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Bibliometric Mapping of Gamification in Education: Evidence from Taylor and Francis Online Using VOSviewer

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Abstract

In recent years, gamification has gained substantial attention in the field of education for its ability to make the learning process more engaging, foster interest, and enhance learner motivation. While its pedagogical potential has been widely acknowledged, a systematic understanding of research developments in this area remains limited. The study provides a bibliometric overview of gamification in education, drawing on 120 articles published between 2012 and August 2024 in the Taylor & Francis Online database. Using VOSviewer for co-occurrence mapping and network visualization, the analysis identifies prominent research themes, influential authors, journals, countries, and institutions. The results reveal uneven publication growth over the years, with a peak in 2021, and point to three dominant research directions: (1) measuring perceptions and motivation in the classroom, (2) assessing learning outcomes and learner experiences, and (3) pedagogical approaches and practical implementation of gamification.

Keywords: Gamification, education, bibliometric analysis, VOSviewer.

1. Introduction

In the 21st-century educational landscape, gamification - the incorporation of game elements to enhance learning has emerged as a notable trend in educational research. By converting traditional, often monotonous academic content into engaging and interactive learning experiences, gamification has attracted substantial interest within the academic community, particularly in contemporary educational settings and digital learning platforms. However, despite the numerous studies investigating the potential of gamification, many questions remain about its practical application and actual impact across different educational contexts.

This research aims to provide a comprehensive overview of gamification in education through a bibliometric analysis conducted using the VOSviewer tool, based on data from Taylor & Francis Online from 2012 to 2024. The research outlines current trends in gamification and introduces a unique methodological approach. By engaging in this paper, readers will find valuable and specific information - from trend charts to research strategies - that helps in understanding the broader landscape and identifying existing research gaps. Furthermore, this study offers guidance to researchers interested in learning how to conduct initial scientific research or perform bibliometric analysis using tools like VOSviewer, thus enabling them to pursue independent research and leverage technology in academic data analysis.

The study aims to provide a comprehensive overview of research directions on gamification in education through bibliometric analysis using VOSviewer, with data sourced from the Taylor & Francis Online database, compiled from 2002 (when the term *gamification* was first coined) to 2024. Taylor & Francis Online was selected as the primary research database because it is a free resource, enabling users to easily access and extract data. While there have been bibliometric studies on gamification in education using larger databases like Scopus, WoS (Web of Science), etc., studies using the Taylor & Francis Online database remain relatively limited. Therefore, this research chose Taylor & Francis database, which is particularly advantageous for students who face financial constraints in accessing paid resources. Additionally, using this database enables students to practice foundational research skills and gain familiarity with the scientific research process.

The authors have structured the study into five sections. It begins with an introduction to the research topic, followed by a comprehensive review of prior studies on gamification in education. The third section explains the research methodology, detailing the bibliometric analysis methods, data sources, search strategies, use of VOSviewer, and data extraction process. The findings and discussion are presented through tables and figures illustrating research trends, key authors, leading journals, influential countries, and organizations. The paper concludes with key findings, methodological and practical contributions, and future research directions.

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2. Literature Review

2.1. Gamification in Education

In the context of modern education, the concepts of *gamification* or *gamified* have quickly emerged as advanced methods aimed at enhancing student engagement and learning effectiveness. The rise of gamification reflects a shift in teaching approaches and a range of new research opportunities for educators. To better understand the role of gamification in education, it is essential to examine its history and the various definitions of the concept.

The term *Gamification* was defined by Deterding *et al*. in 2011 as the use of game design elements in non-game contexts to make tasks easier and more enjoyable [1] (Education can be understood as a non-game context). However, the concept of gamification had already begun to appear in human life much earlier, as seen in the late 18th century with initiatives like the stamp reward program by Sperry and Hutchinson or the Boy Scout movement, established in the early 19th century; in these cases, members earned badges upon completing tasks [2, 3]. In 1973, the book The Game of Work by Charles A. Coonradt highlighted the power of games in engaging employees [4]. This was followed by the emergence of social video games in 1978 and the first scientific studies on Gamification. The academic community began recognizing the potential of games in 1982, when Thomas W. Malone demonstrated how lessons learned from computer games could be applied to other fields [5]. An increasing number of people began to recognize the power of enjoyment; a study suggested that user enjoyment should be a primary requirement for all software designs [6].

The term *gamification* was coined in 2002 by Nick Pelling to describe the use of game elements in non-game contexts. This concept gradually gained popularity in 2011. The number of studies on gamification grew exponentially, particularly between 2014 and 2015 [7]. Gamification in education is a set of activities and processes that use game mechanics to solve problems related to learning and education [8]. This approach leverages tools such as points, badges, leaderboards, and rewards to motivate students, enhance their engagement, and foster interactive learning. In this research, gamification in education is defined as "the application of games or game-related elements in learning to enhance student engagement, learning motivation, and learning effectiveness". This includes using digital devices like tablets, smartphones, or computers to promote active participation and collaboration among students [9].

The application of gamification has been shown to provide numerous benefits in educational settings. For example, it can enhance learning by creating a dynamic environment where educators can effectively utilize tools to guide and reward students, transforming the learning process into a more compelling activity [10]. Numerous studies have shown that applying gamification in education has a positive impact on teaching, such as enhancing learners' motivation, increasing confidence, fostering collaboration in learning, and improving learning outcomes [11, 14]. The goal of gamification is not only to develop skills and knowledge but also to optimize learning and support positive behavioral and attitudinal changes towards lifelong learning [15].

2.2. VOSviewer

VOSviewer is a software tool designed for constructing and visualizing maps from bibliometric data, facilitating the analysis of knowledge structures, the identification of research trends, and the mapping of collaboration networks across various fields [16]. This tool enables users to create maps based on keywords, authors, organizations, or other indicators from scientific articles, thereby aiding in the identification and visualization of research clusters, relationships, and influences among different analytical units [16, 17].

VOSviewer provides three main types of visualizations: network, overlay, and density, which help explore the connections and development of research over time. Each type of visualization allows for the exploration of different aspects of bibliometric data. Additionally, VOSviewer integrates text analysis functions, enabling the extraction of data from the titles and abstracts of scientific documents [16]. In this study, VOSviewer will be employed to analyze data from the Taylor & Francis database, offering an overview of gamification in education and identifying key trends, leading authors, and collaborative relationships within this research field.

