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Transformando el aprendizaje de Metodología de Investigación: una revisión sistemática de gamificación y otras estrategias de aprendizaje activo

Transforming Research Methodology learning: a systematic review of active learning strategies

Metodologia de Pesquisa Transformando a Aprendizagem: Uma Revisão Sistemática da Gamificação e Outras Estratégias Ativas de Aprendizagem

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Resumen

La Metodología de Investigación es una asignatura importante, aunque desafiante para muchos estudiantes universitarios. Por tanto, en esta investigación se realizó una revisión sistemática de la literatura de los últimos cinco años que sirvió para seleccionar veintiséis estudios que cumplían con los criterios establecidos de calidad metodológica y práctica. Esta revisión evidenció una percepción generalizada negativa hacia esta materia. De hecho, a pesar de su relevancia, parece que la enseñanza en este ámbito aún no ha alcanzado la efectividad deseada. No obstante, se observa un enfoque prometedor con la implementación de estrategias de aprendizaje activo, como la gamificación, las clases invertidas y el aprendizaje colaborativo, las cuales buscan hacer que dicho proceso resulte más atractivo y participativo. El estudio, por ende, subraya la importancia de proporcionar una formación integral que abarque aspectos tecnológicos, pedagógicos y curriculares. Además, destaca la necesidad de reformar las políticas institucionales para fomentar una sólida competencia en investigación. Por último, se plantea la necesidad de una transformación

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completa en la manera de abordar la enseñanza de la metodología de investigación, incorporando la gamificación y estrategias didácticas con el fin de mejorar la calidad del proceso de aprendizaje.

Palabras clave: aprendizaje, estrategias de enseñanza, estudiantes universitarios, gamificación, metodología.

Abstract

Research methodology is an important but challenging subject for many university students. In this study, a systematic literature review of the last five years was conducted, selecting twenty-six studies that met the established criteria for methodological and practical quality. Revealing a widespread negative perception surrounding this subject. Despite its relevance, it seems that teaching in this field has not achieved the desired effectiveness. However, a promising approach is observed: the implementation of active learning strategies, such as gamification, flipped classrooms, and active learning, is gaining ground. These strategies aim to make the learning process of research methodology more engaging and participatory. The study emphasizes the importance of providing comprehensive training that encompasses technological, pedagogical, and curricular aspects. Additionally, it highlights the need to reform institutional policies to promote strong research competence. There is a call for a complete transformation in the way research methodology is taught, incorporating gamification and didactic strategies to enhance the quality of the learning process.

Key words: Learning; Teaching strategies; undergraduate students; Gamification; Methodology.

Resumo

Metodologia de Pesquisa é um assunto importante, embora desafiador, para muitos estudantes universitários. Portanto, nesta pesquisa foi realizada uma revisão sistemática da literatura dos últimos cinco anos, que serviu para selecionar vinte e seis estudos que atendiam aos critérios estabelecidos de qualidade metodológica e prática. Esta revisão revelou uma percepção negativa generalizada em relação a esta matéria. Na verdade, apesar da sua relevância, parece que o ensino nesta área ainda não atingiu a eficácia desejada. Porém, observa-se uma abordagem promissora com a implementação de estratégias ativas de aprendizagem, como gamificação, aulas invertidas e aprendizagem colaborativa, que buscam tornar esse processo mais atrativo e participativo. O

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estudo, portanto, destaca a importância de proporcionar uma formação integral que abranja aspectos tecnológicos, pedagógicos e curriculares. Além disso, destaca a necessidade de reformar as políticas institucionais para promover uma forte competência em investigação. Por fim, levanta-se a necessidade de uma transformação completa na forma de abordar o ensino da metodologia de pesquisa, incorporando gamificação e estratégias de ensino a fim de melhorar a qualidade do processo de aprendizagem.

Palavras-chave: aprendizagem, estratégias de ensino, estudantes universitários, gamificação, metodologia.

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Introduction

The Research Methodology subject provides theoretical-practical tools to develop investigative skills, as well as to prepare academic texts that highlight the intellectual maturity of the undergraduate student, their disciplinary knowledge and their critical capacity in relation to the facts. Additionally, it fosters the ability to formulate questions based on logical, reflective and systematic reasoning that leads to the discovery of new facts or data about a problem or need that needs to be addressed (Ross and Call-Cummings, 2020).

