its established benefits, and the collaborative efforts across countries. Thus, future research should focus on addressing identified gaps by developing structured frameworks and conducting studies that evaluate the sustained effectiveness of gamified interventions across various educational contexts. This bibliometric analysis provides a foundation for educators, researchers, and policymakers to understand the evolving landscape of gamification in education.

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Keywords:

Gamification, Technology, Education, Motivation

Introduction

Gamification has emerged as a powerful tool in environmental education, aiming to foster pro-environmental behaviors and enhance ecological awareness. By integrating game elements such as rewards, challenges, and social influence into educational frameworks, gamification seeks to make learning more engaging and effective. Studies have proven that gamification can significantly impact students' attitudes and behaviors towards sustainability. For instance, platforms like SaveOhno and JouleBug have been identified as best practices for their ability to engage users in pro-environmental activities through meaningful and credible game mechanics (Ouariachi et al., 2020). Additionally, the use of gamification in primary education has proven effective in instilling new habits related to water and electricity usage, as well as recycling, while also improving digital literacy among students (Ricoy & Sánchez-Martínez, 2022).

The application of gamification in higher education and specialized courses has also yielded positive results. In university settings, gamified learning experiences have been revealed to enhance students' motivation, participation, and acquisition of professional skills. For example, the use of the game Cities: Skylines in an environmental science course allowed students to simulate sustainable city planning, resulting in high levels of engagement and skill development (Fernandez & Ceacero-Moreno, 2021). Similarly, the integration of gamification in online courses has demonstrated that teaching presence and social interaction are crucial for sustaining student participation and improving learning outcomes (Mahmud et al., 2020).

Overall, the incorporation of gamification in education not only makes learning more enjoyable but also effectively promotes sustainable behaviors and ecological awareness across different educational levels (Miao et al., 2022; Vera-Morales et al., 2023; Rao, 2022).

Literature Review

The integration of gamification within education reveals its potential for enhancing student engagement, awareness, and the promotion of sustainable practices. Various studies underscore gamification's motivational impact, particularly where traditional education has led to disengagement. The effectiveness of gamified activities, such as escape rooms, in increasing motivation and teamwork, supporting curriculum goals. Similarly, Tan et al., (2024) reported that the Edcraft program encourages teenagers to embrace recycling and upcycling through social interaction and rewards. Meanwhile, Custoder (2024) demonstrated gamification's capacity to promote cultural values, particularly in smaller tourist destinations. Together, these studies illustrate gamification's motivational benefits, fostering student engagement through interactive and relatable content. Beyond motivation, gamification also fosters an understanding of sustainable behaviors. Novo et al., (2024) discussed the GoBeEco project, which promotes sustainable habits by bridging the gap between awareness and action through gamified elements. At the same time, Burbach et al., (2024) presented how gamified agricultural competitions encourage environmentally conscious practices. These studies, along with Khasawneh (2024), emphasized the role of gamification in translating abstract concepts into tangible actions, promoting a meaningful connection to sustainability.

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However, gamified education presents notable challenges. Runnerstrom et al., (2024) identified varying learning outcomes, noting that first-generation students may benefit less from gamified learning, a finding echoed who warned of neutral or negative impacts when gamification is misaligned with objectives (Dehghanzadeh et al., 2024). In addition, Lučić & Uzelac (2024) stressed that carefully designed interventions with elements like incentivization and parental involvement are essential for fostering long-term behavioral change. This highlighted the need for gamified approaches tailored to demographic differences and aligned with educational goals. However, current research also indicates gaps, such as the absence of a comprehensive framework aligning gamification with broader educational objectives. As such, Zhang et al., (2024) noted ambiguity around how to structure these strategies effectively, while Pereira et al., (2024) and Menkhoff et al., (2024) called for frameworks that support both individual learning and broader social objectives. Thus, further research could address this by developing structured, validated frameworks for gamification. Additionally, emphasized the potential of immersive and scalable gamified interventions, such as virtual worlds and "climate duels," to support institutional and societal shifts toward sustainability (Occhioni et al., 2024; Berger & Koch, 2024).