2.3. Bibliometric Analysis Methodology

Bibliometric analysis is a widely recognized and rigorous scientific research method for exploring and analyzing a large volume of scientific data on a specific topic over a defined period [18]. Dicheva and Dichev identified emerging changes and trends in the field of gamification and systematically mapped 41 experimental studies from reputable databases such as Scopus, Science Direct, ERIC, and others, covering the period from 2014 to 2015 [7]. In recent years, many bibliometric studies have extended the research period to provide a clearer overall picture of gamification in education. Lou's study presented the results of a bibliometric analysis on the topic of gamification in education, encompassing 4,059 articles published in the WoS database from 1995 to 2020 [19]. Similarly, another study using the WoS database employed bibliometric analysis to examine the development of gamification over time, utilizing 4,706 publications published between 2011 and 2019 [20]. A further study using the WoS database, without limiting the publication period, analyzed 1,170 articles to reveal research trends on gamification in education and identify popular keywords [21].

In addition to prominent databases like WoS, Scopus has also been utilized by researchers for conducting bibliometric analyses. Irwanto applied bibliometric analysis to study 819 articles published in various peer-reviewed journals indexed by Scopus from 2013 to 2022 [22]. These examples illustrate that the use of bibliometric analysis methods in this study provides certain advantages over other methods. The results of the study are summarized in tables and figures, which help readers, including educators, to better understand the presented information. By using the VOSviewer tool to analyze data from the Taylor & Francis database, this study not only analyzes the content of research on gamification in education but also provides comprehensive insights into influential authors, organizations, and countries. Such statistical analysis helps researchers, not only in education but also in other fields, to expand their scope of study. Additionally, it aids students in understanding trends in gamification in education and learning how to conduct a comprehensive bibliometric analysis.

2.4. Research Objectives

This paper provides an overview of research on gamification in education using bibliometric data from VOSviewer, based on the Taylor & Francis Online database, compiled from 2002 (when the term *gamification* was first coined) to 2024. Taylor & Francis Online was selected as the primary research database because it is a free resource, enabling users to easily access and extract data. While there have been bibliometric studies on gamification in education using larger databases like Scopus, WoS, etc., studies using the Taylor & Francis Online database remain relatively limited. Therefore, this research chose the Taylor & Francis database, which is particularly advantageous since there are still students who may find it difficult to afford paid resources. Using Taylor & Francis Online allows them to practice initial research steps and familiarize themselves with the scientific research process.

The study focuses on identifying increasing research trends, prominent authors, leading journals, countries, and organizations that have made significant contributions, along with relevant references. Overall, the paper aims not only to establish a solid knowledge base on gamification in education for new researchers but also to provide a visual and quantitative analytical framework, facilitating the exploration of connections between gamification in education and bibliometric research.

3. Research Methodology

3.1. Data Sources and Search Strategy

The bibliometric analysis was conducted using the Taylor & Francis Online database from 2002 to 2024. The year 2002 was selected as the starting point because the year when the term *gamification* was first coined. However, although the initial search range was set from 2002, the earliest study on gamification in the Taylor & Francis Online database was not published until 2012. Consequently, the search parameters were adjusted to focus on studies published from 2012 to 2024. This adjustment ensures that the analysis concentrates on meaningful and relevant research, ensuring that all collected data is directly related to the topic, thereby enhancing the quality and accuracy of the analysis.

A keyword search using *gamification* was performed in the Taylor & Francis Online database, followed by using the database's advanced filtering system to select articles on gamification within the *education* field. The keyword search method was chosen to ensure comprehensive coverage of related research, including studies with in-depth content or those not directly mentioning the keyword in their titles or abstracts [23, 24].

3.2. Data Extraction

Fig. 1 presents the flowchart of the search and filtering process employed, which follows the model by Zakaria *et al*. [25]. An initial keyword search using *gamification* was performed in the Taylor & Francis Online database. A total of 304 records were identified. To narrow down the scope, the advanced filtering function was applied to retain only studies related to the field of education, reducing the dataset to 122 articles.

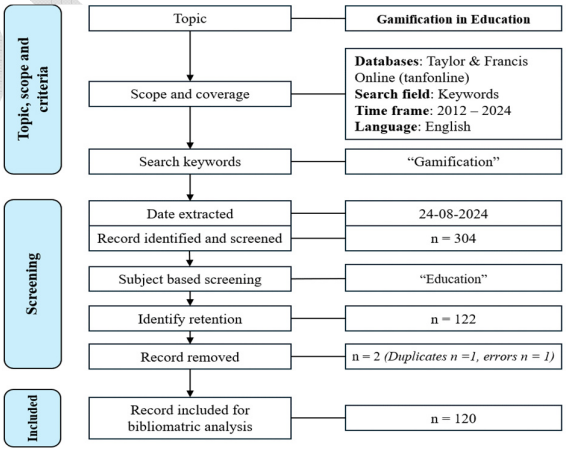

Fig. 1. Data search and filtering flowchart

In the next phase, the authors further screened the records based on author keywords, ensuring the inclusion of only those publications explicitly containing the terms *gamification* or *gamified*. This criterion enhanced the thematic relevance of the dataset by focusing on studies that centrally addressed the concept of gamification. As a result of this step, 2 articles were removed, one duplicate and one due to keyword-related errors, resulting in a final total of 120 articles included for bibliometric analysis.

All selected articles were analyzed using established bibliometric methods. Specifically, the authors used (i) *Microsoft Excel 2016* to calculate the frequency and percentage distribution of the published documents and to create relevant charts and graphs; (ii) *VOSviewer* (version 1.6.20) to construct and design bibliometric networks; and (iii) manual calculation tools like *Calculator* available on the computer to compute citation indices.

The Taylor & Francis Online database does not provide citation indices, such as the *h*-index, so the authors manually calculated these indices. The *h*-index captures both the quantity (number of published articles) and the quality or impact (number of citations by other scientists) of scientific activities. A scientist has an *h*-index of *h* if *h* of their *n* papers have at least *h* citations each, and the remaining (*n*-*h*) papers have less than *h* citations each [26]. The screening process also involved excluding duplicate documents or those containing keyword errors to prevent duplication or inaccuracies in the total count of studies analyzed.

4. Results

4.1. Description of Retrieved Documents

In this study, data were primarily collected from various types of documents, including articles, reviews, evaluations, commentaries, discussions, reports, and other types of materials. Based on this classification, a total of 120 documents were retrieved from the Taylor & Francis Online database. Table 1 provides a summary of the data retrieved from 2012 to 2024 by category of document type. Leading the list are articles, which constitute the highest number at 105, accounting for 87.5% of the total published documents. The remaining document types represent a much smaller percentage, contributing only between 0.83% and 5.84% of the total.

4.2. Keyword Networks and Research Trends of Gamification in Education

During the analysis of the network map of author keywords generated by VOSviewer, the minimum occurrence criterion for a keyword was set at 4. The results showed that out of 319 listed keywords, only 10 met this criterion and were thus selected for further analysis. These keywords were divided into 6 clusters in Fig. 2, with the red, green, and blue clusters being the most prominent.