However, the teaching of research methods does not have scientific journals dedicated exclusively to the discussion of its strategies nor does it have an established area of study, as is the case with the teaching of mathematics, science or statistics (Earley, 2014). In addition to this, Peñaloza Ramella (2005) points out that research methodology is a prescriptive science and, as such, it is not feasible for students to acquire skill in its application. In fact, it is considered a complex field that involves a combination of procedures and definitions of which, on many occasions, the academic community itself does not have a uniform conception (Earley, 2014; Faber *et al.*, 2016; Peñaloza Ramella, 2005).

Currently, universities have shown interest in scientific training at the undergraduate level, which requires specific methods as a substantial activity to teach students to conduct research, develop study skills, use science and technology, as well as manage instrumental and methodological resources to prepare scientific works that provide solutions to educational, professional and everyday life problems (Peñaloza Ramella, 2005; Rivera Flores *et al.*, 2018). However, to date, the work done in this area has been limited. Furthermore, despite being part of

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the curriculum, it has not been possible for students to acquire basic research skills for their training (Abdullah Alharbi and Alqefari, 2021; Earley, 2014; Guzmán Cáceres, 2021; Jakeman *et al.*, 2017; Lehti and Lehtinen, 2005).

For this reason, it is essential to review university training processes in order to improve them, given that the quality and quantity of researchers are directly related to their training and the capacity of the educational system to provide them with the necessary skills (Juárez Popoca, 2021). This means that educational practices must be rethought and innovative processes introduced that support learning processes and skills development. In this scenario is where the role of the teacher becomes important, whose work must focus on preparing future professionals to face the challenges of the current labor market through an integrated and contextualized curricular approach (Saunders and Bezzina, 2015). This means that the teacher must guarantee that the knowledge generated in the classroom is transferred to specific contexts (Márquez Specia, 2022).

However, according to Earley (2014), teachers rarely receive formal instruction on how to teach research methods (as happens in other disciplines), so they must rely on the recommendations of their colleagues, the available literature, or the essay and error (Earley, 2014). For this reason, some students attribute the difficulty in learning research methods to poor planning and teaching (Daniel, 2019), although it should be noted that the quality of the educational process due to various factors, among which we can mention the students themselves and their learning styles, and to teachers and their teaching methods (Adriani *et al.*, 2020; Enríquez *et al.*, 2020).

Regarding the teacher's responsibility, some authors have carried out documentary reviews to know the main strategies and their results in implementation in the classroom (Ndenje-Sichalwe and Elia, 2021; Nind and Katramadou, 2022). For their part, Singh *et al.* (2022) applied an awareness program for students that served to demonstrate the importance of the *research concept* for professional development.

Likewise, many teachers and institutions have implemented various strategies to teach research methodology in different educational contexts, from undergraduate, which is the focus of this analysis, to postgraduate. An example of this is the proposal of Daniel (2018), who presents a generic framework with four critical dimensions: reliability, auditability, credibility and transferability (TACT), designed to teach rigorous topics to graduate students and those new to the methodology. research. In this regard, in some studies this strategy is only presented as a proposal, while in others its effectiveness is demonstrated within the application environment.

Having explained the above, the method followed to develop this systematic review of the literature is described below. Then the results are offered, including the systematized table, and finally a brief discussion of the works and conclusions is provided.

Method

For the systematic review, an 8-step method was followed based on the proposal of Okoli and Schabram (2010), who combine quantitative and qualitative methodologies and incorporate the principles of Fink (2005), Levy and Timothy (2006), Kitchenham and Brereton (2013), among other authors. Each of these stages is described below.

Purpose of the literature review

Through an exhaustive evaluation of the literature, the works found on the use of active learning strategies (such as gamification) in research methodology courses were identified and synthesized. In addition, the main strategies used in this area for undergraduate students were detected. This review provides an overview of the current state of research and offers valuable information on how these innovative techniques can significantly improve the learning experience and increase academic performance of university students.

Protocol and training

This study presents a thorough investigation that addresses all necessary components and additional planning information to conduct a systematic review on the use of active learning strategies (e.g., gamification and project-based learning). as innovative teaching strategies in teaching research methodology for undergraduate university students. This protocol focuses on methodological rigor and the quality of the process with the objective of guaranteeing reliable and significant results in the research.

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Background and rationale

Research methodology courses are challenging for both students and instructors as they require mastery of abstract content knowledge. Therefore, the present study aims to analyze why and how research methodology is taught to undergraduate students. This means that it is not simply about collecting or summarizing other articles, but rather seeking to carry out a critical analysis of the information collected (Okoli and Schabram, 2010).

