Review

Impact of Gamified Teaching on University Student Learning

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Abstract: Gamification is presented as an innovative strategy to traditional teaching in higher education. In this sense, the aim of this study is to review the scientific literature in order to analyse the implementation of gamification in higher education. The impact of gamified teaching on the learning of university students was identified through the analysis of eighteen articles published in four databases (Web of Science, Scopus, Google Scholar, and Dialnet). It is evident that gamification is a novel topic in higher education, providing numerous benefits in the learning of university students, but it is still a little-explored area, being scarce in its application in some branches of knowledge. It is recommended to continue researching and generating experiences on its application in higher education in order to know its real effects on the teaching–learning process of university students.

Keywords: gamification; higher education; learning; students; systematic review

1. Introduction

Currently, there is a constant need to improve the quality of teaching in higher education. Teachers are applying changes in traditional methods, giving great emphasis to the application of more active and participatory methodologies where students acquire a more dynamic stance in order to improve the teaching–learning process. This means that it is the responsibility of teachers to apply innovative strategies in line with reality that increase motivation and meaningful learning for their students. Thus, teachers are increasingly resorting to the use of innovative digital platforms and/or tools to support this process [1]. These technologies allow teachers to offer different strategies and motivating activities in the higher education classroom [2].

In this sense, gamification emerges as a strategy for educational transformation, which is increasingly gaining an important place in higher education [3]. Gamified teaching refers to the application of gaming techniques in the educational process in order to motivate and engage students in learning [4]. Incorporating game elements into teaching and learning can make academic content more interesting, engaging, and meaningful for students in the university setting [5].

Recent research has studied the impact of using gamification as an educational strategy for university students [6]. These studies have shown that there is a positive impact, not only on students' motivation for the subject, but also on academic performance [4,7]. Nevertheless, this tool therefore has great potential within the university context. However, more studies are needed to demonstrate the effectiveness of the implementation of gamification in higher education.

Therefore, the purpose of this study is oriented towards gathering evidence on gamification carried out in higher education and analysing its impact on university students' learning through the analysis of the published scientific literature. Based on this, this work is guided by the following research questions:

RQ1. What is the general state of research on gamified teaching in higher education?
RQ2. In which branches of knowledge are digital tools being applied for educational purposes for gamification in higher education?
RQ3. What is the impact of gamified teaching on university students?

2. Gamified Teaching in Higher Education

In accordance with the purpose of this review, the importance of knowing the concept of gamification and the elements that should be taken into account for its application in university classrooms is recognised. The concept of gamification does not have a universal definition. However, in the context of higher education, gamification refers to the integration of game elements in teaching and learning to motivate students, improve their participation and engagement in the educational process, and foster the development of skills and competences relevant to their training [8]. Several authors have studied the concept of gamification, such as Zichermann and Cunningham [9] and Kapp [10], defining it as a process related to the use of different game techniques to actively engage students in the educational process and solve problems. In this sense, the three authors argue that through the use of different game elements in the educational process, such as badges, points, levels, avatar, etc., it influences the predisposition of students to continue studying. Gamified education therefore aims to influence people's learning behaviour [11].

Thus, numerous research studies have investigated the impact of the use of gamification in higher education. These studies have shown that there is a positive impact, not only on the motivation of individuals in the subject, but also on academic performance, allowing for an improvement of the teaching and learning process in university classrooms [4,7]. However, it was noted that it can be particularly effective for students who have difficulty engaging with learning material. In this way, its application can be useful in fostering collaboration and competition among students, which can be beneficial for their academic and personal development. Hamari and Koivisto [12] conducted a study that sought to analyse the influence of gamification in the context of learning management systems (LMS) at university level. The results showed that this methodology can enhance usability and user satisfaction with the LMS. In turn, it is highlighted that gamification can improve student participation in discussion forums and other online activities, proving to be beneficial for their learning and engagement with the academic course.

Following this line, Werbach and Hunter [13] consider that in order to properly apply gamification in the educational process, it is necessary to take into account six aspects. The first is about defining the objectives in a way that is coherent and effective. Second, they highlight the importance of defining the behaviours that they want to encourage in students. The third aspect points out the importance of defining the players and their characteristics in order to design the desired activities. Fourth, the cycles of the activities, the mechanics of the game, or the interaction between the participants must be established in order to define the gamification system. The fifth element refers to fun, and finally, in sixth place, establishing the resources, including the tools to be used for the development of the strategy.

Therefore, in order to apply gamification in higher education, it is necessary to design educational situations that involve game elements, such as the definition of objectives, the use of rewards and feedback, the design of challenges, and the creation of a playful and motivating environment. For this, various tools and technologies can be used, such as educational games, online learning platforms, and mobile applications, among others [14].