The red cluster (Cluster 1, 3 items) includes “gamification”, “mobile learning”, and “perception”, focusing on the use of game elements in mobile learning and learner experience. This cluster reflects an interest in how gamification can be integrated with mobile technology to enhance engagement and motivation in learning. The green cluster (Cluster 2, 2 items), with the keywords “higher education” and “motivation”, emphasizes learning motivation in higher education. Studies in this cluster often focus on exploring strategies and methods to increase learning motivation for university students, where self-discipline and proactive learning are crucial. The blue cluster (Cluster 3, 2 items) comprises “education” and “student engagement”, reflecting a focus on student engagement within educational environments.

The trends in keywords related to gamification indicate a shift in research focus over time in Fig. 3. After 2022, studies have concentrated on education and perception, highlighting learners' experiences. From 2020 to 2022, keywords like “student engagement”, “higher education”, “motivation” and “flipped classroom reflect a focus on enhancing motivation, increasing student engagement, and evolving teaching methods. Prior to 2019, research primarily revolved around “game-based learning” and “mobile learning”, focusing on the use of games and mobile technology to improve learning outcomes.

The authors expanded the scope of their investigation by visually mapping the network of main keywords appearing in the titles and abstracts of documents retrieved from the Taylor & Francis database. This exploration enabled a deeper understanding of how key terms are employed to describe research, thereby reflecting both the direct and indirect focal points and scholarly orientations within the field. Using binary counting in VOSviewer, with a minimum threshold of 10 occurrences per keyword, the analysis identified 38 keywords meeting the criteria out of a total of 2,617.

Table 1. Summary of retrieved data (2012 - 2024)

Document type	Total number of studies	Percentage (%)
Article	105	87.5
Review Article	7	5.84
Review	2	1.67
Article Commentary	1	0.83
Discussion	1	0.83
Report	1	0.83
Other	3	2.5
Total	120	100

Source: Taylor and Francis Online data

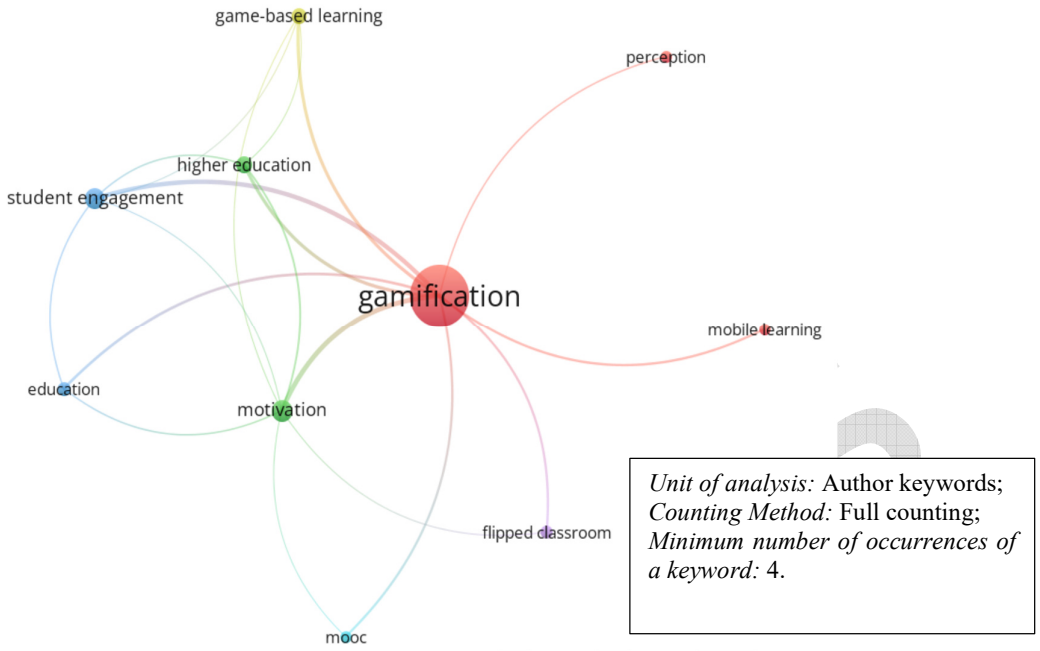

Fig. 2. Visualization of the network map of Author Keyword

Source: Analysis results from VOSviewer software

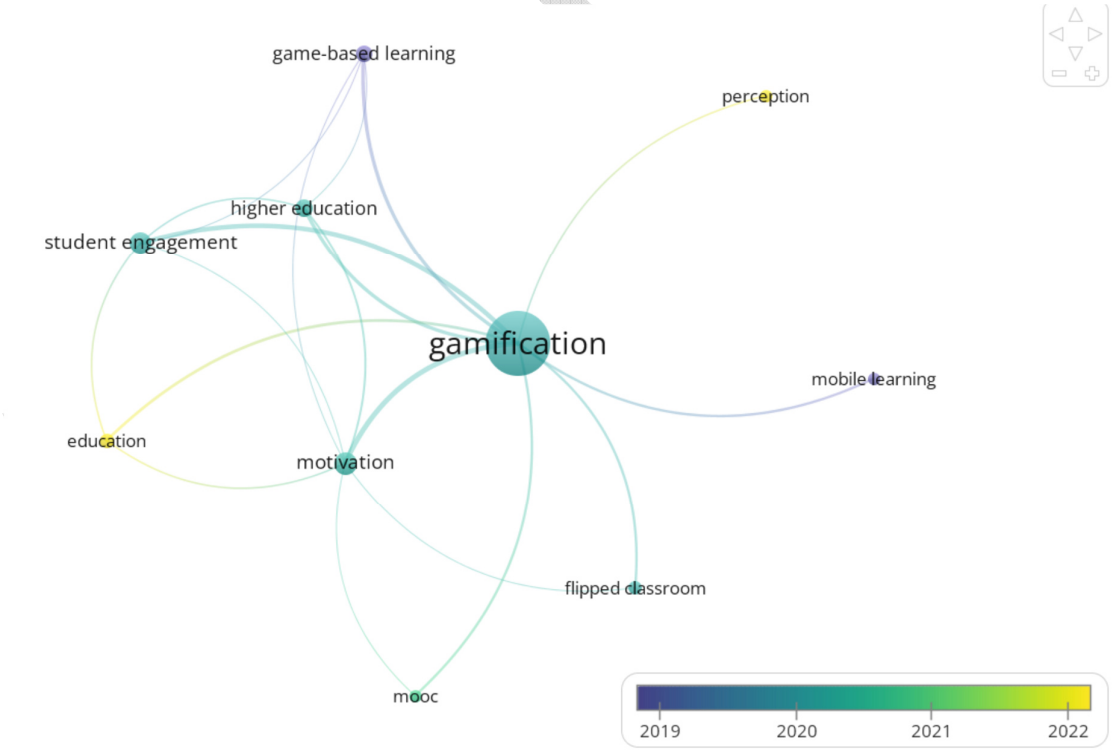

Fig. 3. Visualization of research keyword trends in Gamification

Source: Analysis results from VOSviewer software

The keyword network is illustrated in Fig. 4, where the map is divided into three clusters, represented in blue, green, and red. The frequency of each term is indicated by the size of its corresponding circle, while the strength of connections between terms is represented by the thickness of the linking lines.

