Review Article

A comprehensive bibliometric review of gamified learning in higher education

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ARTICLE INFO	ABSTRACT
	This article has crafted a detailed bibliometric review of gamified learning in higher education which provides the reader a broad scientific background and an overview of relevant publications and their up-to-date status in this growing domain. The study examines the spread of publications over the time, revealing a development of a dynamic curve from minor to peak in 2021, and then leveled-off of activity in the rest of the years. There is special focus on high-achieving authors and institutions that are praised by the work for their key contributions to the field of gamified learning research. The aspect of global geographical distribution of gamified learning studies in the literature is expounded. While the USA and Turkey rank first in this regard, they also head the discourse. The role of key journals and a citation analysis provide the evidence of the highly reputable and established place the gamified leaning has in higher education. This bibliometric review offers important information about the multifaceted aspects of gamified learning and subsequently may be used by future researchers to dig deeper and contribute to the literature. **Keywords:** gamified learning, higher education, bibliometric review

INTRODUCTION

Gamified learning is an instruction approach involving the use of gaming aspects in a learning setting to enhance interaction and involvement (Chen et al., 2023). It strives to inspire students in learning and promote their improvement of a given academic performance according to Thurairasu (2022). Supporting the benefits

of gamification in education are its positive impacts on students' learning experience, motivation and academic achievement (Huang et al., 2023). Techniques and theories used in gamified learning include multi-representational scaffolding, flow (Elshorbagy et al., 2022). Social constructivism to support the process of learning as well as increase student participation. On the whole, gamified learning is a revolutionary method that uses gaming aspects to increase engagement and efficiency in students' lives as stated by Abu-Hammad and Hamtini (2023).

The concept of gamification related to higher education is explained in the following way It means here utilization of game design elements within non-game activities with a goal to make these more effective by stimulating students' motivation and engagement (Khaldi et al., 2023). It includes the working with game mechanisms, dynamics and aesthetics of perception and interaction; social communication in a gamified environment based on special types of gaming tools (Gupta & Sawhney, 2023). Gamification mainly includes points, badges, leaderboards levels and feedback challenges in addition to storytelling. In the field of higher education, gamification approaches concentrate on adaptability and individuality with more focus on structural gamification rather than what refer to as content gamification (Limantara et al., 2023). However, there are no ready-to-proven design approaches and an all-panacea approach that fits the bill in every gamification contextual moment. There are very few empirical studies that rely on motivational theories or integrate a theoretical gamification framework to construct an e-learning system (Irwanto et al., 2023).

The components of gamification have been researched for higher education in various ways. A widely discussed issue is the application of gamification, in particular how it facilitates or hinders students' gains and satisfaction. These factors have been investigated in several studies establishing the fact directly how gamification intervention is related to engagement and knowledge of students, as well indirectly, through satisfaction achieved by impacting with help of this application on these dual values–knowledge and engage (Swacha, 2022). Research on educational gamification is another popular topic analyzed using the words most frequently used. The analysis of keywords showed the prevalence in unobvious relevance and shares imbalances dedicated to different aspects of gamification (La Cruz et al., 2023). Furthermore, the application of gamification techniques when teaching mathematical disciplines has been pointed out as being an efficient form to enhance university quality education (Vergara et al., 2023). Yet, information about the effects of gamification on motivation and academic performance during teaching English as a foreign language has also been thoroughly discussed showing positive influences upon student's drive, language learning. On last note on the review of gamification in digital English learning environments, it has been demonstrated that gamification manages to improve personal educational experiences and outcomes pleasantness, attractiveness motivation and enjoyment as these are real desirable quality (Huseinović, 2023).

Gamification in higher education is drawing much attention as a means to boost student engagement and learning outcomes. Different gamified learning systems have employed a range of game elements, such as points card badges ranking or positioning leaderboards levels feedback challenges storytelling (Khaldi et al., 2023). As one might have expected, a bibliometric analysis of gamification in higher education revealed that Africa has the most geographical scientific gap (Irwanto et al., 2023). The use of gaming activities that are integrated into course curricula has had some positive effects related to their motivation levels and effectiveness as students (Chugh & Turnbull, 2023). In spite of everything, use of gamification in higher education remains a field far from being explored totally now; there are just disciplines that adopt it (Rueda et al., 2023). Vrcelj et al. (2023) stated that the use of gamification in higher education has been found to have a tremendous impact on the teaching-learning process, increase learning outcomes and effective learners as well motivated learn.

The influencers on students' inclination to enjoying gamified apps as auxiliary learning techniques are also studied, where technology acceptance model (TAM) is merged with technology readiness conceptually (Naseri et al., 2023). Furthermore, research has been into the use of gamifying methods in instruction mathematics disciplines offices coping with aspects pertaining to principles involved gaming involvement design structural components and pedagogic conditions (Katerzhina et al., 2023).

