Linguistic and Philosophical Investigations
ISSN: 1841-2394, e-ISSN: 2471-0881
Vol 23 (1s), 2024
pp.369-382

Gamification Strategies and their Effect on Motivation and Academic Performance in Higher Education: A Literature Review

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Abstract

In higher education, gamification has drawn more attention as a cutting-edge tactic to improve academic achievement and student motivation. The scholarly literature on gamification tactics and their effects on learning outcomes is examined using information gathered from the Scopus database between 2013 and 2023. The increasing interest in this topic is demonstrated by the publications' 30.99% annual growth rate. With contributions from 1,931 writers and 452 papers from 302 sources, research reflects the global scholarly interest in gamification research. The results show that the United States (319 articles), China (309), and Japan (98) are the top three countries in terms of scientific contributions. Important research institutes including the University of Pennsylvania (20), Stanford University (21), and New York University Abu Dhabi (39 contributions) are driving advancements. According to Bradford's Law, the most influential journals are PERSPEKTIVY NAUKI I OBRAZOVANIA, ADVANCES IN INTELLIGENT SYSTEMS AND COMPUTING, and LECTURE NOTES IN COMPUTER SCIENCE. Despite the increase in research, there are still issues, such as inconsistent authorship patterns, regional differences, and a dearth of long-term studies evaluating the efficacy of gamification. To improve engagement, learning results, and educational inclusion, future research should concentrate on interdisciplinary collaboration, empirical validation, and adaptive AI-driven gamification models.

Keywords: Gamification, Higher Education, Motivation, Academic Performance, Learning Strategies.

Publication date: May 12, 2024

1 Introduction

A popular strategy for raising student enthusiasm, engagement, and general academic achievement in higher education is the incorporation of gamification techniques. In educational settings where sustaining student engagement and promoting deeper learning continue to be major issues, gamification—the application of game design principles in non-gaming contexts—has proven especially successful (Zainuddin et al., 2024). Institutions all over are using gamified learning experiences as digital tools and technologies expand to provide dynamic, flexible, student-centered educational models (Moseikina et al., 2022).

Gamification has been shown to boost both intrinsic and extrinsic involvement by combining elements of competition, rewards, progress monitoring, and engagement. This will consequently influence student motivation. These elements align with contemporary learning theories, which underline as basic elements of academic success cooperation, active participation, and fast feedback (Dimitriadis et al., 2020). Furthermore, gamified settings usually include adaptive learning technologies and artificial intelligence (AI) to customize learning opportunities for every student, hence enhancing knowledge retention and original learning (Liu, 2024).

Particularly in STEM fields where problem-solving and ongoing interaction are vital, studies have also demonstrated that gamification reduces dropout rates and increases information retention (Zhao et al., 2022). Studies have shown, for instance, that students' perseverance toward completing difficult tasks is much influenced by their achievements points, leaderboards, and digital badges (Alam et al., 2023). Moreover, gamification's ability to duplicate real-world challenges pushes the development of critical thinking and practical skills, both of which are rather essential for being ready for the work.

The growing number of research articles released lately reflects the growing corpus of information on gamification in higher education. Recent bibliometric studies reveal that the subject has expanded at a pace of 30.99% with publications peaked in 2023 (119 articles), 2022 (94), and 2021 (64). This rise demonstrates how researchers are learning more and more how gamification might revolutionize traditional approaches of instruction. Although this increase suggests that researchers in this area are not regularly active, the research environment is still fractured with a significant proportion of writers only releasing one article (Herman et al., 2020).

Gamification researchers also struggle with the uneven geographical dispersion of their work. Regarding scientific contributions, the Middle East, Europe, and Latin America generate far less research while the United States, China, and Japan top each other. This disparity suggests that institutional rules, technical infrastructure, and resource availability define acceptance of gamification in different educational contexts (Lester et al., 2023). Comparative studies examining how gamification approaches may be fit to different learning settings and cross-cultural research projects assist to bridge these gaps (Zhang et al., 2022).

Computer science courses and improvements in computers and intelligent systems are the most crucial academic resources available for gamification research. demonstrating how gamification is quite multifarious and affects disciplines such education, psychology, artificial intelligence, and computer science (Baumuratova et al., 2024). The profusion of publications on artificial intelligence (AI) suggests that future studies will most likely include gamification mixed with virtual reality (VR), adaptive learning technologies, and AI-driven educational systems.