In conclusion, gamification in higher education is a strategy that seeks to motivate and engage students in their learning process through the use of game elements and the creation of challenging and meaningful educational situations. Its application requires the design of educational situations that involve game elements and the use of appropriate tools and technologies for its implementation.

3. Method

To answer the research questions posed above, a systematic review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) recommendations during the article selection process [15].

3.1. Search Strategy

To identify relevant studies, the following search terms were combined to reflect the setting ("university" or "higher education"), the population ("student"), the concept ("gamification" or "gamified teaching"), and the outcome ("learning"). For a more efficient search equation, the descriptors were combined using the Boolean operators AND/OR.

Once the search string was established, the second step was to select the databases in which the scientific literature was to be searched. Therefore, four databases were used, including Web of Science (WoS), Scopus, Dialnet, and Google Scholar. The first three databases are references for research in the field of education, and the fourth is a reference database in the multidisciplinary field. The period analysed corresponds to the last 10 years (2013–2022) in order to obtain the most relevant literature in this field of research. The search for descriptors was carried out by title, abstract, and/or keywords.

3.2. Inclusion and Exclusion Criteria

In order to conduct the literature review, it was necessary to determine a series of inclusion and exclusion criteria to identify the most relevant studies in this field of research. Therefore, to be included in this review, all research needed to fit the following criteria: (a) address the impact of gamification on university students' learning, (b) research published in the last 10 years (2013–2022), (c) in terms of format, only articles published in peer-reviewed journals, and (d) articles published in Spanish or English. In this sense, the exclusion criteria included studies that (a) did not reflect the results of gamification in university students, (b) research published before 2013, and (c) research published in conferences, book chapters, doctoral theses, or dissertations. In addition, duplicate records identified in more than one database were removed.
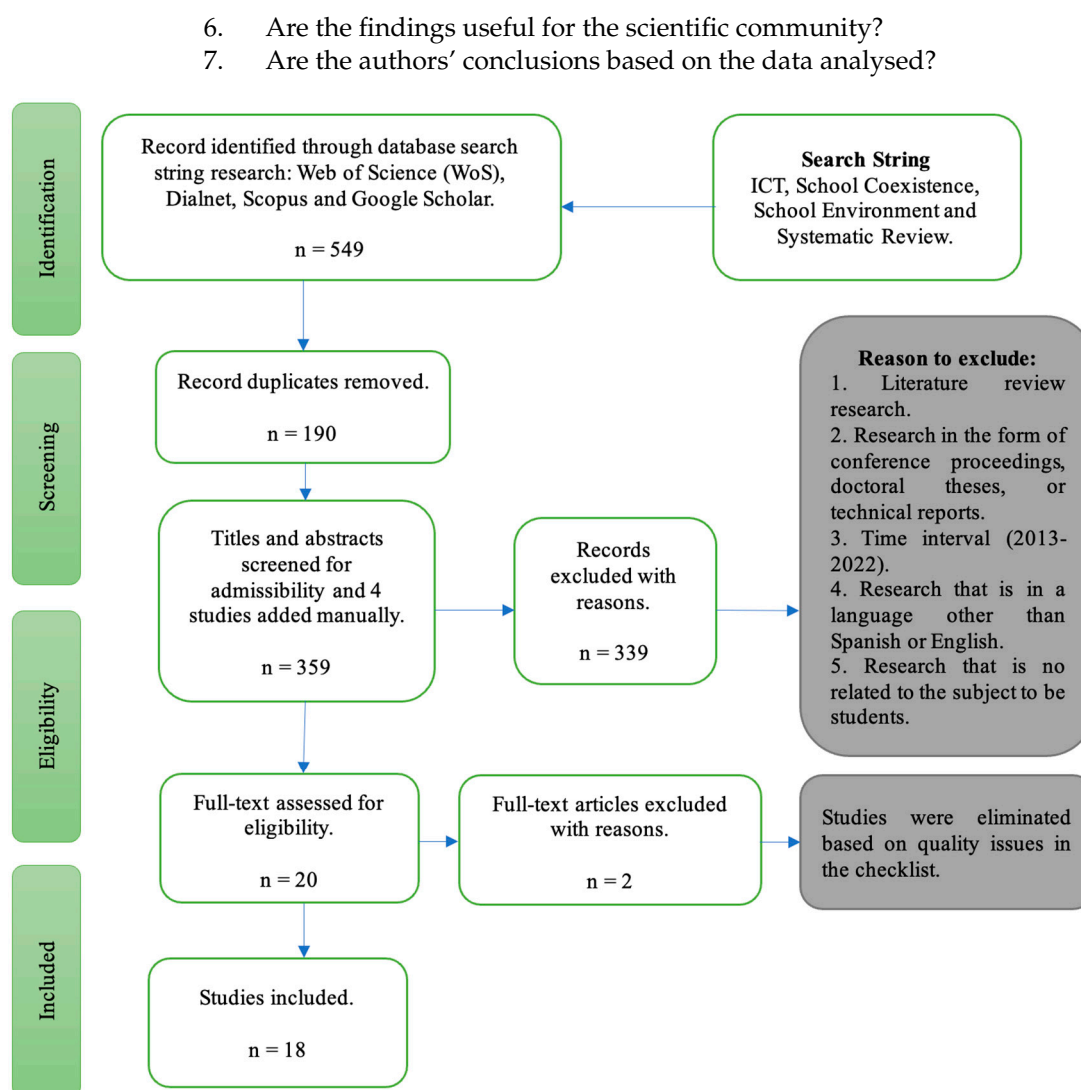
3.3. Selection of Studies