In the first cluster - Red cluster, keywords such as "attitude", "motivation", "perception", "questionnaire", "participant", and "teacher" are closely linked with activity, class, and course. This cluster focuses on measuring and analyzing the attitudes, motivation, and perceptions of both learners and instructors when applying gamification. The co-occurrence of "motivation", "attitude", "activity", "class", and "course" reflects an emphasis on evaluating learner enthusiasm and learning attitudes within gamified learning activities. For instance, 67.7% of participants reported that gamified courses were more motivating than traditional courses [27], while the use of digital badges significantly boosted learner engagement and interest [28]. The presence of "teacher" and "perception" highlights attention to instructors' perspectives and experiences when implementing gamification; many educators believe it fosters teamwork, communication, critical thinking, and social skills – factors that encourage them to integrate gamification into teaching [29]. Meanwhile, "questionnaire" and "participant" are associated with research collecting data from learners and educators through validated measurement scales [30], or via behavioral data analytics - both of which represent notable trends in this research domain [31].

The second cluster - Green cluster, containing keywords such as "student", "engagement", "effectiveness", "outcome", "experience", and "game element", centres on empirical evidence regarding the effectiveness of gamification in relation to learning outcomes and learner engagement. The combination of "student", "engagement", "effectiveness" and "outcome" reflects research assessing academic performance and engagement in gamified learning environments. Studies show that learners in gamified settings tend to complete tasks on time, produce higher-quality outputs and achieve better scores [32]. In particular, flipped classrooms enhanced with gamification show substantial improvements in engagement compared to non-gamified settings [33]. The keywords "experience" and "game element" signal a focus on the learning experience, and motivation derived from game-based elements such as points, levels, leaderboards, challenges and badges, all of which play a crucial role in promoting interactive learning and improving academic performance [34, 35].

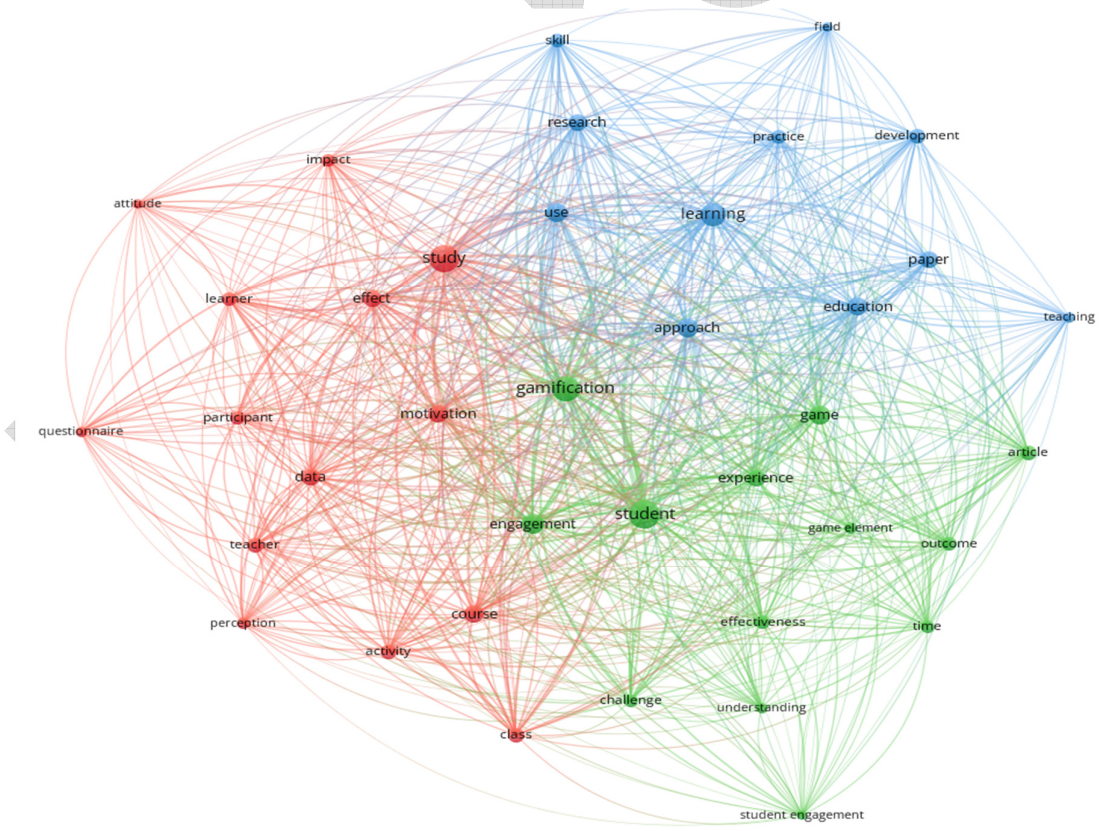

Fig. 4. Keyword visualization in titles and abstracts of the research

Source: Analysis results from VOSviewer software

The third cluster – Blue cluster features keywords such as "approach", "development", "teaching", "learning", "education", "research", "skill", and "use", underscoring the importance of pedagogical approaches and practical implementation of gamification in education. The interlinkage of "approach", "development", "teaching", and "learning" reflects a focus on designing structured learning activities with tasks, rewards, and assessment components that empower learners and promote active participation – often referred to as gameful classrooms [36]. The pairing of "skill" and "education" relates to studies applying gamification to develop domain-specific skills, such as English vocabulary acquisition [37] or programming language proficiency [38], both of which have reported positive results. Beyond the classroom, gamification has also been applied in social campaigns, successfully encouraging participants to engage more actively in community and societal issues [39].

Overall, the design and implementation of gamification are gradually being standardized into clear, replicable processes. Future trends point toward integrating advanced technologies such as AI, emotion recognition, and behavioral analytics, while expanding gamification to a broader range of domains and skills to enhance teaching and learning quality.

4.3. Increase in Research

The growth chart of research in Fig. 5 shows three distinct stages of development in the study of gamification.