Although gamification has clear benefits, its long-term use is still debatable. Depending too heavily on extrinsic rewards—such as leaderboards, badges, and points—some research show may ultimately reduce intrinsic motivation and lead to short-term engagement rather than long-term learning results (John et al., 2023). Moreover among the factors influencing the success of gamification are institutional regulations, issue content, and student demography (Huang et al., 2020). Solving these issues and making sure gamification follows research-based teaching approaches depend on further theoretical development and empirical validation.

Scholars should investigate longitudinal studies evaluating the long-term effects of gamification on student progress and cognitive development as the area expands (Behl et al., 2022). One fascinating approach to enhance tailored education is combining gamification with contemporary technology such artificial intelligence (AI) and data-driven adaptive learning. Moreover, expanding research operations beyond technologically developed nations (Oliveira et al., 2023) may assist to ensure international inclusion and access in gamified education models.

Not just a passing trend in higher education, gamification is now a necessary component of the evolving digital learning environment. Future studies should go beyond temporary experimental investigations and concentrate on its wider, long-lasting effects as it might raise student interest, motivation, and retention. To identify potential best practices that may be broadly used, institutions also have to set consistent procedures to assess the efficacy of gamification across many industries (Silic & Lowry, 2020).

This bibliometric study intends to map the research terrain of gamification in higher education by spotting notable trends, powerful authors, and highly cited publications in the field. Analyzing the evolution of gamification research presents significant new perspectives on the effectiveness, challenges, and chances for future innovation in educational institutions. By means of a comprehensive assessment of scientific literature, this study intends to propose a more inclusive and evidence-based approach to gamified learning thereby educate academics, teachers, and lawmakers on best practices for deploying gamification tactics in different educational situations.

2 Materials and methods

Analyzing the quantity and significance of publications on gamification techniques and their effects on academic performance and motivation in higher education, this bibliometric research aimed to Mostly employed for this aim was the Scopus database, which contains content. The research was conducted in February 2025 utilizing certain lines related to the issue of inquiry.

The bibliometric data collected from Scopus (Mcallister et al., 2021) was handled and investigated using the R and VOSVIEWER tools, well-known in research of this kind because of their capacity to display and analyze networks. By means of a descriptive documentary research technique, the scientific output in this field might be characterized emphasizing significant trends, referencing authors, the most prolific countries, and notable organizations (Wang et al., 2024). This approach also let one evaluate indicators like publication growth rates, document typology, and author cooperation patterns (Bawack et al., 2022).

Furthermore investigated were the authors' output and scientific contribution patrones using the Lotka law (Rybski & Ciccone, 2023). Apart from the Bradford law determining the most significant publications in this area of research. At last, important factors like the significance of the sources, the author's connections, and the citation styles were investigated in order to assess the impact and visibility of the study.

Table 1. Variables and descriptors.

Variable	Descriptor
Gamification	“Cognitive technologies”, “Intelligent systems”, “Artificial Intelligence”
Incentive	“Stimulus”, “Purpose”
Performance	“Achievement”, “Progress”, “Academic productivity”, “Effectiveness”
University education	“Higher education”, “University Studies”, “Academic training”, “university”

Source: author using R software based on information from Scopus (2025).

The following search formula is suggested for the Scopus database based on the identification of these components: ("Gamification") TITLE-ABS-KEY Alternatively, "Cognitive technologies" or "Intelligent systems" might be the title-abs-key. OR TITLE-ABS-KEY ("Incentive") AND TITLE-ABS-KEY ("Artificial intelligence") AND TITLE-ABS-KEY ("performance") OR TITLE-ABS-KEY ("achievement") OR TITLE-ABS-KEY ("stimulation") OR TITLE-ABS-KEY ("purpose") Alternatively, ABS-KEY (or "Progress") AND TITLE-ABS-KEY ("University education") OR TITLE-ABS-KEY ("Effectiveness") OR TITLE-ABS-KEY ("Academic productivity") OR TITLE-ABS-KEY (University studies) OR TITLE-ABS-KEY (Higher education) OR TITLE-ABS-KEY ("academic training") OR TITLE-ABS-KEY ("university") AND PAYMENT YEAR > 2012 AND PAYMENT YEAR < 2024.

3 Results

Table 2. Description of main information.