Research questions

Active learning involves the participation of students in all stages of the educational process to stimulate critical thinking and analytical skills aligned with good pedagogical practices (Phillips, 2005). Its relevance lies in its ability to transform classroom dynamics through strategies such as gamification, flipped classes and active participation. This seeks to intellectually engage students and change the roles of educator and student: from a passive model focused on content to another where the learner becomes more autonomous.

For this reason, the following general question has been raised: can active learning strategies transform the teaching of research methodology? To answer it, this article offers a systematic review of literature on the relationship between these strategies and this area of knowledge, focusing on the following specific questions: what are the main perceptions of teachers and students about this course? What pedagogical strategies do they use? teachers? What are the benefits of implementing gamification? And what are the notable findings in this regard?

Search strategy

Searches were carried out in various bibliographic databases and review sources such as Scielo, Web of Science, Scopus, EBSCO, IEEE and Google Scholar. Additionally, reference lists contained in the articles were examined and experts in the field of interest were consulted to ensure the completeness and quality of the analysis. This systematic review aims to provide a comprehensive and up-to-date view on innovative teaching tools that could transform the way research methodology is explained and learned.

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Regarding the choice of search terms, terms related to teaching strategies, gamification and research methodology were selected. These concepts were used to collect articles, books and reports appropriate for the research (table 1).

Table 1 . Words, phrases and concepts that frame the research questions

Keyword/phrase	Homologous word/phrase
Playful strategy	Teaching strategies Teaching strategy Teaching method Teaching
Gamification	Gamified classroom playful classroom educational game
Investigation methodology	Research protocol Research seminar Thesis
Higher education	University undergraduate students

Source: self made

Study selection criteria and procedures

The systematic review was carried out considering rigorous study selection criteria, which allowed some to be included or excluded objectively (Okoli and Schabram, 2010). To do this, factors such as the language, type and date of publication of the article were considered, so only those articles that contained terms related to these topics in their titles in English and Spanish were selected (table 2).

Application of methodological selection criteria

In the search to improve the learning of research methodology, gamification and teaching strategies have emerged as promising alternatives. To evaluate its effectiveness, high-quality works have been selected, which answered four questions based on the internal and external validity of the research design, the reliability and validity of the data sources, the adequacy of the analytical methods and the significance. practice and statistics of the results (Fink, 2014). Then we proceeded with the systematic extraction of the applicable information for each study and the data analysis was carried out combining quantitative, qualitative or both techniques.

Table 2 . Practical selection criteria

Guy	Inclusion criteria
Study content	• Includes studies that focus solely on strategies for teaching research methodology. • It excludes all studies that address research methodology as a process or gamification as a strategy for contexts outside the research methodology.
Publication language	• Studies in English and Spanish. • Studies in another language are excluded.
Context	• Higher education studies are included. • Excludes all basic level, upper secondary education or postgraduate studies.
Research method	• Studies with qualitative strategies are included • Studies with quantitative strategies are included • Studies with mixed strategies are included • Review articles are included.
Sampling	• Studies with university professors and students are included. • Studies with primary, secondary or postgraduate teachers and students are excluded.
Post Type	• Indexed magazines • Books • Chapters of books • Proceedings • Conference proceedings • Thesis • Non-indexed journals excluded.
Publication date	• Studies published between 2017 and 2022 are included.

Fountain: Own elaboration

Results

A total of 3378 publications were retrieved from six databases using predefined selection criteria and set search terms. After applying practical and methodological criteria, the search was reduced to 209 documents and finally 26 documents were chosen for inclusion in the review. It should be noted that the bibliography contained in each selected title was also reviewed in order to expand the scope of the search and identify relevant articles for this review. Scopus was the database with the most retrieved publications, while Scielo was the one with the least (figures 1 and 2).