From 2012 to 2015, very few studies were published, ranging from 0 to 3 per year, with relatively low and unstable citation numbers. Subsequently, from 2016 to 2020, there was a steady increase in the number of studies per year, ranging from 3 to 15 annually, with a dramatic surge in citations, peaking in 2019 with 636 citations. Finally, from 2021 to the present, the number of studies has remained high, with 19 articles published in 2021; however, the number of citations has significantly declined since then.

This data (Table. 2) clearly shows an absence of research on gamification in education in 2014, with no articles or citations published that year. After 2015, the number of studies began to rise again. These figures illustrate an inverse correlation between the number of publications and the number of citations from 2019 to the present. While gamification emerged as a popular research topic during 2018 - 2019, the impact of more recent studies has diminished and has not been widely recognized.

The citation matrix of documents by year provides an overview of the development and impact of Gamification studies over time, specifically from 2012 to the present. The highest number of citations per study was recorded in 2013, with an average of 80 citations per article. In contrast, the lowest number of citations per article occurred in 2024, with an average of only 0.67 citations per article.

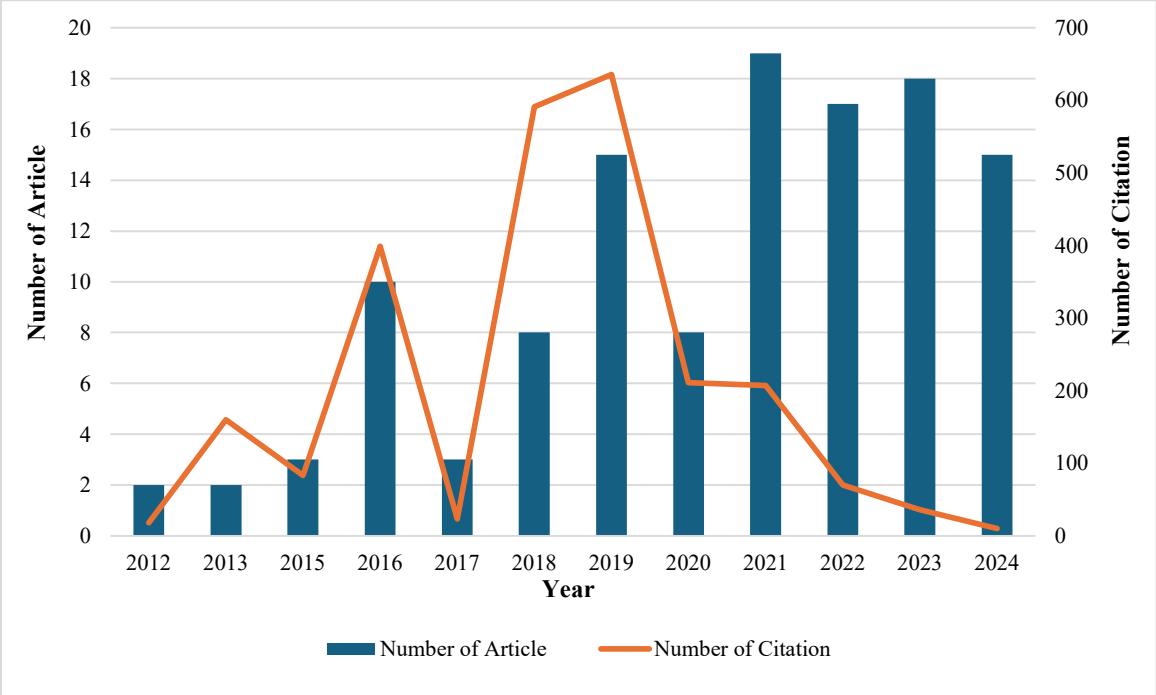

Fig. 5. Growth chart of research studies

Source: Compiled by the author from Taylor & Francis Online data

Table 2. Annual number of studies and citation matrix

Year	Total publications	Citations	Number of Cited articles	Citations per Article	Average Citations per Article	h-index
2012	2	18	2	6	6	2
2013	2	160	2	80	80	2
2014	0	0	0	0	0	0
2015	3	83	3	27.67	27.67	3
2016	10	399	10	39.9	39.9	9
2017	3	23	3	7.67	7.67	2
2018	8	591	8	73.88	73.88	7
2019	15	636	15	42.4	42.4	10
2020	8	211	8	26.38	26.38	7
2021	19	207	18	10.9	11.5	8
2022	17	70	15	4.67	4.67	6
2023	18	36	11	2	3.27	4
2024	15	10	4	0.67	2.5	4

Source: Compiled by the author from Taylor & Francis Online data.

4.4. Authorship Patterns, Collaboration and Notable Authors

According to the data in Table 3, many studies were conducted by small groups of 1 to 4 authors. This category represents 104 articles, accounting for over 75% of the total research output. In contrast, groups of 5 or more authors constitute only a small fraction, ranging from 0.83% to 5.83%, roughly 25% of the total studies. These results suggest that researchers in the field of gamification tend to collaborate in smaller groups to optimize coordination, enhance efficiency, and ensure a diversity of perspectives and viewpoints. As shown in Fig. 6, the co-authorship network appears rather fragmented, with limited connections among researchers, indicating that collaboration in this field remains relatively weak.

Table 3. Number of authors per study

Number of authors	Number of studies	Percentage (%)
1	20	16.67%
2	38	31.67%
3	27	22.50%
4	19	15.83%
5	7	5.83%
6	4	3.33%
7	1	0.83%
8	2	1.67%
11	1	0.83%
13	1	0.83%

Source: Compiled by the author from Taylor & Francis Online data.

Fig. 6. Visualization map of co-authorship networks in organizational culture research
Source: Analysis results from VOSviewer software.

From 2012 to the present, a total of 384 authors have contributed to research on gamification in education, both in groups and individuals. Based on the collected dataset, Table 4 shows 9 authors (with at least 2 or more articles) who have demonstrated the most effective publication productivity during the research period. The top-ranked author is Khe Foon Hew from Hong Kong, with 5 articles and 393 citations. Meanwhile, author Samuel Kai Wah Chu ranks second with an impressive 3 articles and 15 citations.

In 2005, the *h*-index was proposed by Jorge Hirsch to provide an estimate of the importance, significance, and overall impact of a scientist's cumulative research contributions [40]. To rigorously assess the publication productivity of researchers, this study expanded the dataset to include *h*-index data (Table 2, Table 4, and Table 7). However, since the data collected from Taylor

& Francis Online does not directly provide the *h*-index, it was calculated manually to ensure high accuracy. The manual calculation of the *h*-index involved the following steps: First, the articles of a scientist were ranked by the number of citations, from highest to lowest. Then, by comparing the rank of each article with the number of citations, the *h*-index is determined as the highest value at which the scientist has at least *h* articles cited at least h times. The results in Table 5 show that Khe Foon Hew ($h = 4$) has the highest *h*-index, indicating that this author has both a significant total number of articles and the best productivity.

