

<https://doi.org/10.23913/ride.v14i28.1902>

*Scientific articles*

***Impacto de la gamificación en el aprendizaje de estudiantes  
universitarios***

***Impact of gamification on university students' learning***

***Impacto da gamificação no aprendizado de estudantes universitários***

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## **Resumen**

La aplicación de estrategias de gamificación en la educación superior ha cobrado especial relevancia en estos últimos años a raíz de la pandemia por covid-19. Por eso, el objetivo del presente trabajo es identificar el impacto de dichas estrategias en el aprendizaje de estudiantes universitarios. Para ello, se efectuó un análisis de revisión de revisiones en la base Scopus utilizando términos asociados a la temática en cuestión, en la que se recurrió a la plataforma Rayyan. En concreto, se seleccionaron artículos publicados entre 2019 y 2023 de significativa aportación relacionados con el uso de estrategias de enseñanza a nivel profesional. Los resultados indicaron que la mayor cantidad de trabajos fueron divulgados a partir del año 2020 en España y Estados Unidos, los cuales impactaron principalmente en la motivación, el compromiso, la participación, la interacción y el trabajo en equipo. Como conclusión, se obtuvo el 100 % de coincidencia entre los autores, al señalar que la aplicación de la gamificación a nivel universitario es una estrategia con la capacidad de generar mejoras importantes en la experiencia educativa del estudiante; sin embargo, las concomitancias sobre el impacto en los resultados académicos alcanzaron el 73 %.

**Palabras clave:** gamificación, educación superior, aprendizaje, estudiantes.



## Abstract

The application of gamification strategies in higher education has gained special relevance in recent years as a result of the COVID-19 pandemic. In this order of ideas, the objective of this paper is to identify the impact of these strategies on the learning of university students. In this sense, a review analysis of reviews was carried out in the Scopus database using terms associated with the subject in question, in which the Rayyan platform was used. For this, articles of significant contribution, related to the use of teaching strategies at a professional level, were identified and selected, applying exclusion and exclusion criteria in the period 2019-2023. The results indicated that the largest number of studies were published as of 2020 in Spain and the United States. These mainly impacted motivation, commitment, participation, interaction, and teamwork. In conclusion, a 100% coincidence was obtained between the authors, noting that the application of gamification at the university level is a strategy with the capacity to generate important improvements in the educational experience of the student, however, the concomitances on the impact in academic results they reached 73%.

**Key words:** Gamification, Higher Education, Learning, Students

## Resumo

A aplicação de estratégias de gamificação no ensino superior ganhou especial relevância nos últimos anos em decorrência da pandemia da COVID-19. Nesse contexto, o objetivo deste artigo é identificar o impacto dessas estratégias no aprendizado dos estudantes universitários. Para isso, foi realizada uma análise de revisões na base de dados Scopus com termos associados ao tema em questão, utilizando a plataforma Rayyan. Para isso, foram identificados e selecionados artigos de contribuição significativa relacionados ao uso de estratégias de ensino ao nível profissional, aplicando critérios de exclusão e exclusão para o período de 2019-2023. Os resultados indicaram que o maior número de estudos foi publicado a partir de 2020 na Espanha e nos Estados Unidos. Esses estudos tiveram impacto principalmente na motivação, no compromisso, na participação, na interação e no trabalho em equipe. Em conclusão, houve 100% de concordância entre os autores de que a aplicação da gamificação no nível universitário é uma estratégia com a capacidade de gerar melhorias significativas na experiência educacional do aluno; no entanto, as concordâncias sobre o impacto nos resultados acadêmicos chegaram a 73%.

**Palavras-chave:** gamificação, ensino superior, aprendizagem, estudantes.

Reception date: January 2023

Acceptance Date: May 2024

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## Introduction

Gamification is a teaching strategy that is based on the use of elements, properties, and aspects of game design to improve the user's experience, motivation, empowerment, and engagement through interactions usually focused on entertainment (Ahmad *et al.*, 2022; Hanus and Fox, 2015). Indeed, by taking inspiration from games and taking advantage of the components that keep users interested and engaged, gamification seeks to make the students' experience more intriguing, challenging, and pleasant (Lampropoulos *et al.*, 2022), since they can solve problems in environments designed to achieve better learning. In addition, achievements are reflected in the form of badges, points, or rankings (Magylaité *et al.*, 2022; Zhan *et al.*, 2022).