Figure 1. Item collection and selection process

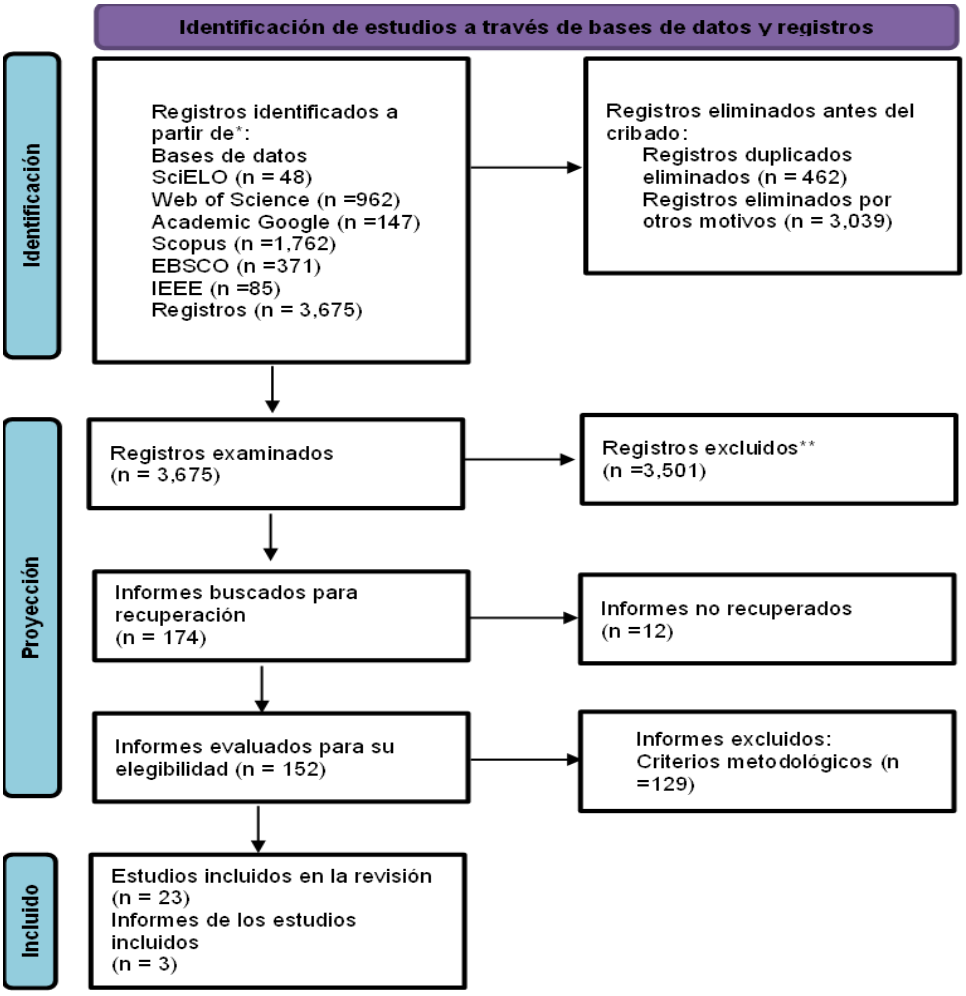

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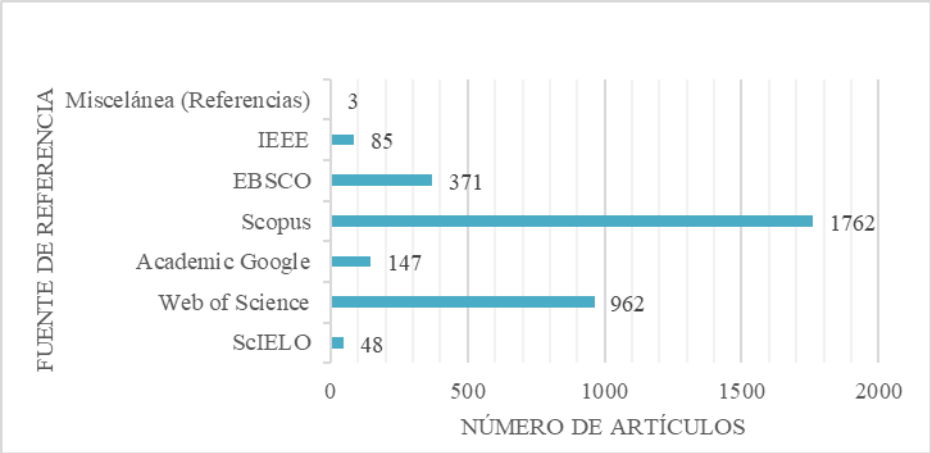
Figure 2. Reference source



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To expand the scope of the research, the documents were analyzed by thematic areas, which allowed four emerging themes to be identified: the perspective of teachers and undergraduate students in research methodology courses, pedagogical strategies for teaching research methodology in undergraduate students, gamification as a teaching strategy for research methodology, and main findings in the documentary review.

With this information, a table was created for analysis, so that the articles were classified by subject area and characteristics such as author, title, year of publication, among others. All this content is described in the following link: https://doi.org/10.6084/m9.figshare.21829974.v1 (González Calleros & Torres Gastelú, 2023).