In summary, the literature on gamification, while expansive, underscores both the strengths and limitations of current gamified interventions. Key trends include gamification's success in boosting motivation and its potential to translate awareness into action. However, challenges persist, including demographic disparities in learning outcomes and the need for a structured framework to guide gamification design. Hence, this review suggests that future research should focus on developing and testing scalable, structured gamification models that can be adapted to various educational and social contexts. Accordingly, it supports not only individual learning but also broader sustainability initiatives.

Research Question

- **a.** What are the research trends in online learning studies according to the year of publication?
- **b.** Who writes the most cited articles?
- **c.** Who are the top 10 authors based on citation by research?
- **d.** What are the popular keywords related to the study?
- **e.** What are co-authorship countries' collaboration?

Methodology

Bibliometrics involves the collection, management, and analysis of bibliographic data from scientific publications (Alves et al., 2021; Assyakur & Rosa, 2022; Verbeek et al., 2002). In addition to basic descriptive statistics, such as identifying publishing journals, publication years, and main authors (Wu & Wu, 2017), bibliometrics also includes more complex techniques, like document co-citation analysis. Note that conducting a comprehensive literature review requires an iterative approach: selecting the right keywords, searching the literature, and thoroughly analyzing the results to create a reliable bibliography and generate meaningful insights (Fahimnia et al., 2015). This study specifically aimed to highlight influential publications, as these provide key insights into the theoretical frameworks driving the field forward. To ensure data accuracy, the Scopus database was used for data collection (Al-Khoury et al., 2022; di Stefano et al., 2010; Khiste & Paithankar, 2017). Furthermore, to maintain a high-quality standard, only articles from rigorously peer-reviewed academic journals were included, deliberately excluding books and lecture notes (Gu et al., 2019). Notably, Elsevier's

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Scopus database, renowned for its extensive reach, enabled the collection of publications from 2020 to December 2024 for in-depth analysis.

Data Search Strategy

The table provides the advanced search query applied in the Scopus database for the study titled "Exploring Gamification in Education: A Bibliometric Study." This query uses specific filters and keywords to retrieve only the most relevant and focused documents for bibliometric analysis. This advanced search strategy is designed to create a focused and interdisciplinary dataset. Thus, by specifying both relevant keywords and subject areas, the query retrieves studies that are not only directly related to gamification in education but also span multiple scientific fields. This, in turn, offers a comprehensive view of the topic. Furthermore, this approach helps ensure that bibliometric analysis includes high-quality, relevant, and diverse research contributions in the field. The table presents the inclusion and exclusion criteria applied in an advanced search on the Scopus database for the research titled "Exploring Gamification in Education." These criteria were set to refine the search results, ensuring that only relevant and high-quality documents were included in the bibliometric analysis. Here is a breakdown of the criteria:

TABLE 1
The Search String.

Scopus	TITLE-ABS-KEY ((gamification AND education)) AND (LIMIT-TO (SUBJAREA, "SOCI")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (SRCTYPE, "j"))

TABLE 2

The Selection Criterion Is Searching

Criterion	Inclusion	Exclusion
Language	English	Non-English
Timeline	2020 – 2024	< 2019
Literature type	Journal (Article)	Book, review, proceeding, short survey, book

Data Analysis

VOSviewer, developed by Nees Jan van Eck and Ludo Waltman at Leiden University, Netherlands (van Eck & Waltman, 2010, 2017), is a popular bibliometric software known for its user-friendly design. The software is widely used for visualizing and analyzing scientific literature, specializing in creating clear network visualizations, clustering related items, and

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producing density maps. In addition, its capabilities enable the examination of co-authorship, co-citation, and keyword co-occurrence networks, providing a detailed view of research landscapes. Moreover, the interactive interface, along with regular updates, ensures a smooth and dynamic experience for exploring large datasets. Additionally, VOSviewer's robust features for computing metrics, customizing visualizations, and compatibility with multiple bibliometric data sources make it a valuable tool for researchers seeking in-depth insights into complex research domains.