The initial search retrieved a total of 549 records in the different databases. Records that were identified as duplicates in the different databases were removed, excluding 123 publications. Four studies were added manually after reviewing the references of the identified studies. We were left with 292 studies that were analysed according to the inclusion and exclusion criteria, eliminating 272 studies. This resulted in 20 potentially valid studies for the review. The 20 selected articles were read in full text and assessed for eligibility based on their methodological quality using a checklist. Only articles that met at least five of the seven assessment criteria were accepted in our review. In total, 18 articles were included in this review. Figure 1 summarises the process of study identification, selection, and inclusion.

3.4. Quality Assessment

The methodological quality of the 20 potentially valid articles for review was assessed using the Johanna Briggs checklist (JBI), which was examined by independent critical review (seven-point checklist) [16]. Based on the internal assessment of study quality identified, two researchers independent of the study assessed each of the articles in a blinded fashion to avoid assessment bias, according to the established checklist. The checklist includes the following assessment criteria:

1.　Is the purpose of the research clearly specified?
2.　Does it specify the type of educational tool for gamification in the study?
3.　Is the sample used only university students?
4.　Is mentioned made of the branch of university knowledge to which it was developed?
5.　Are the data extraction instruments adequate?

6. Are the findings useful for the scientific community?
7. Are the authors' conclusions based on the data analysed?

Identification

Record identified through database search string research: Web of Science (WoS), Dialnet, Scopus and Google Scholar.

n = 549

Search String
ICT, School Coexistence, School Environment and Systematic Review.

Screening

Record duplicates removed.

n = 190

Titles and abstracts screened for admissibility and 4 studies added manually.

n = 359

Records excluded with reasons.

n = 339

Reason to exclude:
1. Literature review research.
2. Research in the form of conference proceedings, doctoral theses, or technical reports.
3. Time interval (2013-2022).
4. Research that is in a language other than Spanish or English.
5. Research that is no related to the subject to be students.

Eligibility

Full-text assessed for eligibility.

n = 20

Full-text articles excluded with reasons.

n = 2

Studies were eliminated based on quality issues in the checklist.

Included

Studies included.

n = 18

Figure 1. Flow chart of the study selection process.

Two studies [17,18] were excluded based on the quality issues raised in the checklist (Appendix A, Table A1), as they did not meet at least five of the seven assessment criteria.

3.5. Data Extraction and Analysis

In order to answer the research questions posed, the content of the 18 selected articles was analysed.

Data extraction was carried out by two researchers. For each study, the following data were extracted (Table 1): details of the author(s), year of publication, methodology used, digital tools and resources used for gamification, branch of university knowledge in which it was developed, and main findings of the study.

Among the university branches of knowledge, also known as areas of knowledge or academic disciplines, a distinction is made between the following: Arts and Humanities, Social and Legal Sciences, Health Sciences, Experimental Sciences and Mathematics, and Engineering and Architecture.

Each of these branches of knowledge is made up of various disciplines and specific areas of study, which are responsible for researching, teaching, and applying the knowledge corresponding to their field. For example, the branch of Arts and Humanities includes disciplines such as Philosophy, Literature, History of Art, or Music, while the branch of Social and Legal Sciences includes Education, Psychology, Sociology, or Economics.

Furthermore, for the extraction and categorisation of the main research trends in this field of study, the semantic application of social network analysis was carried out for subsequent visual representation with the VOSviewer software (version 1.6.18) [19].