Although during its first years of development, it was associated with “harmful video games” (Grande-de-Prado *et al.*, 2020), its implementation over the years has proven useful in education at all levels, as well as in health interventions and the organizational area for job training (Balch *et al.*, 2022; From Noreña Martínez *et al.*, 2022; El Hafidy *et al.*, 2021; Faure-Carvalho *et al.*, 2022; Hammady and Arnab, 2022; Moukram *et al.*, 2022). In fact, after the start of the COVID-19 pandemic and the subsequent quarantine, gamification became the focus of attention, since teachers had to migrate to virtual environments, where traditional strategies were not enough to capture the attention of the students (Burlacu *et al.*, 2023).

This new reality aroused the interest of numerous researchers, who carried out tests in digital environments with various tools, which resulted in publications that expanded the amount of evidence on the application of gamified education (Ahmad *et al.*, 2022; Muth *et al.*, 2021; Park and Kim, 2019; Zhang *et al.*, 2021).

In the case of university education, the interest in this strategy was especially relevant, hence the usefulness of gamified methods was exhaustively examined in various areas of that educational level (Bahtiar *et al.*, 2020; Damaševičius *et al.*, 2023; Lai and Bower, 2020; Nair and Mathew, 2021; Yunus and Hua, 2021). Therefore, currently, there is a need to systematize the findings on the impact of the application of gamification in university teaching.

## Materials and methods

For the present study, a systematic review of research was carried out that evaluated the impact of the application of learning or gamification strategies in the university population of various majors. For this, a search strategy was developed in the Scopus database based on the terms presented in Table 1.

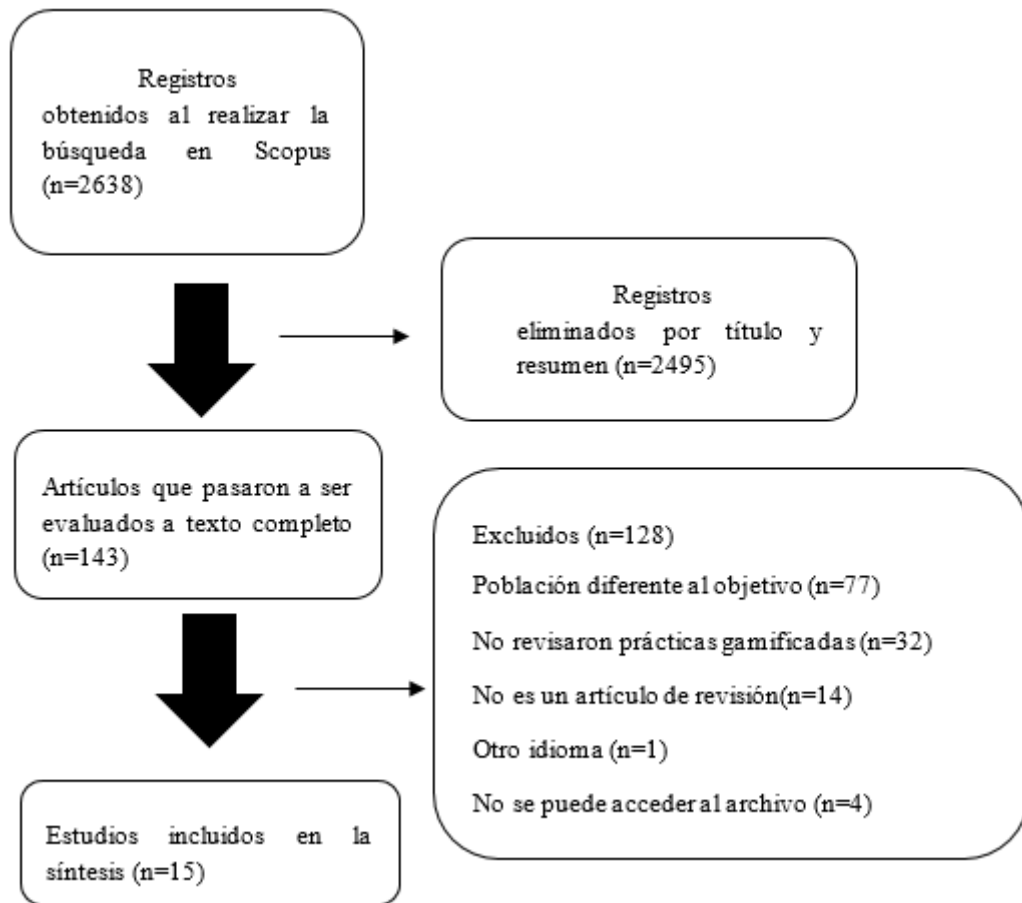
**Table 1.** Terms used to search for articles

|        | Gamification   | Education   | Impact   |
|--------|--|---|--|
| Scopus | Gamification<br>Educational games<br>Ludic immersion<br>Gamified | Educational<br>Learning<br>Education<br>Resume<br>Classroom<br>Drills | Impact<br>effects<br>Outcomes<br>Benefits<br>Implications<br>influence |