Objectives of Study

The aim of this study to present bibliometric review of gamified learning in higher education. Research questions are, as follows:

RQ1. What are the publication trends in gamified learning research within higher education?

RQ2. Which keywords are most frequently used in this field?

RQ3. What are the most productive institutions and countries contributing to research on gamified learning in higher education?

LITERATURE REVIEW

Many peer-reviewed journal research studies have been conducted about gamified learning in education (Alcedo et al., 2022; Cespón & Lage, 2022; Hidayat et al., 2024; Kara, 2021; Magpusao, 2024; Vrceljet al., 2023). Li et al. (2023) reviewed different game-based learning approaches and their usage in the area of education through application fuzzy analytical hierarchy process (FAHP) and evaluation using distance from average solution (EDAS) for comparing rating procedure to find out the most efficient technique. Othman et al. (2023) analyzed the influence of factors on the intention to use gamification during online classes applied TAM and found a positive impact on students' participation discretion, engagement. Rueda et al. (2023) conducted a literature review on the use of gamification in higher education and revealed that it has positive impact towards student learning, but concept requires more research. La Cruz et al. (2023) carried out a review of gamification in digital English learning environments and the results revealed positive impacts on student motivation, enjoyment, or language learning outcomes. Hu and Razlog (2023) researched the attitude of students regarding games as a learning tool in one university at South Africa, concluding that it was quite motivating and enhancing their involvement academic performance; knowledge base as well.

Gamified teaching is considered to be one of the most popular methods in higher education that stimulates learning motivation and involvement by making students' study process fun, active, results-oriented (Subhash & Cudney, 2018). Recent research studies have focused on mobile educational games used in higher education with special emphasis on teaching programming principles and English learning (Yang, 2023). These studies are targeted at assessing the efficacy of gamified teaching in terms of engaging students and enhancing their performance during learning. This research is focused to observe the influence of gamified teaching on English advanced vocational learners' learning performance and interest by developing suggestions for enhancing them according to Yang (2023). As such, there are research of peer-reviewed journal that look into gamified learning use in higher education, especially focusing on programming and English language training.

There has been peer-reviewed journal research studies on gamified learning in higher education. Vylkova (2023) positions her arguments in favor of the necessity to make gamification larger in higher education and offers an innovative solution–on how to organize educational process called it as a method following, the name 'VIRTUOZ method'.

According to Zainuddin (2023) a study carried out determined that the use of quizzes in teaching college students with allusion-to gamification during the COVID-19 pandemic enhance student interest and upsurge learning achievement. Kalogiannakis et al. (2021) critically examined published works and investigates the technical capacity of gamification as an attitude to enhance learning, with surveys showing favorable attitudes from educators and their students.

A detailed framework of a global gamification strategy in higher education and an instance of the implementation is given by Krath et al. (2021) also presenting statistically significant results that show how students' engagement and knowledge behavior undergo changes after using gamified instructional activity.

Some studies have looked into the value and efficacy of ludic methodologies based on learning and knowledge technology for use in online teaching. They also researched the scientific activity associated with gamification in terms of higher education, defining trends, maps for collaboration and geographical gaps. Also, research has been undertaken to address the problem of low completion rates and high dropout in online and distance learning through playful approach as well as gamification (Sumer & Aydin, 2022). These studies found that gamification has increased students' participation, academic performance and had positive effects on learners' motivation and engagement in online as well as distance learning program. Thus, gamified learning in higher education has been a discussed issue and subject to study for peer-reviewed journal research studies.

METHODOLOGY

In this paper, a bibliometric search was carried out using methodology of Zupic and Čater (2015). This phase was characterized by determining the study design, conducting, analyzing, visualizing and communicating results. The availability of the Scopus database was made possible through subscription and licensing deals alongside Elsevier. The search was carried out in the Scopus database by means of a strategy comprising keywords within the keyword section in the database. The keywords were required from the literature (gamified learning, higher education, and bibliometric review), and the operators "AND" or "OR" were used. There was a total absence of rules concerning the nature of documents, the year of creation, or the language. However, titles, abstracts, and keywords required a translation into English being ensured. The searching for and confinement information were done on 20 February 2024.

We had 179 of studies that fell into the inclusion criteria and thus the samples size. It was found through filters that 67 articles that pen the application of gamification in the university system. This study was later recreated in RIS format for VOSviewer 1.6.8 visual analytics software. The software made both charts and statistics, which were used to describe how the tables would be formed and study interpretation in the research conduct discussion part.