Table 1. Description of the studies analysed.

| Author	Year	Method	Tools and Resources	Branch of Knowledge	Findings
Villasagras et al. [20]	2014	Qualitative	Virtual reality, 3D visualisation	Engineering and Architecture	Improvement of motivation, interest, collaborative work in academic activities.
Vélez Osorio, I.M. [21]	2016	Mixed	Role-playing games, Kahoot, Padlet, Tellagami	Social and legal sciences	It has a positive effect on learning, as it stimulates motivation and teacher–student interaction.
Cózar Gutiérrez & Sáez López [22]	2016	Quantitative	MinecraftEDU	Social and legal sciences	MinecraftEdu enables a number of benefits and advantages focused on pedagogies that allow for greater activity, motivation and involvement of students.
Olsson, M et al. [23]	2016	Quantitative	Moodle	Engineering and Architecture	It appears to have several motivational impacts on different study groups.
González Reyes et al. [24]	2017	Qualitative	Classcraft	Engineering and Architecture	Interest in knowing how it works and what happens on the platform. Development of solidarity and collaboration.
Aldemir et al. [25]	2018	Qualitative	Edmodo, Blendspace, Weebly	Social and legal sciences	Gamification is a motivating and engaging learning strategy.
Carrión Candel [2]	2018	Qualitative	Kahoot, MiniQuest, Cuadernia, Treasure Hunt	Social and legal sciences	It enhances cooperative work, competence acquisition, motivation, interest, and innovation.
Gómez Carrasco et al. [26]	2019	Quantitative	Socrative	Social and legal sciences	Results show positive impact on student motivation and learning achievement.
Simba et al. [27]	2019	Quantitative	Moodle	Social and legal sciences	The classes are more interactive, the most essential topics are explored in depth, and practical exercises are carried out in line with reality.
Aguiar Castillo et al. [28]	2020	Quantitative	HEgameApp	Social and legal sciences	Student attitude, interest, and innovation play a positive role in gamified teaching.
Campillo Ferrer et al. [29]	2020	Quantitative	Kahoot!	Social and legal sciences	Improved learning of concepts, motivation, and participation of students.
Carrión Candel et al. [30]	2022	Quantitative	Quizizzs, Socrative, videojuego Assassin's Creed	Social and legal sciences	Improved training and knowledge acquisition, increased motivation.
González Limón [31]	2022	Quantitative	MAPFRE (simulation game)	Social and legal sciences	Interest in game-based learning as an effective teaching tool at university level.
Cangalaya-Sevillano et al. [32]	2022	Quantitative	Kahoot, Lego, Puzzle	Engineering and Architecture	Gamification improves the teaching–learning process, and students' perception of learning.
Poma Japón et al. [33]	2022	Quantitative	Simulation game.	Engineering and Architecture	Gamification as an evaluation proposal. Improves motivation, performance, and feedback.
Martínez López et al. [34]	2022	Quantitative	Kahoot!	Social and legal sciences	Increased participation, improved subject results.
Morón Hernández et al. [35]	2022	Quantitative	Not specified	Arts and Humanities	The application of gamification as a strategy for hybrid education achieved high favourable proportions.
Solís Castillo et al. [6]	2022	Qualitative	Kahoot, Socrative, Quizizz, Flipgrid	Social and legal sciences	Gamification enables student motivation, peer interaction, participation, and teamwork.

4. Results

Following the compilation of studies related to the impact of gamification on university students' learning, a total of 18 potentially relevant articles were obtained in the aforementioned subject area. Most of the research production in the field of study was conducted during 2022, finding that no research was conducted in 2013 or 2020 that met

the inclusion and exclusion criteria set out above. These data can be observed in Figure 2, showing the need for more research in this area, as the production during the last decade has been scarce.
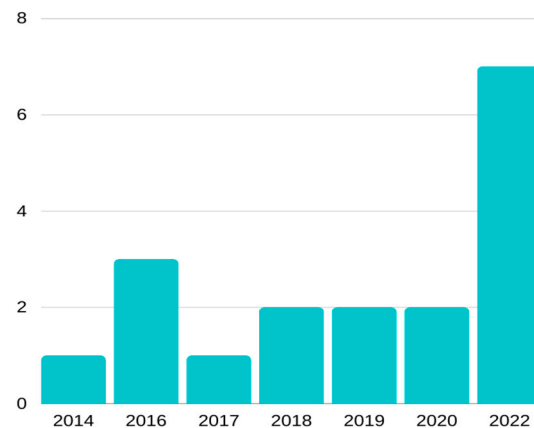
Figure 2. Distribution of publications by year of publication.