Source: Own elaboration

Regarding the selection of articles, reviews published during the period from 2019 to 2023, in English or Spanish, were considered. In addition, the Rayyan platform was used to process the research obtained (Ouzzani *et al.*, 2016) based on a 2-step screening: first by title and abstract, followed by a full-text review. The process is illustrated in Figure 1.

**Figure 1.** Article search and filtering process



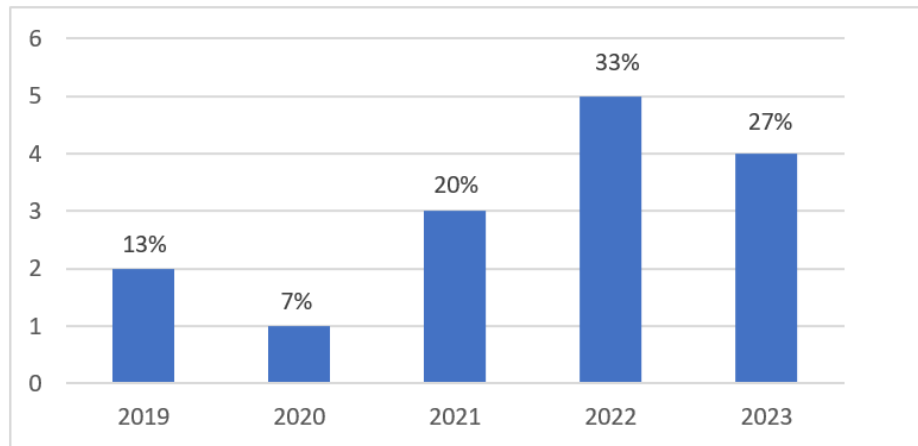
Source: Own elaboration

For data extraction, the author, year, country, type of review, the total number of studies reviewed, students' professional area, gamification strategies found, platform, and results were considered, and the information was organized in an Excel document. Finally, a descriptive synthesis of the findings obtained in the reviews was carried out.

## Results

For the development of this study, 15 review articles were evaluated. When analyzing the years of publication (Figure 2), it can be seen that starting in 2020 there was a significant increase in the number of reviews. The year 2022 recorded the peak with 5 published reviews (33.3%), while the lowest amount was in 2020, with a single publication (6.7%).

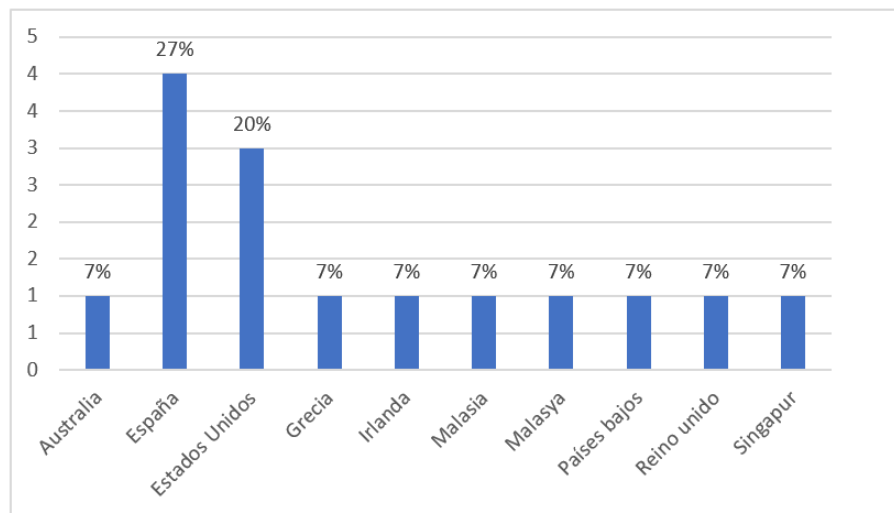
**Figure 2.** Temporal distribution of revisions



**Source:** Own elaboration

When observing the distribution of origin of the reviews (Figure 3), it was found that the countries that carried out the largest number of studies were Spain, with 4 articles (26.7%), and the United States with 3 publications (20%). Other countries contributed one article each, accumulating a total of 8 reviews (53.3%).