Data analysis was performed by considering annual scientific production, most prolific authors and institutions, most productive countries, institutions, most influential journals, collaboration map by country and the collaboration network by country and authors. The taken threshold was 11 authors, 10 countries, and 13 journals of the highest scientific production. This selection was made at the sole discretion of the researcher with reference to already published bibliometric studies.

The main mechanism and approach employed in the bibliometric review of gamified learning in higher education that is systematic and systematic follows closely the steps of a rigorous methodology meant to reflect the many-sided and deep nature of scholarly contribution in this evolving field. The key data for the study are provided as from the Scopus academic database. Managing of research strategy is carried out with the help of a full set of keywords and terms related to gamified learning and higher education. The initial search is conducted across the specified sources, which return a large volume of the relevant articles that are then put through the predefined screening process to identify those that match our inclusion and exclusion criteria. The research features the in-exclusion criteria aim at articles of the year from peer-reviewed journals, articles in English and papers without any scouring of the gaming application in higher educational institutions. At the same time, only the teaching sources and information coming from the established scientific sources are admitted to keep the review of the required academic standards. To this end, the second stage involves data mining, where characteristic information, for instance, the author or the publication year as well as the journal and citation count will be meticulously recorded one-by-one. Moreover, abstracts and keywords are subjected to analysis in order to have a closer look at what exactly each article deals with. Citational analysis is perhaps the core aspect of this study since it helps with tracing ground-breaking works by others and also demonstrating relation between these works. A network evaluator is also employed to define co-authorship and institutional alliances within the gamified learning community.

This paper presents a critical and bibliometric analysis of the current studies on gamification in higher education; providing the reader a broad scientific background and an overview of relevant publications and their up-to-date status in this growing domain.

RESULTS

Growth of Publications Over Time

Gamified learning in higher education has been the growth rate of publication in time, is significant but dynamic showing an interest burgeoning scholarship for this innovative approach. This year embarked in a modest growth that saw the emergence of two articles, which are an early phase for research. Despite this, a fast rise in the rate of publications followed; three articles were published on these two years as an indication increased awareness regarding gamified learning within higher education sector. Starting from 2018, the momentum that was already gained in this field rose higher as five articles were issued to express a more
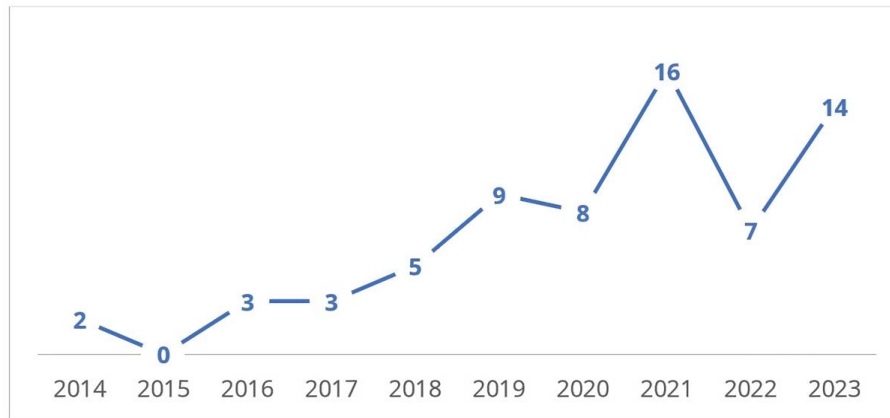
**Figure 1.** Distribution of publications over time (Source: Authors)
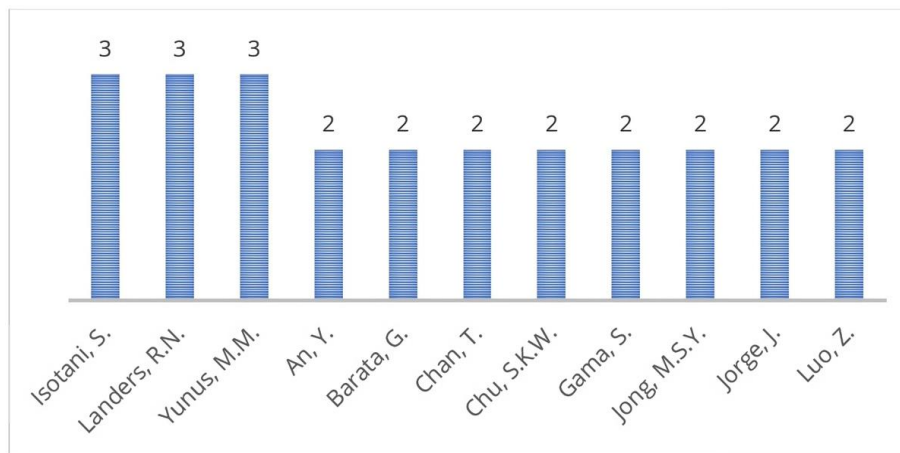
Figure 2. Distribution of most prolific authors (Source: Authors)