Regarding the methodology used in the selected research on the impact of gamification on university students' learning, according to Figure 3, quantitative methodology (66.7%) is more widely used than qualitative methodology (27.8%). On the other hand, little research has opted for a mixed methodology, as only one study considered that it would be the best way to extract data (5.6%).
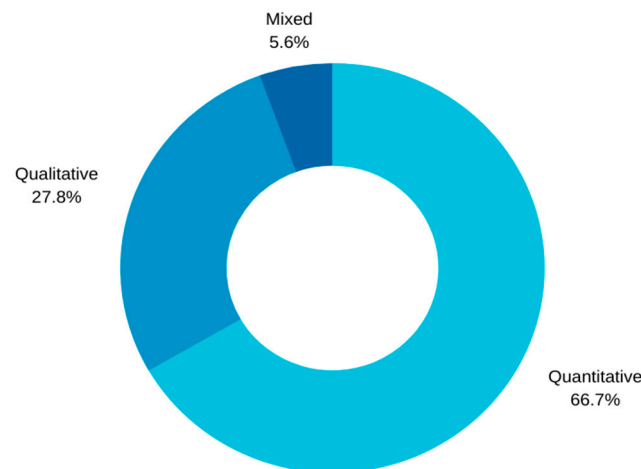
**Figure 3.** Type of methodologies used in research.

In relation to the branch of knowledge in which gamification strategies are mainly implemented, it can be seen in Figure 4 that the branch of Social and Legal Sciences (66.7%) is the branch of knowledge in which gamified teaching was implemented the most. This branch refers mainly to university degrees related to education, psychology, and economy. In second place is the branch of Engineering and Architecture (27.8%), with engineering and computer science degrees standing out. Finally, gamification experiences are found in the branch of Arts and Humanities (5.6%). This branch is related to the areas of philosophy and philology, among others.

Once the documents collected have been analysed descriptively and quantitatively, the analysis of the relationships established between the keywords extracted automatically or Keywords Plus (KW+) from the different databases will be represented using the VOSviewer programme [19].

In order to extract the main trends in this field of research, the 18 studies selected over the last decade have been analysed using the VOSViewer programme. This programme

represents the relationships established between the automatically extracted keywords or Key Words Plus (KW+) of the 18 documents analysed by means of a network map. In total, 67 KW+ have been extracted. The following figure (Figure 5) shows how, according to the degree of similarity of the KW+, three groups or clusters have been formed to define the main research trends in this field. The size of each circle or node represents the relevance of each descriptor in this review, while the links or distance reflect the relationships between the two nodes.
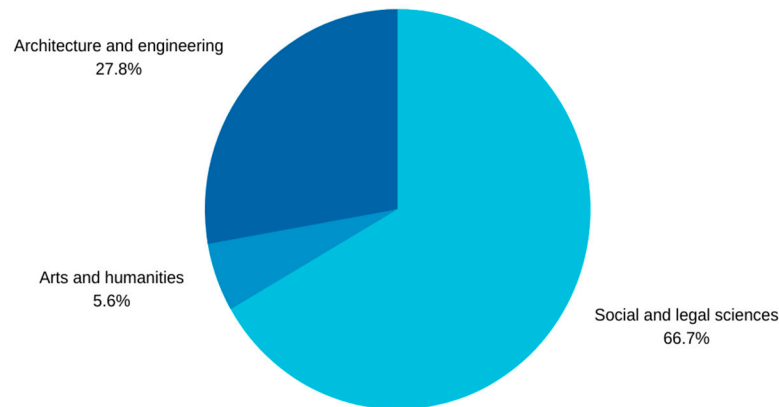
Figure 4. Distribution of research according to the branch of knowledge.
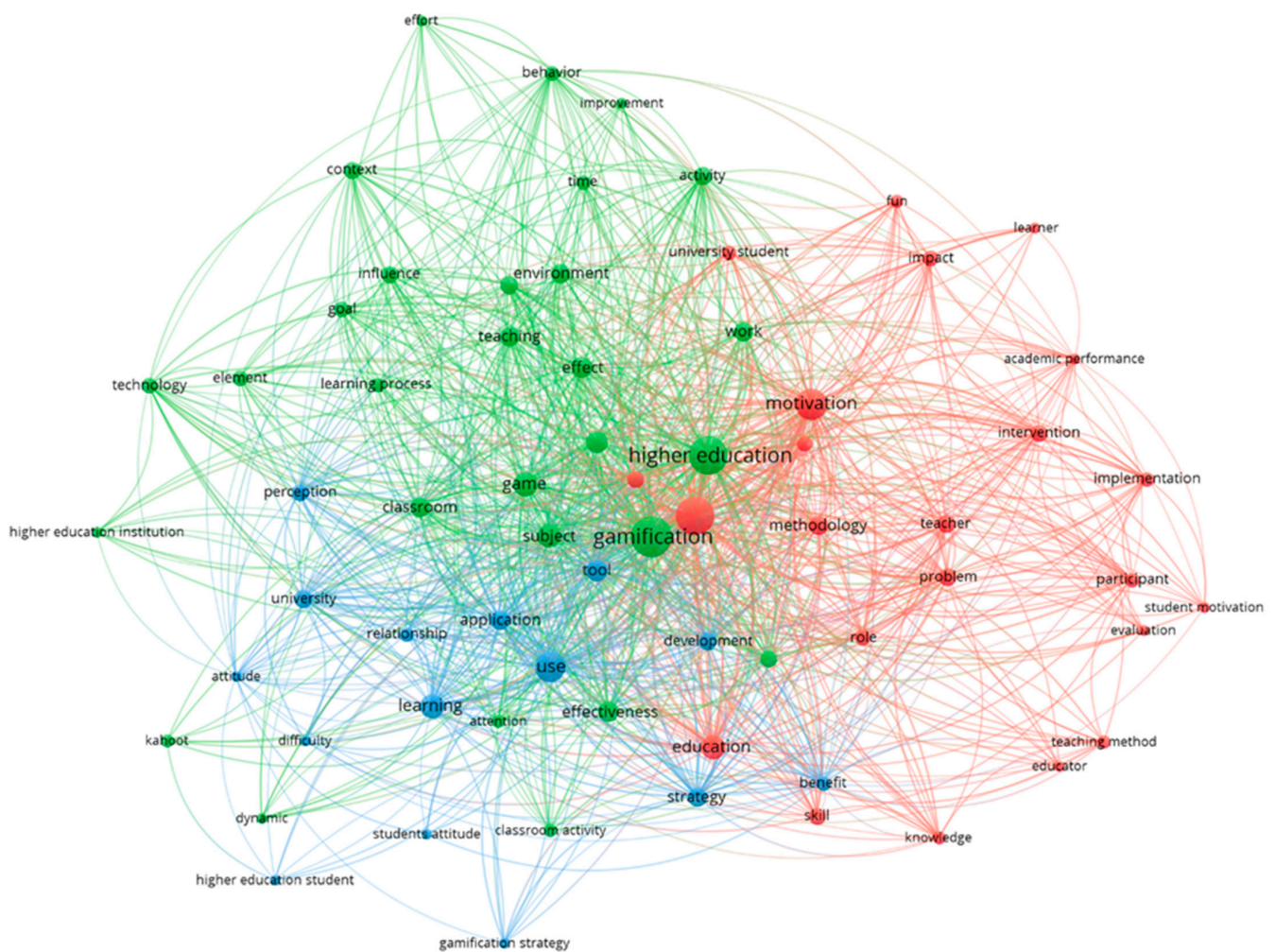
Figure 5. Labelled bibliometric map.