**Figure 3.** Countries of origin of reviews



**Source:** Own elaboration

When evaluating the results of each study, as shown in Table 2, it is observed that the research reviewed agrees that strategies related to gamification provide important improvements in the educational experience. These strategies not only generate greater attention and commitment to the activity but also stimulate teamwork and participation.

As for those most frequently found in the reviews, questionnaires, escape games, simulations, and serious games stand out. Subsequently, challenges, scores, competitions,

treasure hunts, missions, levels, role-playing games, video games, and virtual reality are mentioned less frequently. Lastly, and although anecdotally, the use of avatars and puzzles is mentioned.

**Table 2.** Results obtained by the study

| Author                                 | Results  |
|--|--|
| Camacho-Sanchez <i>et al.</i> (2023)   | The application of gamification strategies in university students generated an increase in motivation, academic performance, physical performance, and improvement in perceived health.  |
| Abdul <i>et al.</i> (2022)             | The most effective gamification elements in project-based learning are faithful simulation, inquisitive exploration, collaborative learning, interactive instructions, guidance and feedback, and rewards.   |
| Nieto- Escamez and Roldán-Tapia (2021) | Game elements associated with the competition, such as rankings and points, were the most common. Its application increased participation and improved learning outcomes. Similar results are obtained with simulations and questionnaires. Only one study used puzzles, with moderate results. Those who used escape games and game manuals had negative results. |
| Grande-de-Prado <i>et al.</i> (2020)   | Role-playing games (RPGs) can be used effectively in educational environments as part of gamified learning. The results do not show a relationship with any specific type of RPG.  |
| Safapour <i>et al.</i> (2019)          | Gamification and case study methods improve students' planning and problem-solving skills. The implementation of the flipped classroom, gamification, and autonomous learning methods improve the intrinsic motivation of students and the adoption of the social media method facilitates continuous learning and promotes creativity.                            |
| Hintz <i>et al.</i> (2023)             | Pharmacy students enjoy escape games and perceive that they help their clinical knowledge and teamwork skills. Additionally, this strategy shows the potential to increase content awareness, especially in games that focus on specific content. To use this strategy, it is recommended that the teacher consider that the preparation,                          |

|  |   |
|--|---|
|  | <p>delivery/logistics, and content are aligned with the objectives they seek to develop.</p>  |
| <p>Montenegro-Rueda <i>et al.</i> (2023)</p> | <p>Studies indicate that the use of different digital tools and resources as gamification strategies improves students' academic performance and provides broader feedback on their learning. Likewise, it increases students' motivation, commitment, and interest in the subject, since classes are more interactive and delve into essential and practical topics in line with the student's reality. To guarantee the successful implementation of gamification in higher education, it is required: a) A creative faculty trained in gamification that can propose attractive and motivating activities for students, and b) An infrastructure and diversity of technological resources that allow the development of gamified activities in the university classroom.</p> |
| <p>Hope <i>et al.</i> (2023)</p>             | <p>Educational outcomes were inconsistent and the review revealed an apparent over-reliance on student perceptions as primary data. For student perceptions to be credible outcome measures, they need to be related to discipline-specific outcomes, such as the acquisition of knowledge and skills that benefit patients. Despite its frequent reporting, there is limited evidence that student enjoyment and satisfaction improve learning.</p>  |
| <p>Tavares (2022)</p>                        | <p>Overall, these methods were well accepted by students, who supported their broad use in the nursing curriculum. Most studies reported an increase in student experience and learning when using game-based learning, although time-limited games can often increase anxiety in students.</p>   |
| <p>Thangavelu <i>et al.</i> (2022)</p>       | <p>Subgroup analysis for knowledge and skills outcomes demonstrated that serious games were more effective than control groups with no intervention or other educational interventions. A large effect size was found in favor of serious games in improving knowledge scores in nursing care management.</p>   |