dynamic era of scientific article writing and discovery. The years that followed saw a dramatic increase in publications; nine articles were published in 2019, and eight papers came out the following year. This trend suggests consistent growth with an upward slope Yet, the year of 2021 became a period when there was an impressive jump with about sixteen articles published in this area, which constituted an absolute peak for research showing interest and productivity concerning gamified learning. In 2023, the number of published articles was impressive–as much as a dozen. There was an insignificant decline in publications just one year ago when seven papers were put into circulation. Thus, even during that short period, the field remained quite active and lively throughout this timeframe after so many years of its developmental taking-off phase earlier on among mainstream areas taken together, the data throws into relief gamified-learner research in high education; hence its transcendent growth. This shows that shell sheds everyone is some of which will shape future practices with time to come while teaching everything based on it (**Figure 1**).

Most Prolific Authors & Institutions

Through analysis of the most productive authors in the area of gamified learning at higher education context, a few research stand out as having published major papers undergone literature. Three authors who figure as the most prolific scribes in this field include Isotani, S., Landers, R. N., and Yunus, M. M., each with three entries to her/his name. The fact that they have been regularly contributing to the knowledge base on gamified learning in higher education, by publishing peer-reviewed papers and proceedings has shown their consistency as a proof of commitment. The authors of this section have shown a continuous scholarship in the area, thus supplementing gamified learning research discourse with their varied views and observations. This set of prolific authors as a whole, therefore, has contributed greatly to the literature on gamified learning in higher education; thus, making it vital for understanding their importance and contribution to this emerging domain (**Figure 2**).
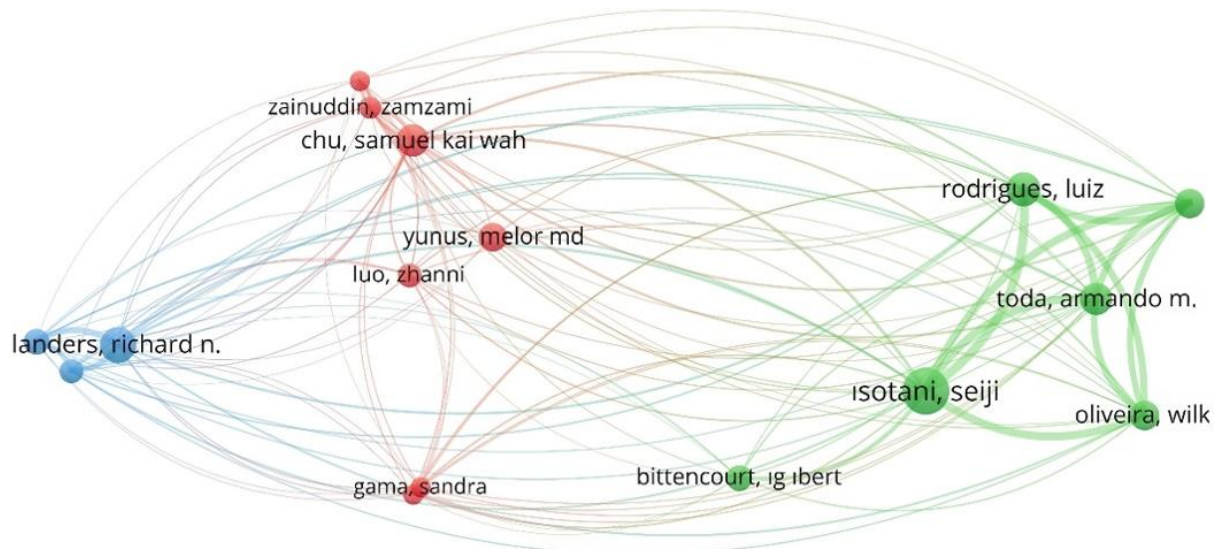
Figure 3. Networks between most prolific authors (Source: Authors)