A distinctive aspect of VOSviewer is its ability to convert complex bibliometric data into easily interpretable maps and charts. With a focus on network visualization, the software effectively clusters related items, analyzes patterns of keyword co-occurrence and generates density maps. Its intuitive interface makes it accessible to both beginners and experienced researchers, supporting efficient exploration of research landscapes. The continuous development of VOSviewer ensures its relevance in the field of bibliometric analysis, providing meaningful insights through metrics calculation and adjustable visualizations. Thus, its adaptability to various forms of bibliometric data, such as co-authorship and citation networks, positions VOSviewer as a versatile tool for researchers aiming to gain comprehensive insights within their academic fields.

Datasets containing publication year, title, author names, journal, citation, and keywords in PlainText format were obtained from the Scopus database, covering the period from 2020 to December 2024. These datasets were then analyzed using VOSviewer software, version 1.6.19. By applying VOS clustering and mapping techniques, the software enabled the creation and examination of visual maps. VOSviewer, providing an alternative to the Multidimensional Scaling (MDS) approach, situates items in low-dimensional spaces where the proximity between items reflects their relatedness and similarity (van Eck & Waltman, 2010). This way, VOSviewer operates similarly to the MDS approach (Appio et al., 2014). However, unlike MDS, which primarily focuses on computing similarity metrics like cosine and Jaccard indices, VOSviewer employs a more suitable method for normalizing co-occurrence frequencies, such as the association strength (ASij), calculated as (Van Eck & Waltman, 2007):

$$AS_{ij} = \frac{C_{ij}}{W_i W_j}$$

which is "proportional to the ratio of the observed number of co-occurrences of items i and j to the expected number of co-occurrences, assuming that the occurrences of i and j are statistically independent" (Van Eck & Waltman, 2007):

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Result And Finding

What Are The Research Trends In Online Learning Studies According To The Year Of Publication?

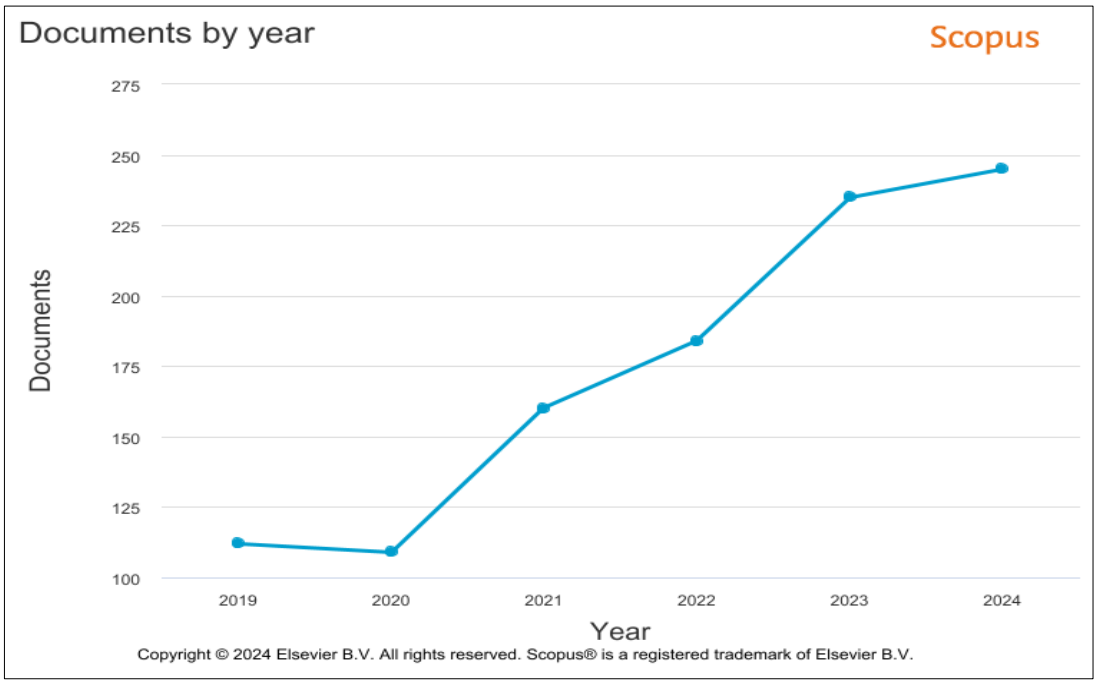

Figure 1: Plotting Document Publication By Years.