|  |  |
|--|--|
| <p>Chytas <i>et al.</i><br/>(2022)</p>     | <p>The gamification of anatomical education has been accompanied by positive results in student perception and acquisition of anatomical knowledge.</p>  |
| <p>Abdul <i>et al.</i> (2022)</p>          | <p>Although there is still a lack of solid evidence on the effectiveness of educational escape games, they have the potential to provide an interactive, enjoyable, and engaging learning environment that helps pharmacy students and pharmacists gain knowledge and develop professional skills.</p>   |
| <p>Szeto <i>et al.</i> (2021)</p>          | <p>Gamification increased motivation and engagement, improved consolidation of learning objectives, and contributed to more enjoyable and positive educational experiences compared to traditional instructional methods. Additionally, it improved test scores, increased confidence, and developed stronger team dynamics.</p>   |
| <p>Van Gaalen <i>et al.</i><br/>(2021)</p> | <p>Gamification appears to be a promising tool to improve learning outcomes by strengthening learning behaviors and attitudes toward learning. Satisfaction rates are typically high and positive changes in behavior and learning have been reported. However, most of the included studies were descriptive and rarely explained what was meant by gamification and how it worked in health professions education.</p>   |
| <p>Gentry <i>et al.</i><br/>(2019)</p>     | <p>There was not enough evidence to conclude whether one type of serious games/gamification intervention is more effective than another. There was limited evidence on the effects of serious games/gamification on professional attitudes. Serious games/gamification may improve satisfaction, but the evidence was limited. The quality of evidence was low or very low for all outcomes and was downgraded due to imprecision, inconsistency, and study limitations.</p> |

**Source:** Own elaboration

Regarding the number of publications, it is observed that the article that included the smallest number of studies was that of Chytas *et al.* (2022) with 8, while the one that grouped the largest base was that of Tavares (2022) with 70. The total of systematized studies was 390, which found multiple gamification strategies applied to university education. These include challenges and levels, project-based learning, points, competitions, puzzles, escape games, quests, avatars, quizzes, treasure hunts, simulators, role-playing games, virtual reality, video games, serious games, and scoreboards (Table 3).

**Table 3.** Strategies found and studies evaluated by review

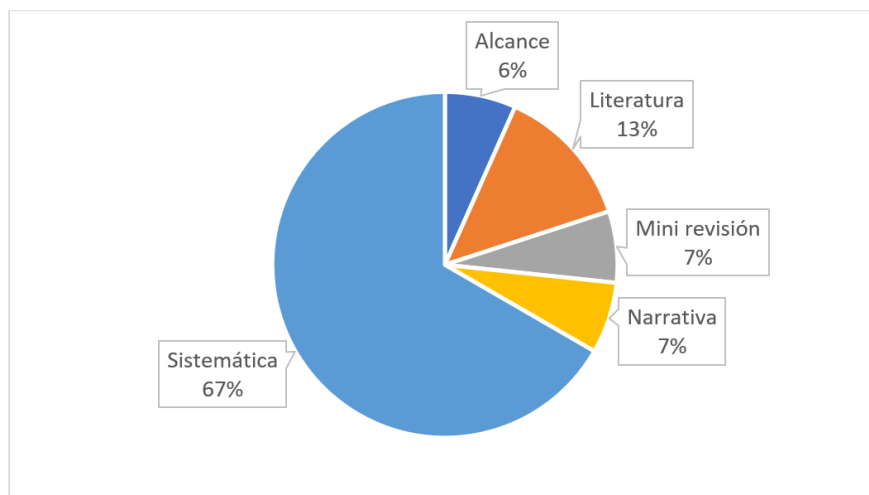
| Author                                  | Reviewed studies | Gamification strategies   |
|---|------------------|---|
| Camacho-Sanchez <i>et al.</i> (2023)    | 17               | Challenges and levels   |
| Abdul <i>et al.</i> (2022)              | 14               | Project-based learning  |
| Nieto- Escamez and Roldán-Tapia, (2021) | 11               | Challenges, levels, points, competition, puzzles, escape games, missions, avatars, quizzes, treasure hunts, simulations |
| Grande-de-Prado <i>et al.</i> (2020)    | 21               | Role-playing games  |
| Safapour <i>et al.</i> (2019)           | 29               | Gamification (not specified)  |
| Hintz <i>et al.</i> (2023)              | 10               | escape games  |
| Montenegro-Rueda <i>et al.</i> (2023)   | 18               | Virtual reality, role-playing games, quizzes, quests, treasure hunt, simulations, video games                           |
| Hope <i>et al.</i> (2023)               | 66               | Simulators, video games, quizzes, escape games  |
| Tavares (2022)                          | 70               | Quizzes, score-boards, escape games, and serious games  |
| Thangavelu <i>et al.</i> (2022)         | 19               | serious games   |