Besides this, **Figure 3** shows networks between most prolific authors. **Figure 3** depicts a network graph that maps the collaboration between different individuals, and this collaboration comes as a result of contribution of their research in gamification of learning as a student at higher education. Nodes symbolize authors and edges signify cooperation or joint citation links. The color of the nodes demonstrates the authors' country of affiliation, while size of the nodes shows the college count attached to it. In that context, the graph of the network is a useful instrument for mapping out the areas of investigation in the field of higher education research for the use of gamification. It discloses clustering of different institutions, pinpoints the leading scientists in the field and provides insights into the map of activities in different places. Such data is important in capturing the knowledge flow dynamics and has potential of discovery of new areas for the collaboration between researchers.
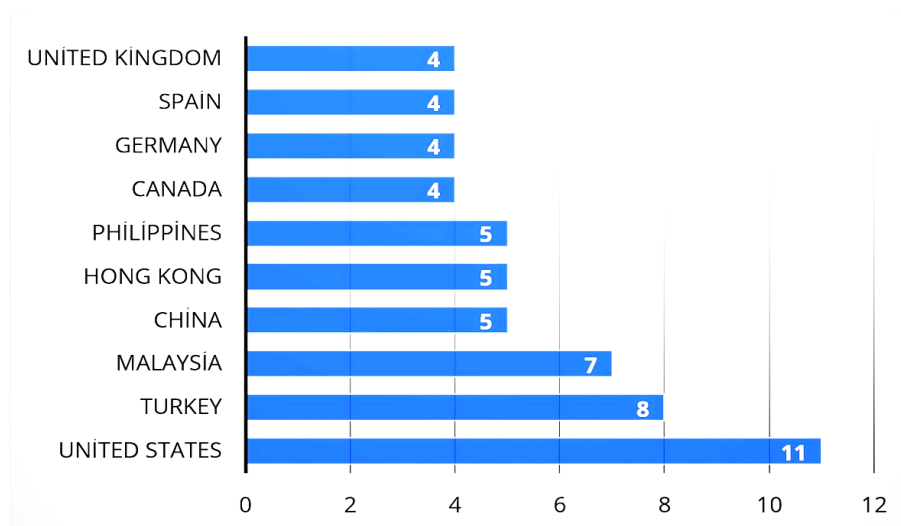
Geographical Distribution of Studies

The study of predominant countries in this kind for gamified learning term- give a variety climate to research donations. However, the USA is regarded as a leader country that published 11 documents, which reveals its foremost position in shaping scholarly discourse on this topic. But in close pursuit is Turkey with eight documents, reinforcing the country's profound impact on literature regarding gamified learning application for higher education. Similarly, countries such as Malaysia, China, Philippines, and Hong Kong each have five documents that indicate the significant contribution in research emanating from these areas. Canada, Germany, Spain, and the UK also show more significant contributions as they generate four documents each which reflect their participation in international level research on gamified learning. Taken together, the foregoing countries therefore reveal a universal implication of gamified learning research in higher education that portrays significant involvement as well as participation with this pedagogical innovation on an international level (**Figure 4**).

Figure 5 demonstrates the connections between countries. There has been a central group of authors within the pool of researchers with citations to commonly re-occurring articles and shared words (as seen in the density plot). The results are illustrated visually using large nodes for the most prolific scholars and coloring based on distinct investigations' locations across the globe. Such situation reveals a process of knowledge translation between and across the disciplinary groups in which researchers from distinct regions make their own inroads to mainstream ecological economics.

Most Influential Journals

The analysis starts with major journals within this field and goes down to publications presented at international conferences. Some key literature is revealed by looking into these sources, all reinforcing each other's validity as representatives of significant body knowledge about this issue area.

**Figure 4.** Geographical distribution of publications (Source: Authors)
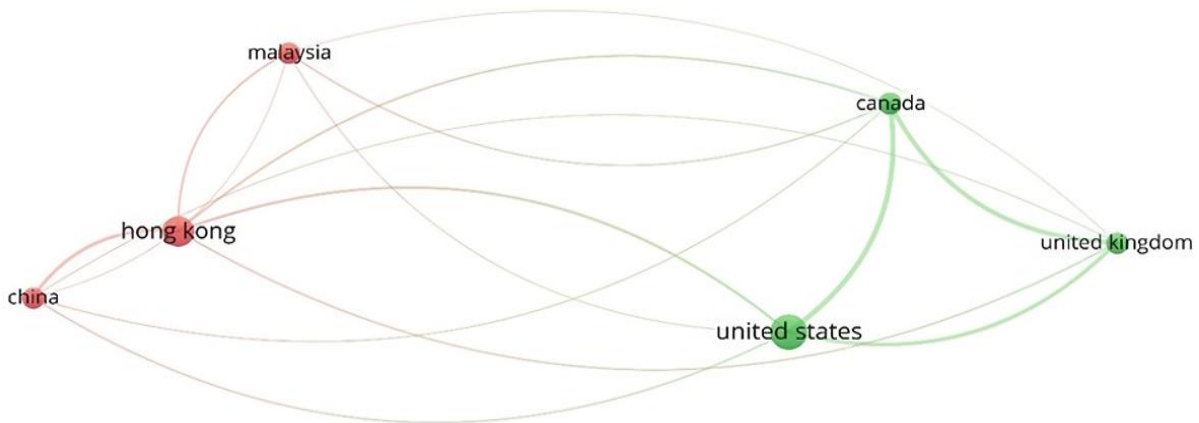
Figure 5. Networks between countries (Source: Authors)