MAIN INFORMATION ABOUT DATA	
Timespan	2013:2023
Sources (Journals, Books, etc)	302
Documents	452
Annual Growth Rate %	30.99
Document Average Age	4.5
Average citations per doc	15.92
References	15005
DOCUMENT CONTENTS	
Keywords Plus (ID)	3287

Author's Keywords (DE)	1410
AUTHORS	
Authors	1931
Authors of single-authored docs	61
AUTHORS COLLABORATION	
Single-authored docs	62
Co-Authors per Doc	4.51
International co-authorships %	18.81
DOCUMENT TYPES	
article	246
book	2
book chapter	10
conference paper	169
conference review	8
data paper	1
editorial	1
retracted	1
review	13
short survey	1

Source: author using R software based on information from Scopus (2025).

The data in Table 2 above provides broad information about scientific productivity in this field of study, showing a 30.99% growth rate in recent years. A total of 302 sources and 452 documents have been recorded, and 1931 writers have contributed to these publications. Similarly, Figure 1 provides a clearer picture of this trend, showing that the years 2023 (119), 2022 (94), and 2021 (64), respectively, have the largest yearly production.

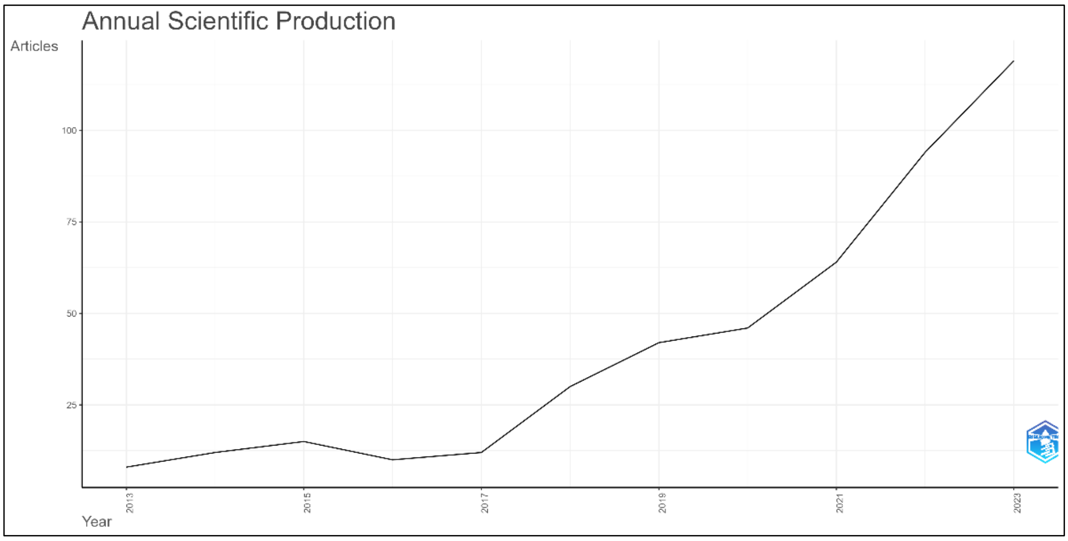

Fig. 1. Annual scientific production, source: author based on information from Scopus (2024).

Laws of bibliometric productivity

Lotka's law provides a clear perspective on the influence of authors on the field of knowledge and is essential for examining the relationship between the number of publications and the number of authors (Wan Liah et al., 2025).

Table 3 shows that 95.9% of the authors have only contributed one work, 3.1% have published two or more, and 0.8% have contributed three or more. Since the majority of authors only contributed one paper, a tiny number of authors contributed more extensively, indicating a strong concentration in scientific activity.

Table 3. Lotka 's Law.

Documents written	N. of Authors	Proportion of Authors
1	1851	0.959
2	60	0.031
3	15	0.008
4	3	0.002
5	1	0.001
6	1	0.001

Source: own elaboration (2025).