|                                 |     |   |
|---------------------------------|-----|---|
| Chytas <i>et al.</i> (2022)     | 8   | Virtual reality, quizzes, competitions, simulations |
| Abdul <i>et al.</i> (2022)      | 20  | Escape games  |
| Szeto <i>et al.</i> (2021)      | 13  | Serious games, simulations                          |
| Van Gaalen <i>et al.</i> (2021) | 44  | Competitions, challenges, scores                    |
| Gentry <i>et al.</i> (2019)     | 30  | Serious games, gamification (not specified)         |
| Total                           | 390 |   |

Source: Own elaboration

Regarding the type of review carried out, as seen in Figure 4, the largest number of reviews was of the systematic type, with ten publications (66.7%), followed by literature reviews with two publications (13.3%). Other types, such as mini-reviews, narrative reviews, and scoping reviews, account for 20% of the total.

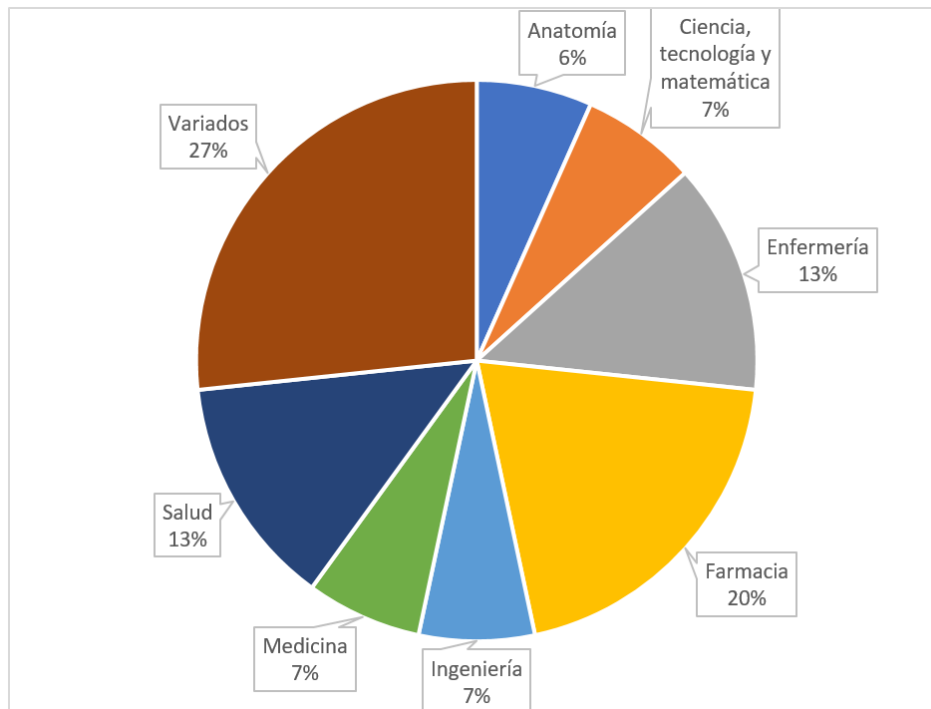
Figure 4. Types of reviews included in the study



Source: Own elaboration

Regarding the areas of education on which the review focused, greater diversity is observed (figure 5). Three reviews were developed in the field of pharmacy (20%), 2 in the health area (13.3%), and four studies (26.7%) did not make differences between the areas of origin of the university students evaluated by the studies explored. Only one job falls into each of the other areas (anatomy, engineering, medicine, science, technology, and mathematics).

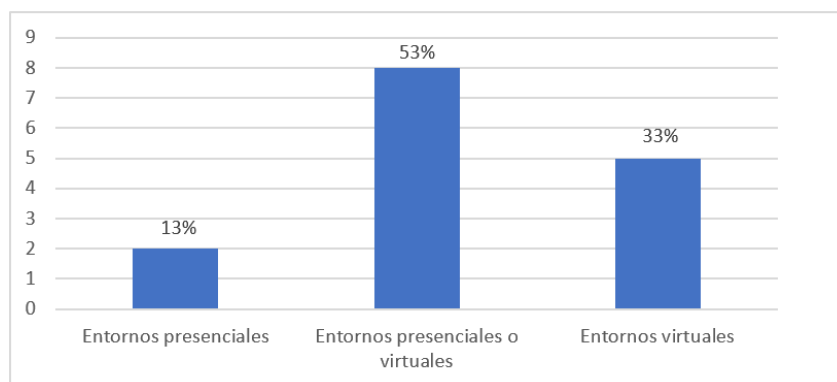
Figure 5. Professional education areas reviewed



Source: Own elaboration

Gamified strategies, five reviews focused exclusively on virtual environments (33%), two on in-person environments (13%), and eight covered both strategies developed in virtual environments and those implemented in person (53%) (Figure 6).