Figure 1 illustrates the publication trend from 2019 to 2024 in the field of gamification in education, as depicted in the figure highlights a significant and consistent increase in research interest. Beginning in 2019 with around 125 documents, there is a slight decrease in 2020, where publications drop to slightly above 100. Notably, this reduction could be attributed to the global disruptions caused by the COVID-19 pandemic, potentially affecting research focus and publication timelines. However, the field quickly recovered, demonstrating a marked increase from 2021 onwards, where the publication count exceeds 150. This growth suggests a heightened interest in gamification as an educational tool, possibly driven by a need for innovative digital learning solutions during the pandemic.

The upward trend continues significantly through 2022, reaching approximately 200 publications and peaks around 250 by 2023, slightly leveling off in 2024. Accordingly, this steady increase reflects gamification's growing acceptance as a valuable method for enhancing educational engagement and effectiveness. Meanwhile, the plateau observed between 2023 and 2024 may indicate that foundational research has been well established, prompting more targeted studies or consolidation in the field rather than continued exponential growth. Accordingly, this pattern illustrates the academic community's commitment to exploring and validating gamification's role in education. Hence, future research is likely to focus on refining methodologies, exploring different educational contexts, and assessing long-term impacts.

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Who Writes The Most Cited Articles?

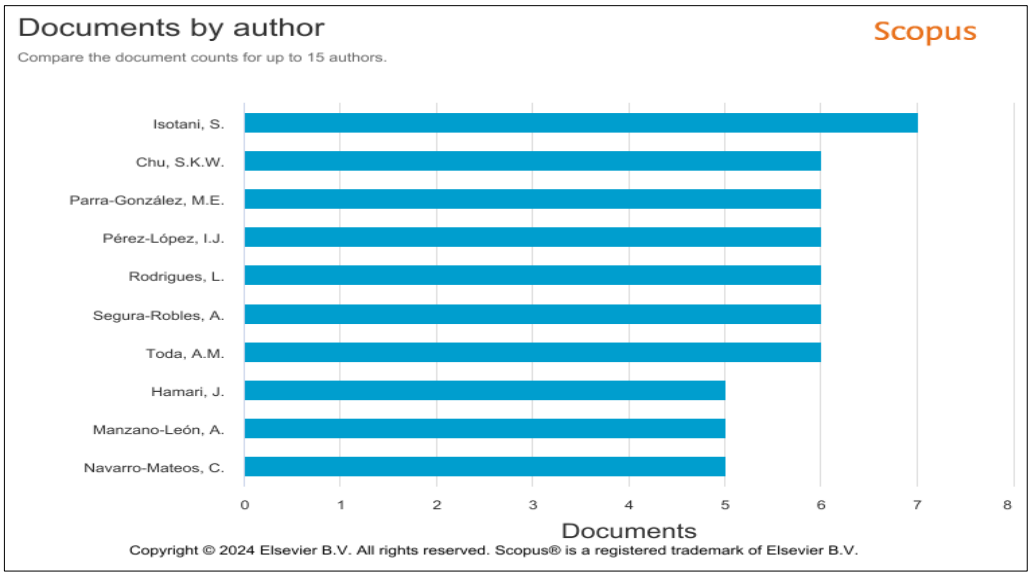

Figure 2: Document Contribution by Top-Cited Author

Table 3: Top Contributing Authors and Document Percentages in the Dateset

AUTHOR NAME	Number of Document	Percentages (%)
Isotani, S.	7	0.427611484
Chu, S.K.W.	6	0.36652413
Parra-González, M.E.	6	0.36652413
Pérez-López, I.J.	6	0.36652413
Rodrigues, L.	6	0.36652413
Segura-Robles, A.	6	0.36652413
Toda, A.M.	6	0.36652413
Hamari, J.	5	0.305436775
Manzano-León, A.	5	0.305436775
Navarro-Mateos, C.	5	0.305436775

The bibliometric analysis of gamification in education reveals a diverse group of authors who have significantly contributed to this field. The table presents the number of documents published by each author, alongside their respective percentages. Let us delve into the key insights and implications of this data. Several authors have emerged as prolific contributors, each with a notable yet relatively small percentage of the total documents. Isotani, S. leads the list with seven documents, constituting 0.67% of the total publications. This distribution suggests that while Isotani has made a prominent contribution, the research output in this field is widely distributed. This is with the addition of multiple researchers adding to the body of knowledge without any single author dominating the landscape.