In relation to the three thematic clusters differentiated in the Figure 5, we can highlight the following:

Cluster 1: identified in green, is related to the technological tools and resources for gamification in higher education. This is the main theme on which this study focuses. Some of the descriptors are *technology*, *kahoot*, *game*, *gamification*.

Cluster 2: represented in blue, it is related to the impact of gamification on the learning of university students. Among the descriptors we can find *benefit*, *student attitude*, *learning*, *relationship*.

Cluster 3: shown in red, is related to the role of teachers in the implementation of gamification strategies in university teaching. The following descriptors are highlighted: *methodology*, *teacher*, *training*, *implementation*.

Finally, looking at Figure 6, we can observe the impact of gamification as a strategy for improving the teaching and learning process of university students. First, the motivation generated in students is the most important aspect of gamification, as 77% of the studies mentioned this characteristic. Next, we find the improvement of academic performance due to the great influence it exerts on the teaching and learning process of students (61%). This is followed by student participation and collaboration in academic activities (55%) and improved communication both among peers and with the teaching staff (44%). Finally, and to a lesser extent, 27% of the studies analysed point to gamification as an element of innovation in the classroom, as it is attractive and novel for students.
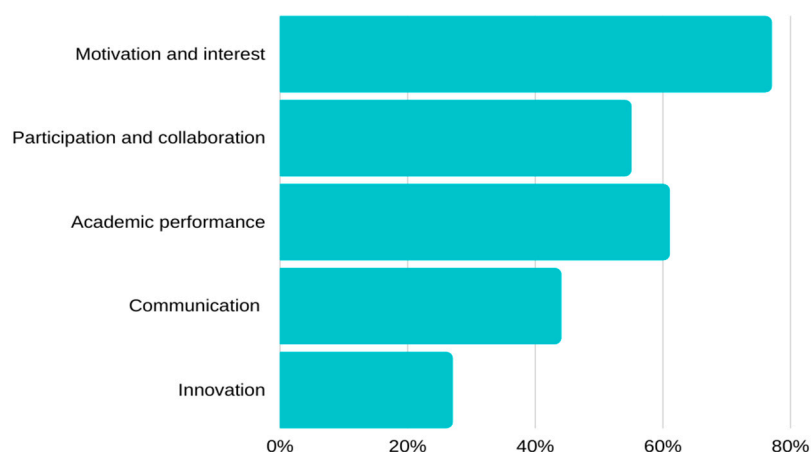

Figure 6. Impact of gamification on learning.