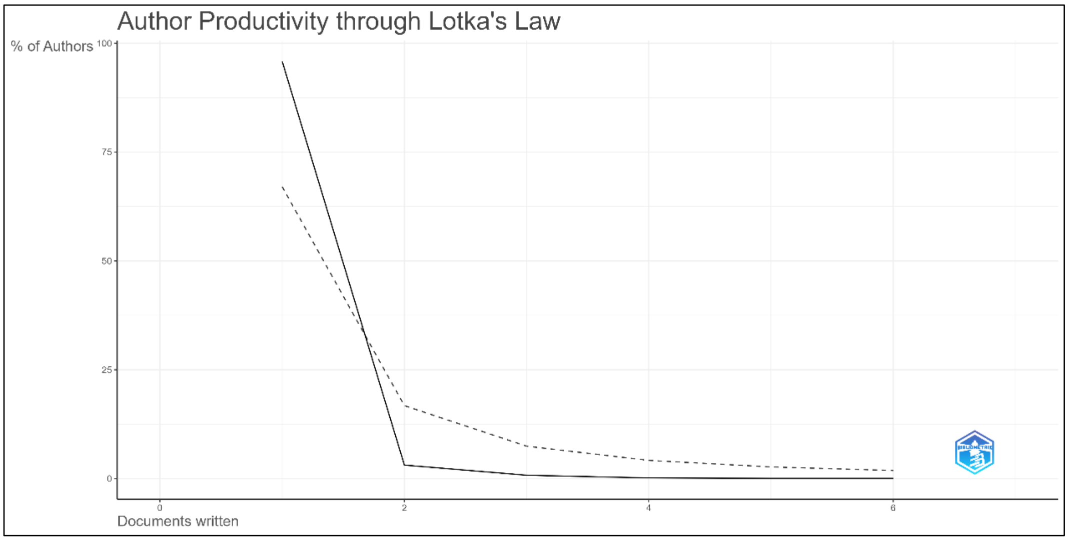

Fig. 2. Lotka's Law, source: author based on information from Scopus (2025).

Based on the frequency of publications on the topic and the percentiles displayed by Bradford's Law—which divides journals into three performance zones, each with an increasing number of journals and a comparable proportion of articles—the most pertinent sources are displayed (Sudhier, 2020). The percentages for each Bradford's Law Zone are displayed in Table 4. With 33.85% of articles, Zone 2 is the group leader, followed by Zone 1 (33.19%), and Zone 3 (32.96%). The most representative journals based on this law are displayed in Figure 3.

Table 4. Bradford's Law.

Zone	No. Magazines	No. Titles	Percentages
Zone 1	29	150	33.19%
Zone 2	124	153	33.85%
Zone 3	149	149	32.96%

Source: own elaboration (2025).

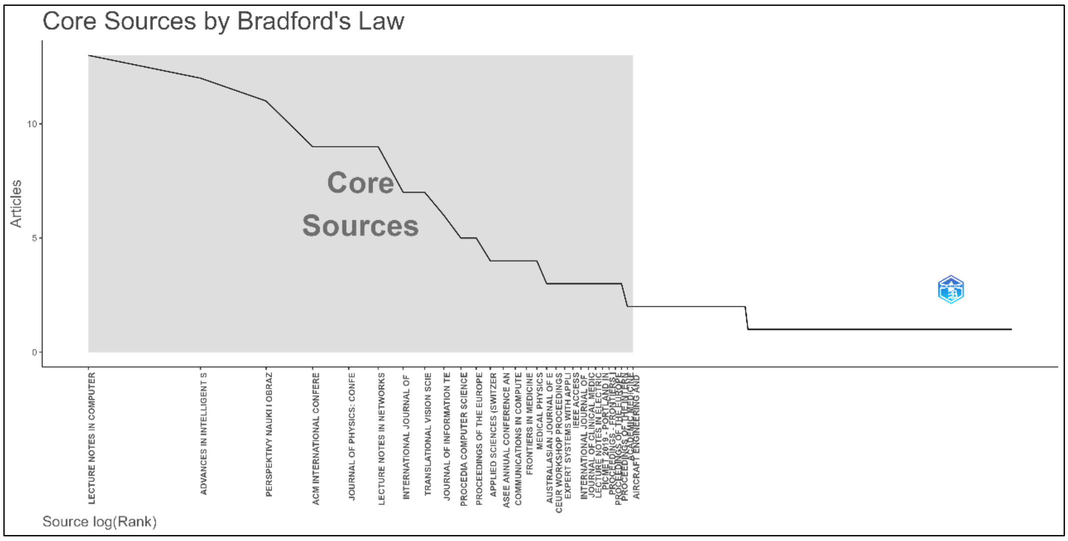

Fig. 3. Bradford's Law, source: author based on information from Scopus (2025).

Bibliometric indicators

With 13 publications, LECTURE NOTES IN COMPUTER SCIENCE leads the field, followed by ADVANCES IN INTELLIGENT SYSTEMS AND COMPUTING (12 publications), and PERSPEKTIVY NAUKI I OBRAZOVANIA (11 publications), as seen in Table 5.

Table 5. Most relevant sources.