Authors such as Chu, S.K.W., Parra-González, M.E., Pérez-López, I.J., Rodrigues, L., Segura-Robles, A., and Toda, A.M. have each contributed six documents, representing 0.57% of the total publications for each author. This balanced distribution among these researchers indicates

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a collaborative and inclusive research environment in gamification in education, with each author sharing a significant role in advancing the field. In addition, the contributions of these authors reflect the interdisciplinary nature of gamification, encompassing diverse perspectives and expertise. As a result, this strengthens the field by incorporating a range of approaches and findings.

Authors with five documents, including Hamari, J., Manzano-León, A., and Navarro-Mateos, C., each contribute 0.48% to the total publications. While their individual contributions are slightly smaller compared to others, collectively, they add valuable insights and further broaden the research base. The overall distribution of publications among these authors reflects the collaborative and multi-faceted nature of gamification research in education. Note that this decentralized pattern may indicate the adaptability and wide appeal of gamification across various educational settings, with each author contributing to varying aspects of this approach.
5.3 Who are the top 10 authors based on citation by research?

Table 4: Details The Top 10 Most-Cited Documents In The Field Of Gamification In Education

Authors	Title	Year	Journal	Cited by
Kalogiannakis et al., (2021)	Gamification in science education. A systematic review of the literature	2021	Education Sciences	292
Manzano-León et al., (2021)	Between level up and game over: A systematic literature review of gamification in education	2021	Sustainability (Switzerland)	229
Smiderle et al., (2020)	The impact of gamification on students' learning, engagement and behavior based on their personality traits	2020	Smart Learning Environments	192
Sanchez et al., (2020)	Gamification in the classroom: Examining the impact of gamified quizzes on student learning	2020	Computers and Education	186
Saleem A.N., et al. (Saleem et al., 2022)	Gamification Applications in E-learning: A Literature Review	2022	Technology, Knowledge and Learning	177
Gómez-Urquiza et al., (2019)	The impact on nursing students' opinions and motivation of using a "Nursing Escape Room" as a teaching game: A descriptive study	2019	Nurse Education Today	171
Almeida & Simoes, (2019)	The role of serious games, gamification and industry 4.0 tools in the education 4.0 paradigm	2019	Contemporary Educational Technology	169

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Legaki et al., (2020)	The effect of challenge-based gamification on learning: An experiment in the context of statistics education	2020	International Journal of Human Computer Studies	167
Huang et al., (2020)	The impact of gamification in educational settings on student learning outcomes: a meta-analysis	2020	Educational Technology Research and Development	157
Lo & Hew, (2020)	A comparison of flipped learning with gamification, traditional learning, and online independent study: the effects on students' mathematics achievement and cognitive engagement	2020	Interactive Learning Environments	145

The table presents a selection of the top 10 most-cited documents in the field of gamification in education, highlighting influential research from 2019 to 2022. Leading this list is a 2021 study with 292 citations for a systematic review of "Gamification in Science Education," published in *Education Sciences* (Kalogiannakis et al., 2021). Notably, this high citation count underscores the importance of systematic reviews in consolidating key findings and trends within science education, positioning it as a valuable reference for subsequent studies. Another highly cited work from 2021, with 229 citations, provides a comprehensive review of gamification in educational settings, published in *Sustainability (Switzerland)* (Manzano-León et al., 2021). Accordingly, these high citation counts reveal a significant interest in literature reviews that offer an overarching perspective on gamification research, emphasizing the foundational need to understand existing literature before addressing specific applications or case studies.