The largest amount of gamified learning articles is dedicated to the journal "Education and Information Technologies", as there are four publications in this area. It means that this issue should be took into consideration first because it covers significant contributions on research about gamification out of all similar periodicals at hand. Their close follow-up are "Computers in Human Behavior," "Frontiers in Education," "International Journal of Game Based Learning", "Simulation and Gaming", and "Sustainability Switzerland," each with a total contribution of three published articles that reflect their worthy admirable presence within such scholarly articulations on gamified The impact of these four journals namely, "IEEE Transactions on Learning Technologies," "International Journal of Emerging Technologies in Learning," " International Journal of Information and Education Technology," and " International Journal of Scientific and Technology Research" are confirmed by two articles each.

Moreover, there has been one paper published on the topic of gamified learning in each: "ACM Transactions on Computing Education," "Accounting Education," and "Active Learning in Higher." Thus, they have helped to broaden dissimilarity while bringing forth important contributions from their perspectives. As a whole, these leading journals have deemed to be the cornerstones in facilitating knowledge dissemination regarding gamified learning and also act as primary scholarly debate grounds (**Figure 6**).

Citation Analysis

The citations of research on gamified learning in the higher education demonstrate a steady, vast growth forward impact and prestige for this specific sphere. In 2015, the total number of references equaled to ten and it such a level reveals moderate interest and involvement in early works related to this field.
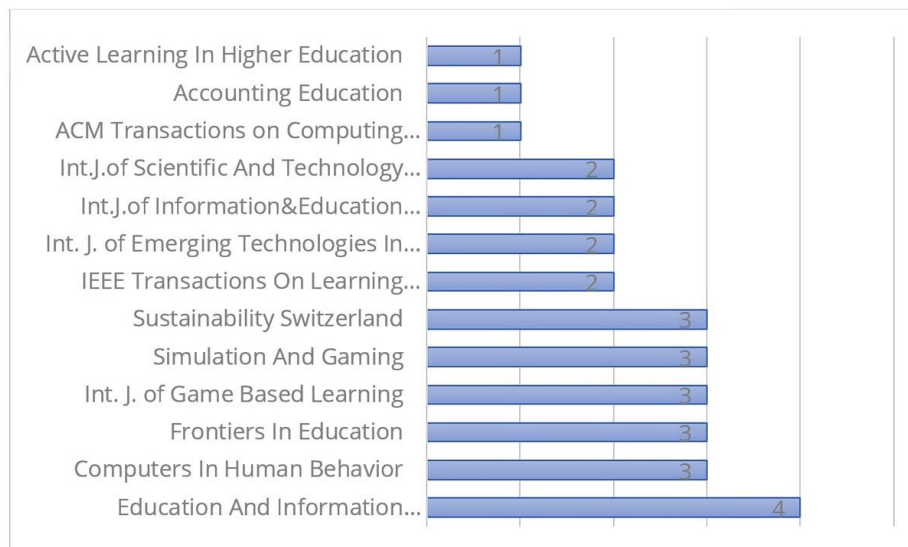
Figure 6. Distribution of most influential journals (Source: Authors)
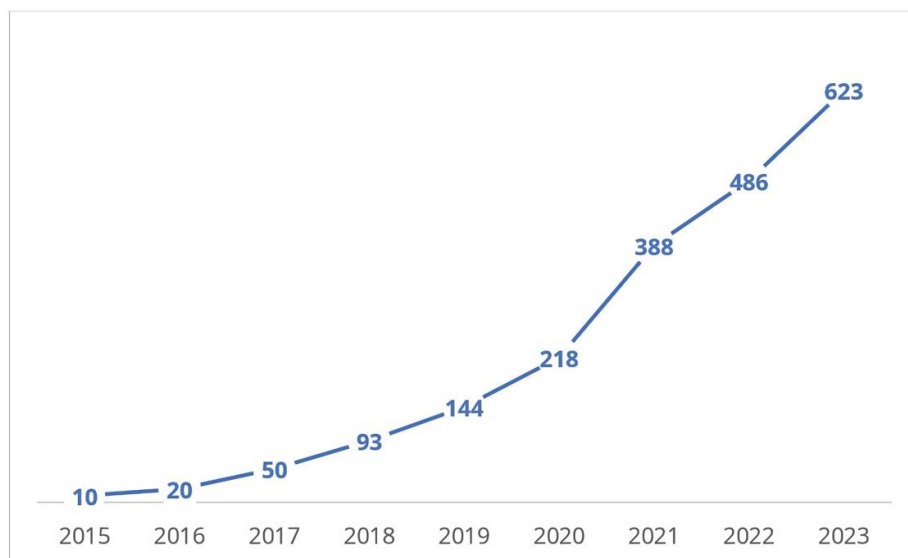
Figure 7. Number of citations over years (Source: Authors)