Sources	Articles
LECTURE NOTES IN COMPUTER SCIENCE	13
ADVANCES IN INTELLIGENT SYSTEMS AND COMPUTING	12
PERSPEKTIVY NAUKI I OBRAZOVANIA	11
ACM INTERNATIONAL CONFERENCE PROCEEDING SERIES	9
JOURNAL OF PHYSICS: CONFERENCE SERIES	9
LECTURE NOTES IN NETWORKS AND SYSTEMS	9
INTERNATIONAL JOURNAL OF EMERGING TECHNOLOGIES IN LEARNING	7
TRANSLATIONAL VISION SCIENCE AND TECHNOLOGY	7
JOURNAL OF INFORMATION TECHNOLOGY EDUCATION: RESEARCH	6
PROCEDIA COMPUTER SCIENCE	5

Source: own elaboration (2025).

However, Figure 4 compares the output of scientific publications across the nations with the highest number of published papers based on the results of the bibliometric analysis. With 319 documents, the United States is by far the largest producer, followed by China (309) and Japan (98). In comparison to the former, some nations, including Spain and Turkey, exhibit significantly lower production.

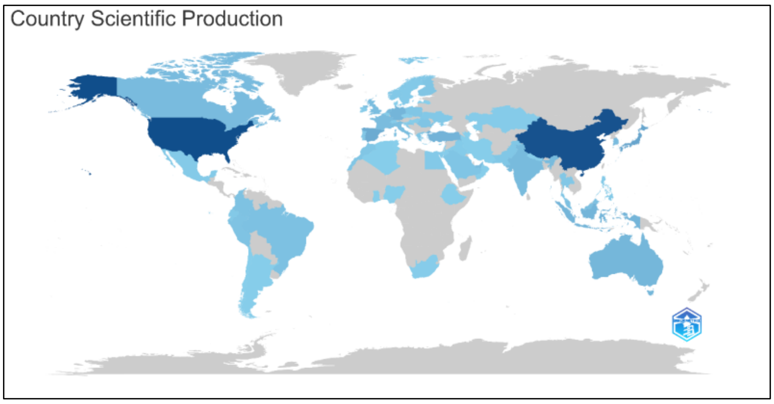

Fig. 4. Scientific production between countries, source: author based on information from Scopus (2025).

Figure 5 presents the institutions that have contributed the most to the study topic. New York University Abu Dhabi has made 39 contributions, followed by Stanford University with 21 and the University of Pennsylvania with 20.

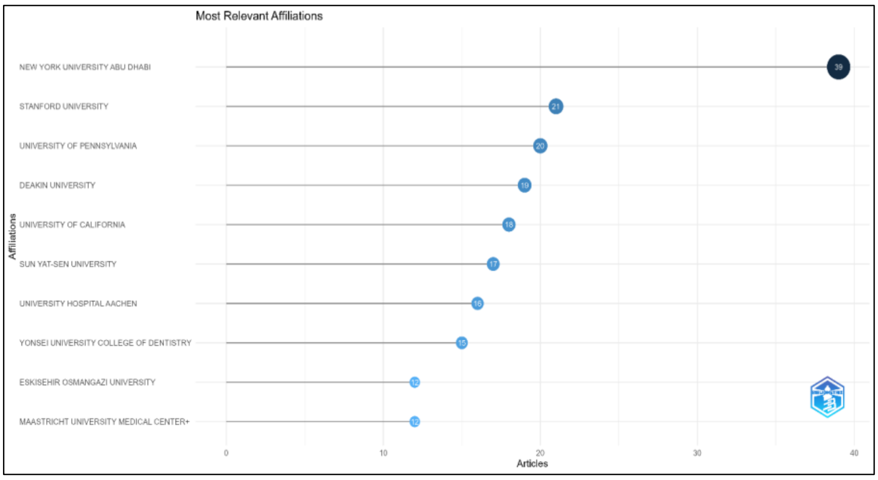

Fig. 5. Most relevant affiliations, source: author based on information from Scopus (2025).

The frequency index is used as a reference to quantify production per researcher in a different order of ideas. Figure 6 illustrates the leadership of LIU Y with six (6) contributions, followed by SOBOLEVA EV with five (5) and LIU X with four (4).