Although the review focused on the period 2017-2023, the following constants were found: 4 articles published per year, an increase of 100% in 2021 and a decrease of 50% in 2022 (only 2 articles published) (figure 3).

Figure 3 . Year of publication

Fountain: Own elaboration

During the documentary analysis, several relevant themes were identified, such as research, teaching, learning, teaching strategies, research methodology, gamification, among others.

Likewise, searches were carried out following previously established parameters, which suggests that an exhaustive and appropriate documentary review was carried out. These themes are visualized in Figure 4. Its inclusion in the systematic review contributes to offering a detailed understanding of the relationship between gamification and teaching strategies in learning research methodology.

Figure 4. word cloud

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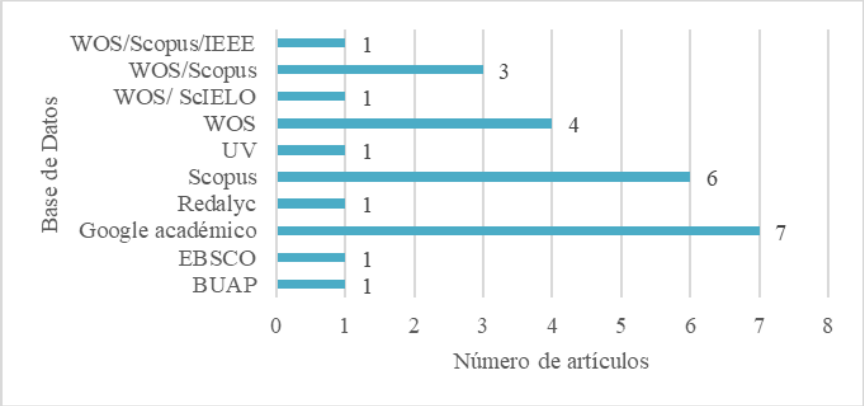
During the systematic review process, 16 articles in English and 10 in Spanish were identified, which met the inclusion criteria. Most of the documents were indexed in Scopus, a database recognized for its extensive coverage of 240 disciplines; Furthermore, it is considered a reliable source by researchers, educators, librarians and students in search of important publications (figure 5).

Figure 5. Articles by database



Fountain: Own elaboration

During the documentary analysis, it was found that the majority of the documents included in the review were articles (figure 6). In addition, searches were carried out in different types of documents, such as *proceedings* , doctoral theses, *reviews* , course proceedings and conference articles, which met the practical inclusion criteria established by the authors and were found in the databases, although it is possible mention that some documents with restricted access were not considered in the analysis.

Likewise, various publication sources were examined, including internationally renowned indexed journals and prestigious universities, and articles with varied research approaches and methodologies were selected, including qualitative, quantitative, mixed, research development and review.

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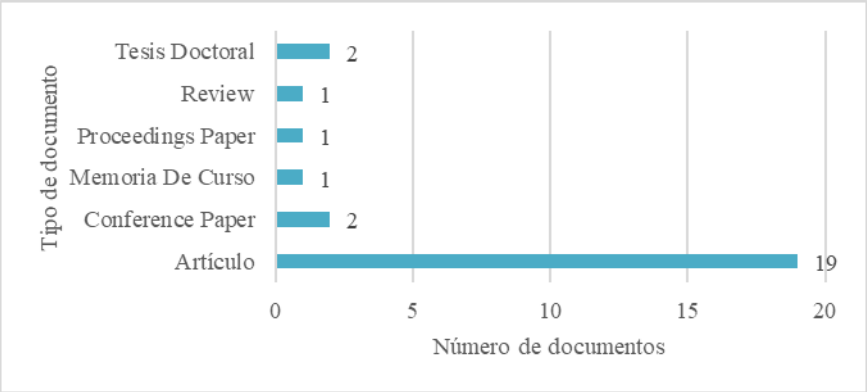
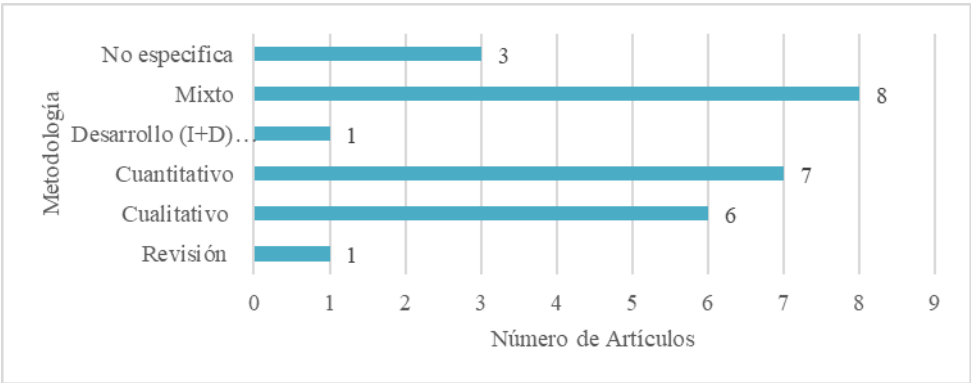
Figure 6. Document type