Nevertheless, this figure almost doubled in 2016 and it accounted for as many as twenty citations that means there was now a growing interest in the research based on gamified learning. In the following years, there was a significant jump in citations observed to be 50 citation points for 2017. This rising trend was seen in 2020 as well, where the citations increased to 218 and by year-end of 2019, close almost doubled into gamified learning that a period now when is really popular for learnings through games. The wave continued to climb in 2019 and above all the number of citations reached at a remarkable figure, which was again stepped up during following year, with respectively encounter 486 and prevailing trend 623. Summing up, the conducted citation analysis reinforces gamified learning research's rising significance in higher education to reflect its gradual popularity among scholars (**Figure 7**).

Top-Keywords & Concepts

The word cloud created for the field of gamified learning compares with higher education turned up some critical keywords that were seemingly topical or pertinent in this area. In his turn, gamified learning emerges as the main key term scoring 52 times aimed to signify a leading focus-area of research and discussion. This term, framed at the center of studies dedicated to understanding and describe how game elements are applied in learning environments, sheds light on why games have this effect.

Table 1. Number of keywords in publications

Keywords	Number of keywords
Gamified learning	52
Gamification in learning	35
Higher education	24
Gamification	19
Digital learning environment	11
Total	141
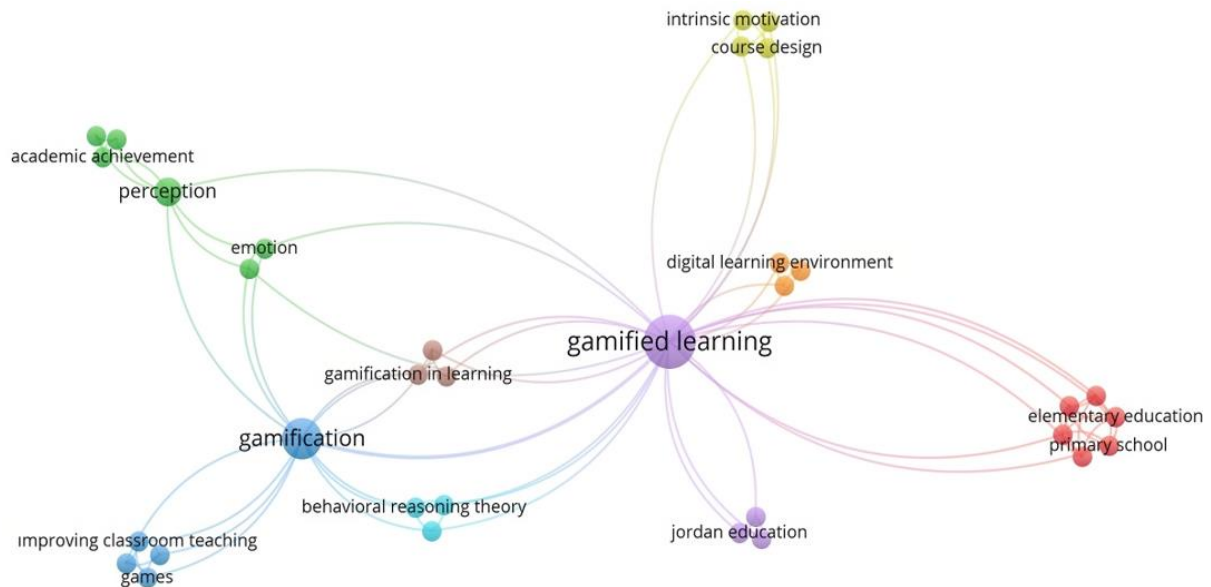
Figure 8. Collaboration networks between keywords (Source: Authors)

"Gamification in learning" is mentioned significantly next, with 35 times of occurrence; it implies that the term points to a relatively related concept involving broader implementation across game mechanics for learning field. The many occurrences of the keyword "higher", 24 times, indicates a target towards gamified learning in early childhood education, which reflects to foundational experiences on home-style. Intuitively, the keyword "gamification" appears as a single other node to show that it is not limited by narrow interpersonal settings. It has 19 occurrences occurring throughout the text. Lastly, digital too has a high count of 10%, as "digital learning environment" implying the use and integration various digital technologies coupled with their platforms in supporting the gamified curriculum (**Table 1**).