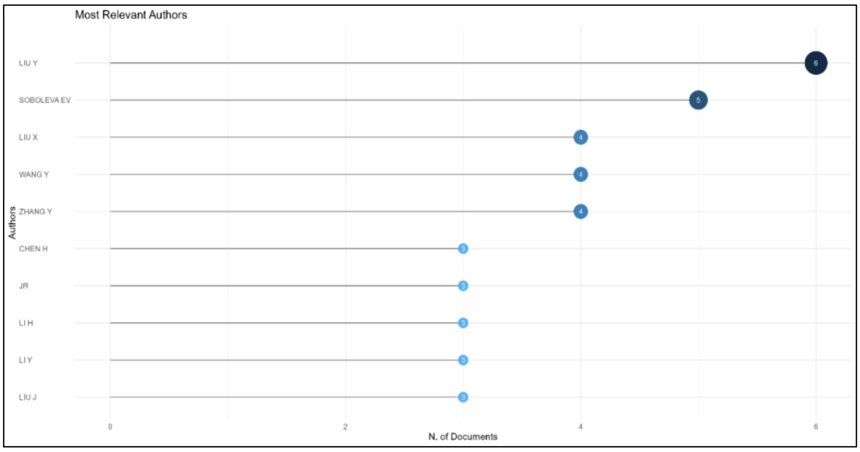

Fig. 6. Most relevant authors, source: author using R software based on information from Scopus (2024).

The twenty most cited articles related to the study's subject are shown in Table 6. ASTERIS PG (2021) in CEM CONCR RES, with 370 citations, ALYAHYAN E (2020) in INT J EDUC TECHNOL HIGH EDUC, with 329 citations, and FUJISAWA Y (2019) in BR J DERMATOL, with 231 citations, are the three publications that stand out the most.

Table 6. Most cited articles.

Articles	TWO	Total Citations	TC per Year	Normalized TC
ASTERIS PG, 2021, CEM CONCR RES	10.1016/j.cemconres.2021.106449	370	74.00	25.14
ALYAHYAN E, 2020, INT J EDUC TECHNOL HIGH EDUC	10.1186/s41239-020-0177-7	329	54.83	9.56
FUJISAWA Y, 2019, BR J DERMATOL	10.1111/bjd.16924	231	33.00	11.05
DHAMIJA P, 2020, TQM J	10.1108/TQM-10-2019-0243	226	37.67	6.57
IFENTHALER D, 2014, TECH KNOWL LEARN	10.1007/s10758-014-9226-4	159	13.25	5.48
ESSEL HB, 2022, INT J EDUC TECHNOL HIGH EDUC	10.1186/s41239-022-00362-6	138	34.50	12.92
THORNHILL-MILLER B, 2023, J INTELL	10.3390/jintelligence11030054	132	44.00	14.32
FELSZEGHY S, 2019, BMC WITH EDUC	10.1186/s12909-019-1701-0	124	17.71	5.93
HIEN HT, 2018, ACM INT CONF PROC SER	10.1145/3287921.3287937	123	15.38	7.70
YANG H, 2020, J CLIN MED	10.3390/jcm9061839	112	18.67	3.25
TERZOPOULOS G, 2020, INFORMATICS EDUC	10.15388/infedu.2020.21	104	17.33	3.02
WILLIAMSON B, 2019, BR J EDUC TECHNOL	10.1111/bjet.12849	99	14.14	4.74
CAIN J, 2015, AM J PHARM EDUC	10.5688/ajpe79447	95	8.64	5.84
FOSSACECA JM, 2015, EXPERT SYS APPL	10.1016/j.eswa.2014.12.040	90	8.18	5.53
PRAHS P, 2018, GRAEFE'S ARCH CLIN EXP OPHTHALMOL	10.1007/s00417-017-3839-y	89	11.13	5.57
COVERING IN, 2020, FRONT PSYCHOL	10.3389/fpsyg.2020.01063	88	14.67	2.56
RIVERA ZB, 2019, MACH	10.3390/machines7020042	86	12.29	4.11
KONG F, 2020, INT J EMERG TECHNOL LEARN	10.3991/ijet.v15i13.15351	82	13.67	2.38
EDELEN AL, 2016, IEEE TRANS NUCL SCI	10.1109/TNS.2016.2543203	77	7.70	4.03
KHANDELWAL P, 2017, INT J ROB RES	10.1177/0278364916688949	77	8.56	3.37

Source: author using R software based on information from Scopus (2025).

Analysis of relationships and co-occurrences

The terms with the greatest impact are finally grouped by co-occurrence in Figure 7, which shows the cluster analysis using VOS VIEWER. Key terms related to the field of knowledge examined in this study include "Artificial intelligence," "Education," "Machine Learning," "Human," "Students," and "Gamification."