Studies that explore specific educational applications and their impact on student engagement and learning outcomes also rank highly. For example, a 2020 study with 192 citations examined the effects of gamification on student learning and engagement in relation to personality traits, published in *Smart Learning Environments* (Smiderle et al., 2020). Similarly, another 2020 study explored the impact of gamified quizzes on learning outcomes, with 186 citations in *Computers and Education* (Sanchez et al., 2020). These contributions provide insights into the nuanced impacts of gamification on student behavior, suggesting how gamified strategies can be adapted to individual learner profiles. Additionally, another study from 2022, with 177 citations, discusses gamification applications in e-learning contexts, highlighting the field's focus on empirical evidence related to learning outcomes (Saleem et al., 2022). Other notable research includes investigations into gamified teaching tools, such as the "Nursing Escape Room" study from 2019 with 171 citations, and the role of Industry 4.0 tools in education, receiving 169 citations in *Contemporary Educational Technology* (Gómez-Urquiza et al., 2019; Almeida & Simoes, 2019). Collectively, the diversity in research interests, from systematic reviews to practical applications, underscores a multidisciplinary approach. This, ultimately, enriches the understanding of gamification's role in enhancing educational experiences across various fields.

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What Are The Popular Keywords Related To The Study?

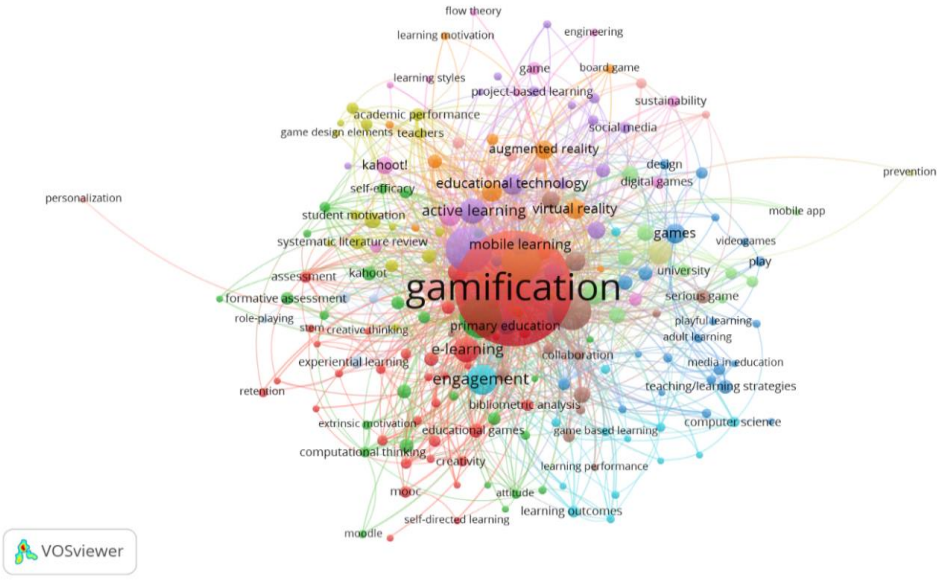

Figure 3: Network Visualization Map Of Keywords' Co-Occurrence

The data from the bibliometric analysis reveals the popularity and interconnections of various keywords in the study of gamification elements in education. The term "gamification" itself has the highest occurrences (1,083) and total link strength (2,108). This indicates its centrality to the field and reflects its significant application and research interest. Other closely related terms like "education" (occurrences: 123, link strength: 290) and "higher education" (occurrences: 174, link strength: 441) underscore the widespread integration of gamification in educational settings, particularly in higher education. Meanwhile, keywords such as "engagement" (occurrences: 75, link strength: 218) and "motivation" (occurrences: 141, link strength: 424) further emphasize the focus on enhancing student involvement and driving through gamification, which are core benefits explored in educational gamification literature.