Table 4. Most productive authors (with at least 02 articles)

Author	Total article	Total citation	Citations per article	h-index
Khe Foon Hew	5	393	78.6	4
Samuel Kai Wah Chu	3	15	5	2
Jared R Chapman	2	97	48.5	2
Geoff Goehle	2	128	64	2
Biyun Huang	2	247	123.5	2
Ya Xiao	2	4	2	1
Miguel Mira da Silva	2	28	14	1
Chung Kwan Lo	2	356	178	2
Peter J Rich	2	97	48.5	2

Source: Compiled by the author from Taylor & Francis Online data.

Table 5. Manual calculation of the *h*-index for author Khe Foon Hew

Article rank	Refer-ences	Number of citations *(Ranked from highest to lowest)*	Note
1	[41]	214	≥ 1
2	[42]	142	≥ 2
3	[43]	33	≥ 3
4	[44]	4	≥ 4
5	[45]	0	≥ 5 *(Does not satisfy)*

Source: Taylor & Francis Online.

4.5. Geographical Distribution of Research

Researchers from 39 different countries have contributed to studies on gamification in education from 2012 to the present. Table 6 provides statistics on the top countries contributing to these studies. The USA leads with 22 studies, accounting for 18.33% of the total, with an outstanding number of citations. Following are China, the UK, and Spain, contributing between 7.5% and 8.3% of the total research. Although Hong Kong ranks fifth in the list, it has a citation index second only to the USA, suggesting that while the quantity of research may be lower, Hong Kong maintains a high quality of its contributions.

The data table reflects the diversity of research from various countries, not only from developed regions but also from areas like the Middle East (Iran, Turkey) and Asia (China, Hong Kong, and Taiwan). Overall, gamification is a research field of global interest.

Gamification in education has attracted the interest of 116 organizations worldwide during the period from 2012 to 2024. Most of the active organizations in this field are in Hong Kong, China, Finland, Portugal, and the USA. Among them, the University of Hong Kong is the leading contributor with 6 studies and 360 citations (Table 7).

Table 6. Countries with significant contributions to research (at least 03 studies or more)

Rank	Country	Total articles	Total citations
1	USA	22	450
2	Spain	10	156
3	UK	10	161
4	China	9	63
5	Hong Kong	7	364
6	Turkey	6	129
7	Portugal	5	132
8	Finland	4	95
9	Australia	3	63
10	Brazil	3	4
11	Iran	3	147
12	Italy	3	11
13	Taiwan	3	152
14	The Netherlands	3	43

Source: Compiled by the author from Taylor & Francis Online data.

Table 7. Institutions with a minimum of 02 or more research contributions

Institution	Country	Total articles	Total cited articles	Total citations	Citations per article	Average citations per cited article	*h*-index
University of Hong Kong	Hong Kong	6	3	360	60	120	3
Beijing Normal University	China	2	1	10	5	10	1
Tampere University	Finland	2	2	5	2.5	2.5	2
University of Lisbon	Portugal	2	1	28	14	28	1
Utah Valley University	USA	2	2	97	48.5	48.5	2
Western Carolina University	USA	2	2	128	64	64	2

Source: Compiled by the author from Taylor & Francis Online data.

4.6. Popular Journals

The data in Table 8 shows that Taylor & Francis Ltd. is the publisher with journals related to the field of Gamification in education. The journal *Interactive Learning Environments* stands out with the highest number of studies and citations, specifically 32 studies and 887 citations. In second place is the journal *Computer Assisted Language Learning*, which has published 9 studies with a total of 274 citations.

Table 8. Top 05 journals publishing research on Gamification in Education

Journal name	Total articles	Total citations	Publisher
Interactive Learning Environments	32	887	Taylor & Francis Ltd.
Computer Assisted Language Learning	9	274	Taylor & Francis Ltd.
College Teaching	6	62	Taylor & Francis Ltd.
Cogent Education	6	93	Taylor & Francis Ltd.
European Journal of Engineering Education	5	79	Taylor & Francis Ltd.
Innovations in Education and Teaching International	4	62	Taylor & Francis Ltd.

Source: Compiled by the author from Taylor & Francis Online data.

5. Discussion

This section presents key findings, linking them to existing literature while highlighting publication trends, themes, and geographical patterns that contextualize the evolution of gamification research. Data analysis from Taylor & Francis Online shows that there were no publications or citations related to gamification in education in 2014 (Fig. 5). In contrast, other databases such as IEEE Xplore, ScienceDirect and SCOPUS recorded a strong increase in Gamification research in education from 2014 to 2015 [7]. This discrepancy may be due to the focus of Taylor & Francis on more traditional research areas, while platforms like IEEE Xplore and SCOPUS prioritize studies in technology and modern educational methods. This suggests that the choice of publication channels may have significantly influenced the dissemination of research on gamification.

Through the data analysis, this research found that most studies discuss the application of gamification in education, with notable topics including improving learning motivation, enhancing learning effectiveness through gamification, and the impact and role of gamification in online teaching systems. Most studies target university and K-12 students, while some focus on early childhood education through gamification, reflecting its adaptability to diverse educational audiences.

The 2018 study by K.F. Hew and C.K. Lo [32] offers a detailed view of Gamification's role in enhancing student engagement within flipped classrooms. It highlights the effectiveness of gamification in fostering both behavioral and cognitive engagement among university students, especially in extracurricular and flipped learning settings. Keywords such as higher education, "motivation", and "student engagement" appear frequently and are central to the keyword network (Fig. 2), emphasizing the methodological focus of the field.

Regarding the geographical distribution of studies, the research found that Europe (including the USA, Spain, and the UK) leads in the number of studies from 2012 to the present (Table 6). Additionally, researchers in the Middle East (Iran) and Asia (China, Hong Kong, and Taiwan) have shown increasing interest in Gamification research in recent years. This is demonstrated by several institutions in Asia that currently hold top positions in Gamification publications in education, such as the University of Hong Kong (Hong Kong, 6 studies) and Beijing Normal University (China, 2 studies) (Table 7).

In addition to the comprehensive analyses from the Taylor & Francis database, the data also reveal considerable geographical diversity in Gamification research, with several countries represented by only a single study – such as Singapore, France, Canada, and Mexico. These studies each focus on specific aspects of Gamification. For example, the Singaporean study "The Effect of Integrating Kahoot! and Peer Instruction in the Spanish Flipped Classroom: The Student Perspective" explores how combining the Kahoot! platform with flipped learning can enhance student engagement and motivation [38]. The French study "How Does Adaptive Gamification Impact Different Types of Student Motivation Over Time?" demonstrates that adaptive gamification can exert varying effects, both positive and negative, on different types of learning motivation [39]. Meanwhile, the Mexican study "A Virtual Environment for Learning Computer Coding Using Gamification and Emotion Recognition" employs machine learning techniques alongside gamification-driven motivational strategies to help students overcome negative emotional states while mastering programming languages [40].