Fountain: Own elaboration

Different research designs and empirical methods were found, among which the non-probabilistic convenience sample, intentional sampling, documentary sampling and simple probabilistic sampling stand out. Four of the selected documents had a funding source, including two doctoral theses (Juárez Popoca *et al.*, 2017; Márquez Specia, 2022) and two scientific articles (Jaffri and Talib, 2017; Pinos-Vélez *et al.*, 2020). This wide variety of approaches and methodologies provides a complete and detailed view of the relationship between gamification and teaching strategies in learning research methodology (figure 7).

Figure 7. Study method



Fountain: Own elaboration

This study presents an exhaustive analysis and theoretical construction of the 26 selected articles. Likewise, the guiding questions are answered and a detailed table of the selected documents is included, providing information on the topic, authors, year of publication, subjects and research method used. The purpose is to offer readers a clear and detailed overview of the research reviewed and to allow them to identify patterns, trends and gaps in the existing literature.

The inclusion of this table in the systematic review provides a valuable reference tool for future researchers in this field (Table 3).

Table 3. Systematized table: gamification and strategies for teaching research methodology

Themes/variables	Authors/ Year of publication	Subjects	Study method
Gamification Teaching strategy Research methodology	(Jaffri and Talib, 2017)	Students belonged to the 3rd year of the Teacher Training in Primary Education degree	Mixed
Gamification Academic performance Research methodology	(Hernández Ramos, 2017)	Teachers in training	Mixed
Teaching strategy Use of ICTResearch methodology	(Martínez Aguirre *et al.*, 2019)	Students in the 2nd semester of the Research Methodology subject. 19 participants. Twelve female and seven male.	Quantitative
Teaching strategy Flipped classroomResearch methodology	(Pinos-Vélez *et al.*, 2020)	Stage I.38 students, while 42 students participated in the second intervention.	Quantitative
Teaching strategy Project-based learningResearch methodology	(do Amaral and dos Santos, 2018)	22 students in their first year of Administration, aged between 19 and 22 years.	Mixed
teaching strategyAssisted individualizationResearch methodology	(Pakpahan, 2018)	30 students and the course teacher.	Does not specify
Teaching perceptions about the research methodology course	(Daniel, 2018)	144 academics from 139 universities in 9 countries, who are dedicated to teaching research methodology (n = 143)	Mixed
Student perceptions about the research methodology course	(Espinoza-Freire, 2021)	180 students and 18 teachers from the Faculty of Social Sciences	Mixed

Student perceptions about the research methodology course	(Guzmán Cáceres, 2021)	73 students who were studying the last year of their Psychology degree at two universities: one public and one private, in Tabasco, Mexico	Quantitative The research design was cross-sectional, correlational, not causal.
Teaching strategy Competencies Research methodology	(Patra and Maroof Khan, 2018)	25 students assigned to the community medicine department	Mixed cross-sectional study
Teaching strategy Peer-assisted learningResearch methodology	(Jawhari *et al.*, 2021)	121 students and 38 tutors regarding peer teaching	Mixed cross-sectional study
Teaching strategy Flipped classroomResearch methodology	(Mendoza Ramírez *et al.*, 2022)	99 students from the 9th cycle of nursing courses; 45 students of the nursing course. And a control group with 54 midwifery students who received traditional teaching.	Quantitative
Teaching strategy Active learning Research methodology	(Abdullah Alharbi and Alqefari, 2021)	A research methodology methodology course (14 university students and the course professor)	Qualitative Case Study
Teaching perceptions about the research methodology course	(Bayram, 2021)	Stage 1: 391 teachers Stage 2: 42 teachers	Qualitative Phenomenology
Teaching perceptions about the research methodology course	(Orellana-Fonseca *et al.*, 2019)	15 students.	Qualitative
Teaching strategy Active learning Research methodology	(Hoon and Singh, 2019)	10 students	Qualitative Action Research
Student perceptions about the research methodology course	(Montesi *et al.*, 2017)	Does not specify	Quantitative
Teaching strategy Interactive learningResearch methodology	(Ortiz and Bello, 2017)	85 students	Does not specify