5. Discussion

This systematic review identified 18 potentially valid studies for this systematic review. Their subsequent analysis allowed us to answer the research questions posed in this study.

RQ1. What is the general state of research on gamified teaching in higher education?

In terms of the general state of the research proposed through the bibliographical review of the literature, there are several aspects that stand out. Firstly, the scarcity of literature on the impact of gamification on university students' learning is highlighted. Despite this lack of research, 2022 was the year with the highest number of publications on the subject, followed by 2016. These data show that gamification is currently a very new field for researchers, and that teachers are increasingly opting for this type of more innovative and participatory strategies, where students are the real protagonists, coinciding with previous studies [36]. Secondly, the research compiled in this paper has been carried out, for the most part, through a quantitative methodology as opposed to qualitative methodologies, which shows that the researchers have considered it necessary to use a deductive, empirical, and positivist approach when compiling and analysing the data obtained on the use of gamification in higher education [37]. Thirdly, addressing the research trends concerning the impact of gamification in the university, different emerging

research lines and research directions have been found through the analysis of keywords. This analysis has given rise to three groups or clusters that relate to each of the research lines. The first one is mainly focused on the different tools and technological resources that are applied in university classrooms to implement gamification. In this way, we can find several studies that analyse the use of different technological applications for the development of gamification in classrooms that allow the improvement of the teaching and learning process [26,27,35]. The second line focuses on the impact of gamification on university students' learning. In this sense, studies that address the benefits and opportunities of developing gamification experiences with university students stand out [2,6]. Finally, the third is closely related to the role of teaching staff in the implementation of gamification strategies in university teaching [20,21]. This line is fundamental, since the success of gamified teaching is closely related to the capacity and ability of the teacher to implement it.

RQ2. In which branches of knowledge are digital tools being applied for educational purposes for gamification in higher education?

The interest in finding out how gamification is being approached in higher education led the review to analyse the different branches of knowledge and technologies being used in university classrooms, in an attempt to find out more about their applicability. The data show that there is no doubt about its transversality to the different branches of university knowledge, identifying that gamification can have a positive impact on student learning.

However, according to the review, the branch of Social and Legal Sciences is the one with the highest number of records in the databases, which allows us to infer that gamification has generated greater interest in this area of knowledge and has motivated teachers int the field of social sciences to make greater use of gamification in higher education, coinciding with previous studies [1]. To a lesser extent, there are studies developed in the university branch of Architecture and Engineering, as well as Arts and Humanities. However, no studies have been found on its application in the area of Health Sciences.

These data show that gamification can be applied in the teaching practice of different university degrees, including Health Sciences. However, studies analysed place gamification within the branch of Social and Legal Sciences, specifically in the field of Education, and its use is focused on improving the learning and educational experience students [22,23,27,30].

On the other hand, considering the different digital tools that have been used for gamification, the use of Kahoot, Moodle, and Socrative stands out. Studies show that the use of these tools increases student participation, cooperation, and interest in the subject, and that students learn more in class, as they break with the passivity of traditional lectures in which the teacher repeats the same content and the students limit themselves to listening and taking notes [38]. In this sense, it is worth mentioning that digital platforms, such as Moodle, have great potential and functionality for university students' learning; however, they are mainly used as repositories of materials, tasks, and asynchronous communication due to the lack of teacher training [32,39].

We should also be aware that the studies are mainly from Western countries. This is due to several factors. One of these is the greater access to technology and connectivity in these countries, which has enabled the implementation of innovative technological solutions in education [40]. In addition, in many Western countries there is a student-centered approach to education and active learning, which has led to the search for new ways of teaching that engage students and keep them motivated [41].

RQ3. What is the impact of gamified learning on university students?

The research reviewed reflects the impact of the implementation of gamification in higher education. Among the main findings, the studies state that the use of different digital tools or resources as strategies for gamification allows for an improvement in students' academic performance, as well as greater feedback on their learning [24,29,33]. Likewise, researchers show that the development of these types of strategies in teaching practice increases the motivation, commitment, and interest of students towards the subject, due

to the fact that classes are more interactive, and they delve deeper into more essential and practical topics in line with the student's reality [25,31,34]. Therefore, it is essential to include this type of innovative practice in higher education, as it allows acquiring knowledge and competences in a more interactive and fun way, favouring a good working environment based on student participation, thus improving the quality of learning of university students [26–28].

However, it should be noted that the implementation of digital tools for gamification does not necessarily lead to better learning outcomes for students but requires the involvement of the entire educational community to have a positive impact on their learning [42]. Therefore, to ensure the successful implementation of gamification in higher education requires (a) a creative teaching staff trained in gamification to be able to propose attractive and motivating activities for students, and (b) having an infrastructure and diversity of technological resources that allow the development of gamified activities in the university classroom.