During the analysis in Table 8, the authors found that the European Journal of Engineering Education featured five related studies, highlighting its significant contribution to the field. This indicates that gamification research is not only being published in technology-focused journals but is also expanding into fields like educational technology and technical education. These journals emphasize improving and innovating teaching methods through technology, experimental research, and global initiatives.

6. Conclusion

This study conducted a bibliometric analysis of 120 articles on Gamification published in the Taylor & Francis Online database from 2012 to 2024, offering a comprehensive overview and further exploring potential research directions in the field of gamification in education through the use of summary tables and visual charts. It not only synthesizes academic contributions but also provides practical value for researchers, especially newcomers, by offering a methodological guide for conducting bibliometric analysis.

7. Limitations

Although this study provides valuable insights, it is important to acknowledge several inherent limitations. These should be considered when interpreting the results and guiding future research.

a. Coverage: Results reflect only the Taylor & Francis corpus; they are not intended to represent the entire global literature on gamification in education. In the future, we will expand the dataset to include Scopus and WoS to improve coverage and enable cross-database comparisons.

b. Temporal drift: Biblographic databaes are dynamic. To ensure replicability, we analyzed a frozen snapshot (retrieved August 2024), acknowledging that later publications are not captured.

c. Indexing and query constraints: The absence of Taylor & Francis items in specific years (e.g., 2014) reflects database coverage rather than a complete absence of research elsewhere; keyword ambiguity and screening decisions may also omit or merge concepts despite iterative refinement.

References

[1] S. Deterding, D. Dixon, R. Khaled, and L. Nacke, From game design elements to gamefulness: defining "gamification", Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments, MindTrek, pp. 9–15, 2011. https://doi.org/10.1145/2181037.2181040

[2] D. Sharma, and J. Sharma, Evolution of gamification, its implications, and its statistical impact on the society, ShodhKosh: Journal of Visual and Performing Arts, vol. 4, no. 2SE, pp. 8–20, Sep. 2023. https://doi.org/10.29121/shodhkosh.v4.i2SE.2023.456

[3] C. Lestari, V. J. Basiroen, and W. Ali, Indonesian history educational card game: gamification of the process of learning to increase interest in history among children, J. Games, Game Art, Gamification, vol. 3, no. 1, pp. 1–7, Oct. 2021. https://doi.org/10.21512/jggag.v3i1.7234

[4] A. Pandey, A brief history of gamification, XRDS Crossroads, The ACM Magazine for Students, vol. 24, iss. 1, p. 13, Sep. 2017. https://doi.org/10.1145/3123774

[5] T. W. Malone, Toward a theory of intrinsically motivating instruction, Cogn. Sci., vol. 5, no. 4, pp. 333–369, Oct. 1981. https://doi.org/10.1016/S0364-0213(81)80017-1

[6] S. W. Draper, Analysing fun as a candidate software requirement, Personal and Ubiquitous Computing, vol. 3, no. 3, pp. 117–122, Sep. 1999. https://doi.org/10.1007/BF01305336

[7] D. Dicheva, and C. Dichev, Gamification in education: where are we in 2015?, E-Learn World Conf. E-Learning Corp. Gov. Heal., vol. 2015, no. 1, pp. 1445-1454, Oct. 2015. [Online]. Available: https://www.learntechlib.org/primary/primary/p/152186/, Accessed on: Sep. 12, 2024.

[8] S. Kim, K. Song, B. Lockee, and J. Burton, What is gamification in learning and education?, Gamification in Learning Education, pp. 25-38, Sep. 2017. https://doi.org/10.1007/978-3-319-47283-6_4

[9] D. Dicheva, C. Dichev, G. Agre, and G. Angelova, Gamification in education: a systematic mapping study, Educ. Technol. Soc., vol. 18, no. 3, pp. 75–88, 2015.

[10] İ. Yildiz, E. Topçu, and S. Kaymakci, The effect of gamification on motivation in the education of pre-service social studies teachers, Thinking Skills and Creativity, vol. 42, Dec. 2021, Art. no. 100907. https://doi.org/10.1016/j.tsc.2021.100907

[11] L. Rodrigues, A. M. Toda, W. Oliveira, P. T. Palomino, A. P. Avila-Santos, and S. Isotani, Gamification works, but how and to whom?: an experimental study in the context of programming lessons, SIGCSE 2021 - Proceedings of the 52nd ACM Technical Symposium on Computer Science Education, pp. 184-190, Mar. 2021. https://doi.org/10.1145/3408877.3432419

[12] K. Bovermann, and T. Bastiaens, How gamification can foster motivation and collaboration in blended learning: A mixed methods case study, J. Interact. Learn. Res., vol. 30, no. 3, pp. 275–300, 2019.

[13] J. Díaz-Ramírez, Gamification in engineering education - an empirical assessment on learning and game performance, Heliyon, vol. 6, iss. 9, Sep. 2020, e04972. https://doi.org/10.1016/j.heliyon.2020.e04972

[14] N.O. Reisch, Can gamification improve higher education students' learning outcome, flow, confidence and motivation in inquiry learning systems?. BS thesis. University of Twente, 2022. https://doi.org/10.13140/RG.2.2.12268.74880

[15] L. Gatti, M. Ulrich, and P. Seele, Education for sustainable development through business simulation games: an exploratory study of sustainability gamification and its effects on students' learning outcomes, Journal of Cleaner Production, vol. 207, pp. 667–678, Jan. 2019. https://doi.org/10.1016/j.jclepro.2018.09.130

[16] N. J. van Eck, and L. Waltman, Visualizing bibliometric networks, Measuring Scholarly Impact, pp. 285–320, Jan. 2014. https://doi.org/10.1007/978-3-319-10377-8_13

[17] N. J. van Eck, and L. Waltman, Software survey: VOSviewer, a computer program for bibliometric mapping, Scientometrics, vol. 84, no. 2, pp. 523–538, Dec. 2009. https://doi.org/10.1007/s11192-009-0146-3

[18] Y. Yang, C. Wang, and M. Lai, Using bibliometric analysis to explore research trend of electronic word-of-mouth from 1999 to 2011, International Journal of Innovation, Management Technology, vol. 3, no. 4, Aug. 2012. https://doi.org/10.7763/IJIMT.2012.V3.250