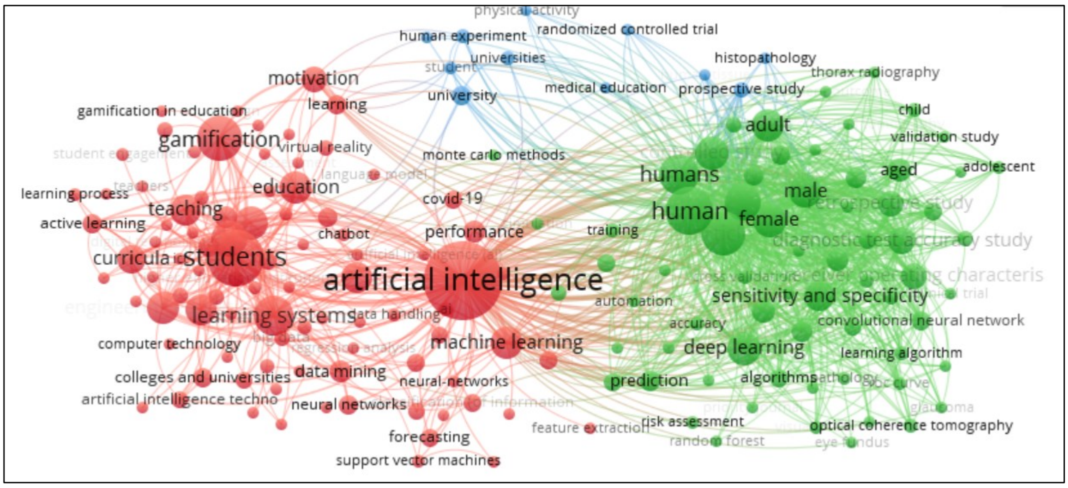

Fig. 7. Co-occurrence of keywords, source: author based on information from Scopus (2025).

4 Discussion

The results show how gamification techniques and their effects on academic performance and motivation in higher education are gaining attention from scholars. With 452 recorded documents from 302 sources, the field has grown at a pace of 30.99% in recent years, suggesting that gamification is becoming more widely accepted as a teaching method. The increase of publications, especially in 2023 (119), 2022 (94), and 2021 (64), is indicative of a growing focus on advances in digital learning and engagement-driven teaching methods (Yue, 2023).

Authorship patterns show a significant level of fragmentation despite the growth of research. Lotka's Law states that 95.9% of authors have only written one study, 3.1% have written two or more, and only 0.8% have written three or more. This implies that although gamification is garnering a lot of scholarly interest, there is still little continuous research involvement (Pasca et al., 2021). The topic has advanced thanks to a small group of authors, such as LIU Y (6 contributions), SOBOLEVA EV (5), and LIU X (4). Nevertheless, the absence of consistent contributions from a larger academic community may impede the creation of long-term theoretical frameworks and empirical research.

A fairly balanced distribution of papers across various journals is demonstrated by Bradford's Law, which offers insights into the most significant academic sources (Esh & Ghosh, 2024). With 33.85% of publications, Zone 2 is in the lead, followed by Zones 1 (33.19%) and 3 (32.96%), suggesting that the body of research is widely distributed throughout several publication sources. ADVANCES IN INTELLIGENT SYSTEMS AND COMPUTING (12), PERSPEKTIVY NAUKI I OBRAZOVANIA (11) and LECTURE NOTES IN COMPUTER SCIENCE (13 publications) are the most representative journals. The popularity of journals devoted to computer science and intelligent systems indicates that research on gamification in higher education is strongly related to developments in artificial intelligence, adaptive learning models, and technology.

The United States is the top contributor (319 papers), followed by China (309) and Japan (98), according to a regional study of research output. These nations' dominance is consistent with their intense concentration on digital transformation and educational technology in higher education (Mohamed et al., 2022). However, production is far lower in European nations like Spain and Turkey, indicating regional differences in gamification research and application. The University of Pennsylvania (20), Stanford University (21), and New York University Abu Dhabi (39 contributions) are the top research institutions in the field, demonstrating the importance of esteemed academic institutions in fostering innovation in gamified learning techniques.

The citation analysis also emphasizes how important studies have shaped the conversation around gamification in higher education. FUJISAWA Y (2019) in BR J DERMATOL (231 citations), ALYAHYAN E (2020) in INT J EDUC TECHNOL HIGH EDUC (329 citations), and ASTERIS PG (2021) in CEM CONCR RES (370 citations) are the most cited publications. These studies have had a big impact on current debates about how gamification affects digital learning environments, information retention, and student engagement (Taşkın & Kılıç Çakmak, 2022).