In addition, technological and methodological terms reflect the diverse tools and approaches associated with gamified learning. Accordingly, "active learning" (occurrences: 56, link strength: 153), "e-learning" (occurrences: 56, link strength: 141), and "educational technology" (occurrences: 38, link strength: 105) represent the significance of incorporating digital and interactive methods in gamification. At the same time, specific tools such as "Kahoot" (occurrences: 25, link strength: 63), "virtual reality" (occurrences: 33, link strength: 77), and "augmented reality" (occurrences: 30, link strength: 65) highlight the range of technological applications utilized to create immersive and engaging learning experiences. Moreover, keywords like "serious games" (occurrences: 52, link strength: 146) and "educational games" (occurrences: 18, link strength: 58) indicate the integration of game-based elements in structured educational frameworks. Accordingly, they contribute to enriched and interactive learning environments.

Lastly, themes like "student engagement" (occurrences: 36, link strength: 101), "assessment" (occurrences: 12, link strength: 33), and "learning outcomes" (occurrences: 13, link strength: 35) represent the emphasis on measurable educational impacts of gamification. These keywords suggest a strong research interest in implementing gamification and evaluating its

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effectiveness in terms of students' academic performance and engagement. In addition, the presence of keywords related to instructional design, such as "project-based learning" (occurrences: 9, link strength: 27) and "flipped classroom" (occurrences: 33, link strength: 101), further indicates that gamification is often applied in innovative pedagogical strategies that encourage active student participation and skill development. Together, these keywords provide a comprehensive view of the diverse applications and benefits of gamification in education, especially in fostering an engaging, technology-enhanced learning environment.

Overall, the network visualization map provides a valuable overview of the research landscape on e-learning during COVID-19. It highlights the key themes, areas of focus, and potential areas for further investigation. Therefore, by analyzing the relationships between keywords, you can gain deeper insights into the trends and nuances within this field of research.

What Are Co-Authorship Countries' Collaboration?

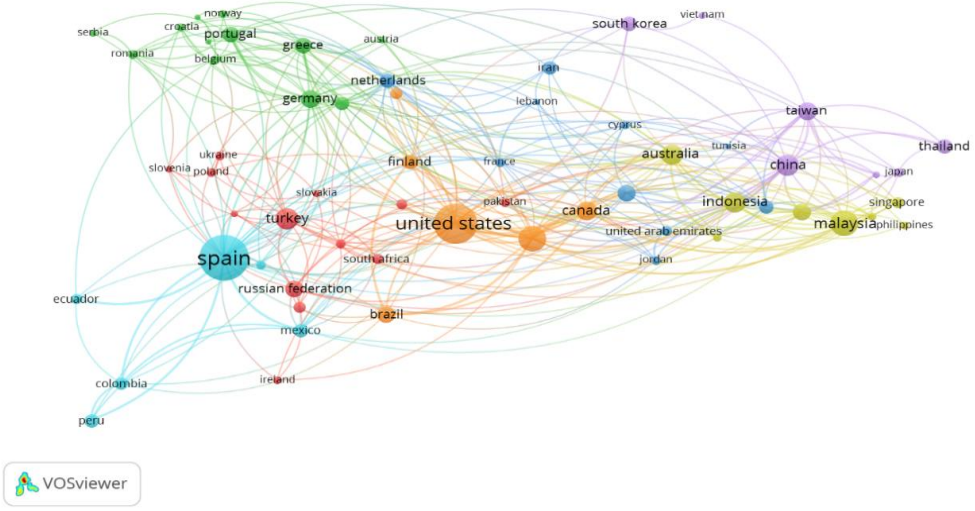

Figure 4: Displays The Countries Whose Authors Collaborate On Gamification In Education

The bibliometric analysis of gamification elements in education across countries highlights significant contributions from leading research hubs worldwide. The United States ranks highest in terms of total documents (229) and citations (7185), demonstrating its dominant role in shaping the field. Similarly, Spain (295 documents, 6268 citations) and the United Kingdom (93 documents, 2374 citations) have made substantial contributions, with high total link strengths (74 and 69, respectively), indicating strong collaboration and influence. Additionally, Canada also stands out with 50 documents and an impressive 2724 citations, reflecting the country's impactful research despite a lower document count compared to the United States and Spain.