[19] Z. Luo, Educational Gamification from 1995 to 2020: A bibliometric analysis, in Proceedings of the 2021 6th International Conference on Distance Education and Learning, Shanghai, China, 2021, pp. 140-145. https://doi.org/10.1145/3474995.3475740

[20] M. Trinidad, M. Ruiz, and A. Calderon, A bibliometric analysis of gamification research, IEEE Access, vol. 9, pp. 46505-46544, Mar. 2021. https://doi.org/10.1109/ACCESS.2021.3063986

[21] M. Dikmen, and F. Bahadır, Bibliometric Mapping of Gamification in Education, Eğitim Yansımaları, vol. 6, no. 2, pp. 50-67, 2022. [Online] Available: https://dergipark.org.tr/en/pub/eduref/issue/74849/1137631

[22] I. Irwanto, D. Wahyudiati, A. D. Saputro, and S. D. Laksana, Research trends and applications of gamification in higher education: a bibliometric analysis spanning 2013–2022, International Journal of Emerging Technologies in Learning, vol. 18, no. 5, pp. 19–41, 2023. https://doi.org/10.3991/ijet.v18i05.37021

[23] E. Nirmala, S. Muthurajkumar, and D. Subitha, An efficient privacy-preserving ranked keyword search method, IOP Conference Series: Materials Science Engineering, vol. 1084, no. 1, Mar. 2021, Art. no. 012103. https://doi.org/10.1088/1757-899X/1084/1/012103

[24] Chi Chen, Xiaojie Zhu, Peisong Shen, Jiankun Hu, Song Guo, and Zahir Tari, An efficient privacy-preserving ranked keyword search method, IEEE Transactions on Parallel and Distributed Systems, vol. 27, iss. 4, pp. 951–963, Apr. 2016. https://doi.org/10.1109/TPDS.2015.2425407

[25] R. Zakaria, A. Ahmi, A. H. Ahmad, and Z. Othman, Worldwide melatonin research: a bibliometric analysis of the published literature between 2015 and 2019, Chronobiology International, vol. 38, iss. 1, pp. 27–37, Nov. 2020. https://doi.org/10.1080/07420528.2020.1838534

[26] M. Zhong, J. D. Hunt, and J. E. Abraham, Modeling logistics and supply chain with an integrated land use transport model: PECAS, ICCTP 2009: Critical Issues In Transportation Systems Planning, Development, and Management, vol. 358, pp. 1300-1305, 2009. https://doi.org/10.1061/41064(358)182

[27] A. Andujar, and F. Z. Nadif, Evaluating an inclusive blended learning environment in EFL: a flipped approach, Computer Assisted Language Learning, vol. 35, iss. 5–6, pp. 1138–1167, Jun. 2020. https://doi.org/10.1080/09588221.2020.1774613

[28] A. Başal, and N. E. Kaynak, Perceptions of pre-service English teachers towards the use of digital badges, Innovations in Education and Teaching International, vol. 57, no. 2, pp. 148-162, Aug. 2019. https://doi.org/10.1080/14703297.2019.1649172

[29] J. Martí-Parreño, A. Galbis-Córdova, and R. Currás-Pérez, Teachers' beliefs about gamification and competencies development: a concept mapping approach, Innovations in Education and Teaching International, vol. 58, iss. 1, pp. 84–94, Jan. 2021. https://doi.org/10.1080/14703297.2019.1683464

[30] O. Baydas, and M. Cicek, The examination of the gamification process in undergraduate education: a scale development study, Technology, Pedagogy and Education, vol. 28, iss. 3, pp. 269–285, Mar. 2019. https://doi.org/10.1080/1475939X.2019.1580609

[31] I. Bouchrika, N. Harrati, V. Wanick, and G. Wills, Exploring the impact of gamification on student engagement and involvement with e-learning systems, Interactive Learning Environments, vol. 29, iss. 8, pp. 1244–1257, Jun. 2019. https://doi.org/10.1080/10494820.2019.1623267

[32] B. Huang, K. F. Hew, and C. K. Lo, Investigating the effects of gamification-enhanced flipped learning on undergraduate students' behavioral and cognitive engagement, Interactive Learning Environments, vol. 27, iss. 8, pp. 1106–1126, Jul. 2018. https://doi.org/10.1080/10494820.2018.1495653

[33] C. K. Lo, and K. F. Hew, A comparison of flipped learning with gamification, traditional learning, and online independent study: the effects on students' mathematics achievement and cognitive engagement, Interactive Learning Environments, vol. 28, iss. 4, pp. 464–481, Nov. 2018. https://doi.org/10.1080/10494820.2018.1541910

[34] H. Haruna, Zamzami Zainuddin, Kingsley Okoye, Robin R. Mellecker, Xiao Hu, Samuel Kai Wah Chu, and Samira Hosseini, Improving instruction and sexual health literacy with serious games and gamification interventions: an outlook to students' learning outcomes and gender differences, Interactive Learning Environments, vol. 31, iss. 4, pp. 2392–2410, Feb. 2021. https://doi.org/10.1080/10494820.2021.1888754

[35] J. Mahat, N. Alias, and F. D. Yusop, Systematic literature review on gamified professional training among employees, Interactive Learning Environments, vol. 31, iss. 10, pp. 6747–6767, Mar. 2022. https://doi.org/10.1080/10494820.2022.2043910

[36] S. Brunvand, and D. Hill, Gamifying your teaching: guidelines for integrating gameful learning in the classroom, Coll. Teach., vol. 67, no. 1, pp. 58–69, Jan. 2019. https://doi.org/10.1080/87567555.2018.1518893

[37] Y. Gao, and L. Pan, Learning English vocabulary through playing games: the gamification design of vocabulary learning applications and learner evaluations, The Language Learning Journal, vol. 51, no. 4, pp. 451–471, Jun. 2023. https://doi.org/10.1080/09571736.2023.2217828

[38] C. G. Ruiz, The effect of integrating Kahoot and peer instruction in the Spanish flipped classroom: the student perspective, Journal of Spanish Language Teaching, vol. 8, no. 1, pp. 63-78, 2021. https://doi.org/10.1080/23247797.2021.1913832

[39] S. D. Reyssier, A. Serna, S. Hallifax, J. C. Marty, S. Simonian, and E. Lavoué, How does adaptive gamification impact different types of student motivation over time?, Interactive Learning Environments, vol. 32, no. 10, pp. 6043-6062, 2024. https://doi.org/10.1080/10494820.2023.2248220

[40] R. Z. Cabada, M. L. B. Estrada, J. M. R. Félix, and G. A. Hernández, A virtual environment for learning computer coding using gamification and emotion recognition, Interactive Learning Environments, vol. 28, no. 8, pp. 1048–1063, 2020. https://doi.org/10.1080/10494820.2018.1558256