Subsequently, major study themes are revealed by keyword co-occurrence analysis using VOSviewer. Terms like "Artificial Intelligence," "Education," "Machine Learning," "Human," "Students," and "Gamification" dominate the area. This implies that as AI-driven learning, adaptive technologies, and human-centered digital education models develop, so does gamification research (Hare et al., 2025).

There are still a number of obstacles in the way of the growing field of gamification in higher education. The field's capacity to establish standardized best practices is hampered by the dearth of longitudinal studies evaluating the long-term effects of gamification on academic performance. Furthermore, geographical differences in research output imply that the adoption of gamification varies among educational environments (You & Sanmugam, 2024). To further improve engagement, motivation, and academic results in higher education, future research should give priority to cross-regional comparisons, empirical case studies, and AI-driven gamification models.

We can assume regarding this analysis that while gamification is becoming more and more important in education, it also emphasizes the necessity for ongoing research, global inclusivity, and workable implementation strategies to optimize its long-term educational benefits (Barca & Tripaldi, 2024).

5 Conclusions

This bibliometric research supports the increasing scholarly interest in gamification as a means of improving academic performance and motivation in higher education. With 452 documents from 302 sources and a growth rate of 30.99%, the field has attracted a lot of attention, especially in 2023 (119 publications), 2022 (94), and 2021 (64). This pattern is indicative of a larger movement toward student-centered, interactive learning approaches that make use of digital tools and engagement-boosting tactics.

Even with the growing amount of research, authorship patterns are still very dispersed. Only 0.8% of writers produced three or more publications, compared to 95.9% who contributed only one, suggesting little persistent research involvement. More long-term investigations are required to create strong theoretical and empirical foundations, notwithstanding the major contributions of scholars like LIU Y (6 publications), SOBOLEVA EV (5), and LIU X (4). The prevalence of a small number of recurrent writers indicates that there isn't a wide-ranging, ongoing research network in gamification, which could impede the creation of standardized best practices for its application in the classroom.

Leading journals including LECTURE NOTES IN COMPUTER SCIENCE (13 publications), ADVANCES IN INTELLIGENT SYSTEMS AND COMPUTING (12), and PERSPEKTIVY NAUKI I OBRAZOVANIA (11) demonstrate that gamification research is dispersed across several fields. This highlights the necessity of interdisciplinary cooperation by demonstrating a strong overlap between gamification, artificial intelligence, and adaptive learning systems. Even though gamification is becoming more and more popular, its uses vary greatly among academic fields, and more research is still needed to determine how gamification techniques can be most effectively applied in various educational contexts to maximize learning results.

There is a very concentrated geographic distribution of research, with the United States, China, and Japan at the forefront and little input from Europe, Latin America, or the Middle East. While lower-research-producing nations might not have access to finances or institutional support for gamified education programs, this shows that gamification adoption and research efforts are stronger in technologically sophisticated locations. Promoting further contributions from underrepresented areas will guarantee that the results are applicable in a variety of educational contexts and contribute to a more internationally inclusive understanding of the effects of gamification.

The citation analysis demonstrates the influence of important works, including FUJISAWA Y (2019), ALYAHYAN E (2020), and ASTERIS PG (2021) influencing the scholarly conversation. Future study may continue incorporating digital innovations into higher education practices, since the term co-occurrence analysis further demonstrates a significant connection between gamification, AI, and machine learning. More research is needed to determine how well AI and machine learning improve long-term academic achievement and student engagement beyond the novelty impact, despite their growing use.

There are still some challenges to be solved even if gamification research is expanding. Absence of long-term empirical research restricts our knowledge of how gamification affects information retention over time and academic performance. Regional differences draw attention to even more the need of further worldwide study to evaluate gamification's success in various learning settings. Studies on best practices for effective integration into courses are crucial as adopting gamification components without a better pedagogical foundation increases the risk of a superficial implementation.

Future study should concentrate on extending longitudinal studies to assess the effects of gamification on academic performance and information retention over long run. Combining concepts from neuroscience, artificial intelligence, psychology, and education would let them also improve transdisciplinary collaboration by means of more successful learning models. Moreover important is worldwide involvement to guarantee that gamification strategies are flexible enough to be used in many educational settings.

Gamification has demonstrated to be a useful tool in higher education; yet, fragmented research efforts, geographical differences, and the requirement of long-term studies pose challenges. By tackling these obstacles, gamification will maintain improving learning outcomes and student motivation wherever by means of cooperative, multidisciplinary, and internationally inclusive research. Emphasizing empirical validation and guaranteeing true pedagogical integration would assist future research to leverage gamification's possibilities as a changing instrument in education.

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