Figure 8 shows collaboration networks between key words.

DISCUSSION & CONCLUSIONS

The literature review on games-based learning in the higher education has presented some useful findings on the existing trends, patterns and key areas of research in this field of study. The analysis of such a large quantity of scientific papers led to several important points that deserve critical examination. First, the trend of the rising number of publications throughout the years reveals an increasing interest and recognition in the sphere of gamified learning in the higher education system (Metwally et al., 2021). The jump in research output proving teachers, researchers, and policymakers is now trying to find the advantages and disadvantages that come along with integrating gamification into the land of higher education.

The distribution of publications in different journals and conference proceedings is the research that reveals the structure of academic field of gamified learning. It is clear that the issue is not limited to a particular field and instead cuts across other areas like education, technology, and psychology. This interdisciplinary nature clearly shows both the breadth of impacts and the relevance of gamified learning that is the reason it helps the collaboration and the knowledge exchange between varied academic communities (Zainuddin et al., 2020).

The most popular keywords and key topic networks have shown the dominating topics in the field of gamified learning literature. Terms like the "engagement," "motivation," and "academic performance" stand out as the main concepts of the academic discussion (Alsawaier, 2018). This, in particular, asserts that the main concern for researchers is to find out the way gamification influences student outcomes and the learning process. Also, the apprehension of the main premises and their interdependencies may function as a roadmap for forthcoming studies and shape the design of successful game-based learning systems.

One can find the geography-based research output distribution very revealing. It is not surprising that the volume of publications from regions like North America and Europe dominate, but the growing contributions from the Asian countries testify the fact that it is a global movement as many people from all over the world contribute to gamified learning (Nadi-Ravandi & Batooli, 2022). This geographical representation that distinguishes these diversities implicitly indicates that the context specific considerations and cultural sensitivity must be considered in the implementation of the gamified approach in higher education.

Summarizing the bibliometric research on the gamified learning in the higher education provides a broad overview of the research landscape in this developing discipline. The increasing number of publications, the wide range of interdisciplinary involvement, and the global spread of participation are the indicators that the gamification is gaining more and more importance in the shaping of the future of the higher education. Identification of themes, keywords, and also geographical patterns delivers very important information for the researchers, educators, and also policy makers that want to learn about and utilize the possibilities of gamified learning. With the field developing, the future research should explore in-depth the influence of the specific aspects like the role played by the different gamification elements, how people from different disciplines react to it and the long-term educational outcomes. Interdisciplinary collaboration of the researchers and empirical investigations accompanied with many rigorous methods will ensure the accumulation of much sounds evidence for the further development of evidence-based practices in the gamified learning.

Finally, the current essay is only indicative and may be used as a starting point for future research, and educational practitioners are provided with the information that there are enough studies on gamified learning to explain the state of the art. Academic researchers can rectify the problems detected and can use the body of literature as is the basis in the development of effective and sustainable gamified learning practices in higher education.

Research Gaps & Future Directions

Through the process of undertaking a thorough and comprehensive bibliometric review of the use of gamified learning in the higher education, some research gaps have been identified thereby paving the way for future investigations. Firstly, the review portrays the overall patterns and the thematic focus but there is a gap in the knowledge of how the gamified learning impacts the academic disciplines in the tertiary level differently. Future studies should look into the different disciplines and find what can be done to adapt the gamification strategies to suit the different learning needs and preferences of the students in various areas of study. Moreover, it is also necessary to conduct more detailed analyses of the efficacy of gamification through examination of the varying gamification elements and also mechanics in the different educational contexts, which consider cultural nuances, learner demographics and the nature of the subject matter into account. Another critical gap is related to the long-term effects and sustainability of the gamified learning intervention. Analyzing the long-term influence on the student engagement, motivation, and also academic achievement will offer many helpful information on the continued effectiveness of the gamified approaches.

Similarly, it is indicated that we really need many more comparative findings in all of the education levels, from the first to the tertiary levels. Much more data on the principle used in the gamification in different categories of age and educational settings will be acquired, which will greatly add to our knowledge on the gamification and its applicability.

Moreover, the paper provides the point about the area that ought to be researched with respect to the ways in which the training and also professional development of the teachers will result in the successful implementation. Future research has to find the impact of instructors' competence and how they decide to use a gamified learning style as they will determine the effectiveness of this style.

Also, they will reveal the right way to incorporate this learning style into the pedagogy. After that bibliometric analysis presents the topic of spatial distribution of research by means of the information that more publications have been made in some places. In the next research phase, a look could be taken into the cultural factors, which influence the gamification and also its success in education according to the different educational settings across the world so as to be able to advise the international training experts.

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