6. Conclusions

This systematic review identified 18 studies that examined the impact of gamified teaching on university students' learning. The studies reveal that the implementation of gamification strategy improves university students' academic performance, their level of motivation, as well as their engagement in the learning process. However, the scientific literature has shown that it is a novel topic at present, but still little explored in some branches of knowledge.

In this sense, in order to improve the quality of education in universities, it is necessary to continue researching different teaching strategies that motivate students to achieve learning. In this sense, this study has allowed us to validate the effectiveness of the gamification strategy for improving the learning of university students. Undoubtedly, this research is of interest to university professors who intend to start implementing this innovative strategy in their teaching practice to improve students' academic results.

6.1. Limitations

Among the limitations of this systematic review is the low number of research studies analysing gamification experiences among the different branches of knowledge in higher education after an exhaustive search in four databases. The lack of existing literature on the subject, including only 18 studies in the review, may limit the generalisability of the results obtained. Therefore, the authors consider that it is important to develop other strategies to address the topic, such as extending the search to other sources of information in future research, which will minimise the risk of publication bias. The authors believe that it is important to develop new quantitative and qualitative studies that analyse the use of gamification in higher education for the subsequent triangulation of the data. This will minimise the risk of publication bias, which will improve or support the reliability and validity of the results.

Another limitation is the lack of diversity of studies in the different branches of university knowledge. The studies focus mainly on the field of Social and Legal Sciences. These results may limit their applicability to other disciplines, such as Health Sciences.

In addition, most of the studies reviewed are from Western countries, since these countries have greater access to technology and connectivity, which may limit the applicability of these findings to other cultural contexts.

6.2. Future Research

In order to address the existing gaps in the scientific literature on the use of gamification in higher education, it would be necessary to carry out research that would allow for an in-depth study of different aspects. Thus, as future lines of research, we can highlight the following:

- Identification of critical variables that influence the effectiveness of gamification as a pedagogical strategy in higher education, such as motivation, engagement, and learning, among others.
- Evaluation of the effectiveness of gamification in different university educational contexts and with different populations, in order to identify the conditions in which this strategy is most effective.
- Design of experimental studies to compare gamification with other pedagogical strategies and evaluate its effectiveness in achieving specific educational objectives in higher education.
- Identification of barriers and challenges in the implementation of gamification in the university classroom, and exploration of strategies to overcome them.
- Analysis of the training and attitude of the teaching staff towards the gamification strategy in the university classroom, since together with the students, they are the main agents involved in this didactic process.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Methodological quality assessment.

Author(s)	Q1	Q2	Q3	Q4	Q5	Q6	Q7
Villasagras et al. (2014) [20]	✓	✓	✓	✓	✓	✓	✓
Gónzález González (2014) [17]	✓	✗	✓	✓	✗	✗	✓
Vélez Osorio (2016) [21]	✓	✓	✓	✗	✓	✓	✓
Cózar Gutierrez & Sáez López (2016) [22]	✓	✓	✓	✓	✓	✓	✓
Olsson et al. (2016) [23]	✓	✓	✓	✓	✓	✓	✓
González Reyes et al. (2017) [24]	✓	✓	✓	✓	✓	✓	✓
Aldemir et al. (2018) [25]	✓	✓	✓	✓	✓	✓	✓
Carrión Candel (2018) [2]	✓	✓	✓	✓	✓	✓	✓
Gómez Carrasco et al. (2019) [26]	✓	✓	✓	✓	✓	✓	✓
Simba et al. (2019) [27]	✓	✓	✓	✓	✓	✓	✓
Aguiar Castillo et al. (2020) [28]	✓	✓	✓	✓	✓	✓	✓
Campillo Ferrer et al. (2020) [29]	✓	✓	✓	✓	✓	✓	✓
Carrión Candel et al. (2020) [30]	✓	✓	✓	✓	✓	✓	✓
García Casaus et al. (2020) [18]	✓	✗	✗	✗	✗	✓	✓
González Limón (2022) [31]	✓	✓	✓	✓	✓	✓	✓
Cangalaya-Sevillano et al. (2022) [32]	✓	✓	✓	✓	✓	✓	✓

Table A1. *Cont.*

Author(s)	Q1	Q2	Q3	Q4	Q5	Q6	Q7
Poma Japón et al. (2022) [33]	Red	Green	Green	Green	Green	Green	Green
Martínez López et al. (2022) [34]	Green	Green	Green	Green	Green	Green	Green
Morón Hernández et al. (2022) [35]	Green	Red	Green	Green	Green	Green	Green
Solís Castillo et al. (2022) [6]	Green	Green	Green	Green	Green	Green	Green

Note: The green color meets the marked characteristics. The red color means that it does not meet the marked characteristics.

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