In addition to these prominent contributors, other countries like China (65 documents, 1,548 citations) and Australia (60 documents, 1071 citations) also demonstrate considerable engagement with the subject of gamification in education. China’s high total link strength (56) highlights its extensive international collaborations. In contrast, Australia, despite a slightly

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lower link strength (45), presents a solid citation count, indicating the value of its research output. At the same time, countries such as Germany (48 documents, 948 citations) and Portugal (36 documents, 941 citations) also contribute to the body of research, though with more modest influence compared to top-ranking nations.

Several emerging regions have demonstrated growing interest in gamification research, including Malaysia (90 documents, 852 citations) and Brazil (41 documents, 831 citations). These countries are beginning to establish their presence in the field, contributing a notable number of documents and fostering international collaborations. Other nations with emerging research activities, such as Indonesia, Turkey, and Finland, indicate that gamification in education is a globally recognized field with expanding influence across diverse educational contexts. Overall, the analysis illustrates both established and emerging contributors, underscoring a global interest in the educational applications of gamification, with significant potential for cross-border collaborations and knowledge-sharing.

Conclusion

The analysis of trends in gamification research within education from 2019 to 2024 reveals a strong, consistent increase in publications, indicating a growing interest in this field. Initial fluctuations, with a minor decrease in 2020, may reflect global disruptions from the COVID-19 pandemic, impacting academic timelines. Nonetheless, a resurgence in 2021 marked a significant rise in publications, with numbers climbing to around 150 and continuing to grow, peaking at nearly 250 documents in 2023 before leveling off slightly in 2024. Notably, this sustained increase in research output suggests that gamification has gained recognition as an effective educational tool, particularly for enhancing student engagement and learning outcomes. Furthermore, the stabilization observed in 2024 might indicate that foundational studies have been established. This potentially shifts the focus toward more specialized applications, detailed methodologies, and long-term impact assessments within specific educational settings.

The distribution of authorship and citation data highlights influential contributors and key studies within this area. Researchers who have contributed multiple documents include authors with six to seven publications, emphasizing a collaborative research environment. Accordingly, the most-cited works between 2019 and 2022 demonstrate a broad scope, ranging from systematic reviews to studies investigating specific impacts of gamification on student behavior and engagement. High citation counts for reviews reflect an academic interest in comprehensive analyses, serving as key references for understanding gamification's theoretical underpinnings and practical applications in education. Additionally, studies exploring unique gamified tools or educational strategies, such as subject-specific games or personality-based approaches, further illustrate the adaptability of gamification across disciplines. Nevertheless, this diversified interest in both theoretical and applied research indicates a holistic approach to exploring gamification in education, fostering a comprehensive understanding of its potential benefits and applications.

The analysis of keywords related to gamification in education reveals core themes and focal points within this research domain. The term "gamification" appears most frequently and has the highest link strength, reflecting its central role in the field. Other prominent keywords such as "education," "higher education," "engagement," and "motivation" highlight the primary areas of interest, underscoring the importance of gamification as a strategy to enhance student

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involvement and drive in educational contexts. Meanwhile, technological terms like "active learning," "e-learning," and "educational technology" highlight the increasing integration of digital tools in gamification, showcasing the field's focus on interactive and immersive learning experiences. Furthermore, keywords like "Kahoot," "virtual reality," and "augmented reality" indicate specific tools and platforms used to create engaging educational environments, while terms such as "serious games" and "educational games" suggest the structured incorporation of game-based elements into formal education.

The co-authorship analysis by country illustrates a global landscape of collaboration and contributions to gamification research within education. Particularly, the United States, Spain, and the United Kingdom lead in terms of publication output and citation influence, indicating their substantial role in advancing the field. Countries like Canada, China, and Australia also demonstrate strong research output and high citation counts, emphasizing their contributions to impactful studies and international collaborations. Notably, emerging research regions, including Malaysia, Brazil, and Indonesia, demonstrate growing engagement with gamification in educational contexts, highlighting the field's expansion across diverse global settings. Nonetheless, this collaborative network reflects both established and emerging academic interests, offering the potential for enhanced cross-border partnerships and knowledge-sharing in educational innovation.

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