Teaching strategy teaching tasks for the development of skills in research methodology	(Boshnakov *et al.*, 2020)	23 students and 17 teachers	Theoretical: analysis-synthesis, inductive-deductive and systemic-structure
Teaching strategy Learning by doing Research methodology	(Mekonnen, 2020)	52 students who enrolled in the research methodology course.	Quantitative cross-sectional study
Teaching strategy Project-based learningResearch methodology	(Adriani *et al.*, 2020)	41 students	Research and development (R&D) development (R&D)
Teaching strategy Flipped classroom and reciprocal peer teachingResearch methodology	(Khapre *et al.*, 2021)	7 students	Does not specify
teaching strategy as an innovative teaching method in the research methods course	(Mangaleswaran , 2017)	95 students	Qualitative
Student perceptions about the research methodology course	(Seid y Cuello, 2021)	35 testimonies collected in 2019	Qualitative Grounded theory: gridding and open, axial and selective coding
Teaching strategy Based on the development of scientific projects and the use of ICTResearch methodology	(Márquez Specia, 2022)	Four groups of students, one control group and three experimental groups. It is worth mentioning that each group has between 20 and 25 students.	Quantitative

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b-learning teaching strategy Project-based learning Research methodology	(Juárez Popoca, 2021)	Phase 1: 10 semi-schooled undergraduate teachers (interviews) and their 154 students (questionnaires) interviewed to be and their student groups. Phase 2, phase 3 and phase 4: 11 semi-school degree teachers, 10 experts in different areas of knowledge	Predominantly qualitative mixed

Fountain: Own elaboration

Discussion

This review identified four key teaching strategies that can significantly improve student learning: project-based learning, flipped classroom, gamification, and active learning. In particular, project-based learning was found to be the most employed strategy, suggesting that teachers are looking for effective ways to engage students in relevant projects that allow them to apply theoretical knowledge to practical situations.

The flipped classroom strategy also proved popular, indicating that teachers are inviting students to acquire knowledge at home and then participate more actively in class. For its part, gamification is increasingly being implemented to motivate and engage students in learning through game techniques, while active learning involves them in an active and participatory way (figure 8).

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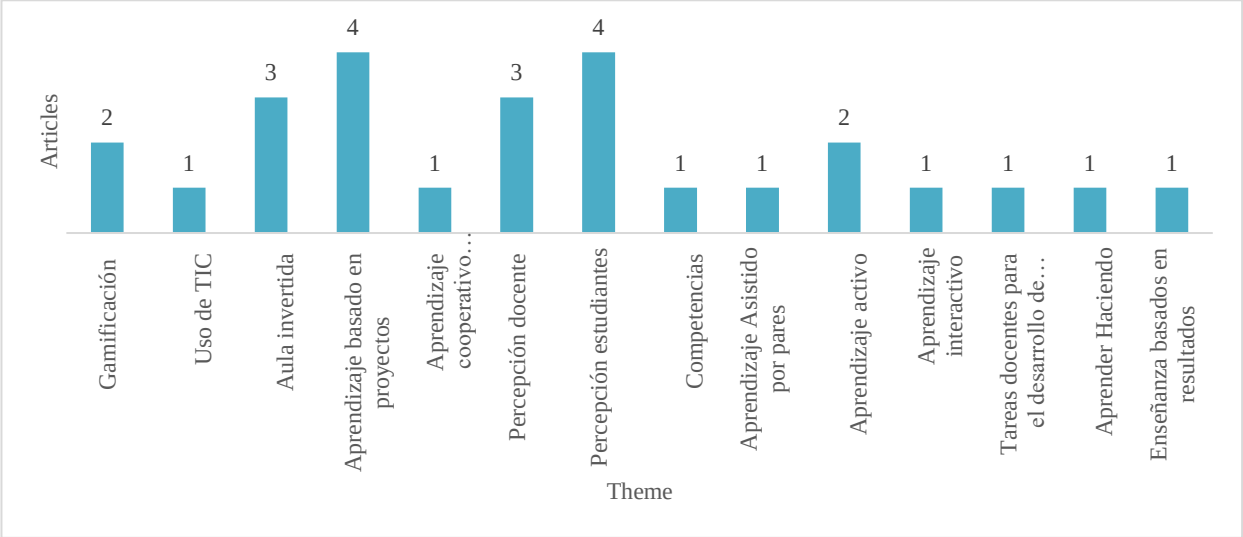
Figure 8. Thematic area



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On the other hand, it was found that the teaching of research methods in higher education presents challenges, such as the delegation of teaching to people with different levels of experience and training, the lack of learning culture and limitations in professional practice due to to educational deficiencies and institutional conditions. Despite this, the importance of research methods in the development of teachers' professional practice is recognized, as noted by prominent authors in the field (Daniel, 2018; Bayram, 2021; Orellana-Fonseca *et al.*, 2019).