Figure 6. Gamified strategy application environments



Source: Own elaboration

Finally, although there is strong evidence that gamification significantly impacts the educational experience, both in virtual and in-person environments, there are inconsistencies regarding the impact it would have on learning indicators. While some authors conclude that they provide improvements in academic performance and learning achievements (Abdul *et al.*, 2022; Camacho-Sánchez *et al.*, 2023; Chytas *et al.*, 2022; Grande-de-Prado *et al.*, 2020; Hintz *et al.*, 2023; Montenegro-Rueda *et al.*, 2023; Nieto-Escamez and Roldán-Tapia, 2021; Safapour *et al.*, 2019; Szeto *et al.*, 2021; Tavares, 2022; Thangavelu *et al.*, 2022), others, mainly in the area of health and related specialties, express their doubts because the studies mostly explore the perception of students without being supported by tests of knowledge or qualifications (Abdul *et al.*, 2022; Gentry *et al.*, 2019; Hope *et al.*, 2023; Van Gaalen *et al.*, 2021).

## Discussions

Gamification strategies have achieved significant interest in higher education, especially since the beginning of the covid-19 pandemic (Burlacu *et al.*, 2023), which does not differ significantly from what was observed at other educational levels (Ahmad *et al.*, 2022; Lampropoulos *et al.*, 2022; Read *et al.*, 2022; Prados *et al.*, 2023). Likewise, it has been found that its tools have a positive impact on motivation, commitment, participation, interaction, and teamwork. However, in terms of learning indicators, more research is required to determine whether gamified teaching strategies are better than conventional ones, such as workshops, readings, and essays (Abdul *et al.*, 2022; Gentry *et al.*, 2019).

Likewise, regarding gamification strategies and development environments, it can be indicated that the use of digital or ICT-based tools (such as simulators, virtual reality, and video games) has not yet become widely widespread. However, it is recognized that the incorporation of these methods is part of the future of education (Ahmad *et al.*, 2022; Ojeda-Lara and Zaldívar-Acosta, 2023), since it must keep pace with new technologies. This constant progress is evident in the increasingly frequent use of digital tools to implement strategies such as quizzes, escape games, and serious games (Hippalgaonkar *et al.*, 2023; Pérez-Jorge and Martínez- Murciano, 2022; Ubben *et al.*, 2023).

## Conclusions

From the data collected in this study, it can be concluded that the application of gamification at the university level can generate important improvements in the student's academic routine, which can be evidenced in greater commitment, participation, collaborative work, and healthy competition. However, it is worth noting that 27% of the articles present observations regarding improvements in the student's academic results, since, usually, the subjective experience of the students is considered as a reference, and not standardized metrics such as evaluations. From this, it can be considered that, to achieve an adequate implementation of gamification and impact both the student experience and their academic results, it is necessary to have trained, creative teachers capable of directing the recreational activity to the objectives. academics, which would imply adapting both the contents and the evaluations.

On the other hand, about the activities developed in gamified environments, it is concluded that they can be carried out in virtual, face-to-face, and hybrid environments. In this sense, questionnaires, escape games, simulations, and serious games are the most used to date. However, more research is required on the use of puzzles, avatars, role-playing games, and other activities based on completely digital environments, such as video games, virtual reality, and simulators.

Finally, regarding the methodologies used, it can be stated that the most common is the systematic review, while the scoping review is less frequent. These reviews were mainly aimed at professions linked to human health, which accumulated 60 % of the total documents reviewed. This is related to the health emergency context in which they were developed, since ensuring the efficiency and quality of training of health personnel became a priority during the covid-19 pandemic.

## Future lines of research

It is recommended to focus on aspects such as gamification and technological innovation, ICT and educational gamification, as well as the creation of motivating environments for learning. In addition, it is suggested to investigate more about gamification in university educational environments and learning in simulated spaces.

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