In fact, students recognize the importance of research methodology, although they consider it a difficult subject (Hoon and Singh, 2019) due to various reasons such as lack of clarity in the classroom, poor coherence in the bibliography and lack of articulation with other theoretical subjects of the career (Seid and Cuello, 2021); as well as limitations of the curriculum and shortcomings in the dynamics of the teaching-learning process (Espinoza-Freire, 2021). Likewise, they mention aspects such as inadequate planning and teaching (Daniel, 2019a), the lack of new content and the low interest of some students, factors that make learning difficult (Guzmán Cáceres, 2021).

Due to the existence of these obstacles, several authors highlight the importance of improving the teaching of research methods in universities (Han *et al.*, 2021; Montesi *et al.*, 2017). In this sense, they agree that gamification is an innovative strategy that allows students to acquire learning in a reflective and self-managed manner, as well as increase motivation and academic performance (Hernández Ramos, 2017; Jaffri and Talib, 2017). Likewise, the use of ICT in education is considered effective in promoting collaboration and organization (Márquez Specia, 2022; Martínez Aguirre *et al.*, 2019). On the other hand, the flipped classroom strategy stands out for its effectiveness in the development of research skills, as long as there is a flexible environment and an active learning culture (Pinos-Vélez *et al.*, 2020; Mendoza Ramírez *et al. al.*, 2022; Khapre *et al.*, 2021).

Furthermore, the project-based learning approach is recognized for its contribution to the development of research skills, such as problem identification and question formulation, as well as the generation of proposals to solve real problems (Adriani *et al.*, 2020; do Amaral and dos Santos, 2018; Juárez Popoca, 2021;

On the other hand, Abdullah Alharbi and Alqefari (2021) and Hoon and Singh (2019) describe active learning as a strategy that not only facilitates the acquisition of knowledge about research methods, but also strengthens the ability to relate what is known with the assigned tasks, which results in more meaningful and lasting learning (Saeed and Al Qunayeer, 2021).

In summary, various strategies have demonstrated effectiveness in the context of the study of the documents analyzed, among which are cooperative learning (Pakpahan, 2018), competency-based learning (Patra and Maroof Khan, 2018), peer-assisted learning (Jawhari *et al.*, 2021), interactive learning (Ortiz and Bello, 2017), results-based learning (Mangaleswaran, 2017), and learning by doing (Mekonnen, 2020).

Conclusions

Although teachers and students have a contradictory understanding of the teaching and learning process of research methodology, it can be argued that this subject is complicated due to its need for precision, organization, analytical skills and the ability to creatively solve problems. , so it is required to have adequate guidance and solid foundations to achieve a satisfactory result.

In this sense, and in relation to the obstacles identified in the reviewed works, we can name the lack of clarity in the classroom, poor planning, the absence of novel content and the low interest

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of some students. However, strategies such as gamification, the use of information and communication technologies, the project-based learning approach and active learning have also been highlighted as effective in improving learning and research performance.

In conclusion, despite the various challenges and obstacles that exist in teaching research methodology in higher education, the importance of adequate training in research methods for the professional development of students is widely recognized. In this regard, several authors agree that the implementation of innovative, active and student-centered teaching strategies, among others, has been shown to significantly improve motivation, learning and the development of research skills and competencies in university students taking subjects. of said area.

Future work

More large-scale empirical studies should be developed to evaluate the effectiveness of innovative teaching strategies such as gamification, project-based learning, and active learning in research methodology courses. Furthermore, it is necessary to develop and implement a comprehensive instructional model that takes advantage of the advantages of combining these strategies, and delve deeper into research on the specific application of gamification in teaching research methodology.

It will also be important to analyze the differences in the effectiveness of these strategies depending on disciplinary variables and teaching modalities. Finally, it is necessary to promote educational policies for teacher training and implementation of these innovative strategies with the aim of transforming and improving the teaching of research methodology at the university level.

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