Revista Española de Pedagogía

Revista Española de Pedagogía (REP)
ISSN: 0034-9461
e-ISSN: 2174-0909

Innovative learning spaces for the university of the future: A bibliometric review (2011–2024)

Espacios de aprendizaje innovadores para la universidad del futuro. Revisión bibliométrica (2011-2024)

Dr Eva JIMÉNEZ-GARCÍA. Associate Professor. Universidad Complutense de Madrid *(eva.jimenez@universidadeuropea.es)*

Dr Judit RUIZ-LÁZARO. Assistant Professor. Universidad Nacional de Educación a Distancia *(Judit.ruiz@edu.uned.es).*

María HUETOS-DOMÍNGUEZ. University Teacher. Universidad Complutense de Madrid *(maria.huetos@universidadeuropea.es)*

Abstract

In recent years, innovative learning spaces have proliferated in the university setting, emerging as one of the foremost national and international trends. This study aims to analyse scientific output relating to the influence of these spaces in the university teaching and learning process between 2011 and 2024. A bibliometric and systematic review was carried out following the PRISMA guidelines, identifying 56 articles indexed in Web of Science with a high concordance index (k = 0.97). Descriptive analysis and co-citation cluster analyses of references, sources and authors were performed. The results show notable growth in studies focusing on these spaces, principally in Spain. They also reveal a clear structure in four thematic blocks: (a) Theoretical Fundations; (b) Impact; (c) Pedagogical Innovations and Educational Technologies; and (d) Social Context. Where appropriate, the sources were organised into four clusters: (a) Teaching and Learning in Higher Education; (b) Technology in Education; (c) Pedagogical Innovation; and (d) Health Sciences Education. The network of author co-citations reveals four main clusters: (a) Innovative Approaches; (b) Educational Technology; (c) Intercultural Approach; and (d) Experiential Learning. This work concludes that innovative learning spaces are an essential element, influencing the development of health sciences education.

Keywords: innovative physical spaces, virtual learning environments, educational technology, classroom of the future, higher education, educational trends

Resumen

En los últimos años, se ha producido un aumento de espacios de aprendizaje innovadores en el contexto universitario, convirtiéndose en una de las principales tendencias nacionales

Date of receipt of the original: 2025-02-27.
Date of approval: 2025-05-09.
Please, cite this article as follows: Jiménez-García, E., Ruíz-Lázaro, J. & Huetos-Domínguez, M. (2025). Innovative learning spaces for the university of the future. Bibliometric review (2011-2024) [Espacios de aprendizaje innovadores para la universidad del futuro. Revisión bibliométrica (2011-2024)]. *Revista Española de Pedagogía*, *83*(292), 609-628 https://doi.org/10.9781/rep.2025.388

e internacionales. Este estudio tiene como objetivo analizar la producción científica sobre la influencia de estos espacios en el proceso de enseñanza y aprendizaje universitario entre 2011 y 2024. Se ha realizado una revisión bibliométrica y sistemática siguiendo las directrices PRISMA, identificando 56 artículos indexados en Web of Science con un alto índice de concordancia (k=0.97). Se llevaron a cabo análisis descriptivos y análisis clúster de co-citación de referencias, fuentes y autores. Los resultados muestran un crecimiento exponencial de estudios centrados en estos espacios, principalmente en España. Asimismo, se revela una estructura clara en cuatro bloques temáticos: (a) fundamentos teóricos, b) impacto, c) innovaciones pedagógicas y tecnologías educativas y d) contexto social. En su caso, las fuentes se organizan en cuatro clústeres sobre (a) enseñanza y el aprendizaje en educación superior, b) tecnología en educación, c) innovación pedagógica y d) educación en ciencias de la salud. La red de co-citaciones de autores revela cuatro clústeres principales: (a) enfoques innovadores, b) tecnología educativa, c) enfoque intercultural y d) aprendizaje experiencial. Se concluye que los espacios de aprendizaje innovadores son una parte fundamental, influyendo positivamente en el proceso de enseñanza y aprendizaje universitario.

Palabras Clave: Espacios físicos innovadores; entornos virtuales de aprendizaje; tecnología educativa; aula del futuro, enseñanza superior, tendencia educativa.

1. Introduction

University education requires an innovative focus that allows students to develop the skills and competencies needed to face current challenges. In this context, innovative learning spaces have become a topic of special interest in the educational field, both nationally and internationally (Desbrow & Domínguez, 2020; Weiss, 2019).

Innovative learning spaces are environments designed to improve the teaching and learning process by using educational technologies, innovative methodologies, adaptability of content or teaching, flexible furniture and collaboration between the stakeholders involved (Araiza-Vázquez et al., 2023; Bautista et al., 2019; OECD, 2015). However, it is essential to highlight that innovative learning spaces are not limited to physical classrooms but can also include digital and virtual spaces. Accordingly, in relation to physical spaces, their design has become one of the principal trends in Europe, prompted by European Schoolnet's Future Classroom Lab, which is divided into six learning areas that help to foster teaching and the development of student competencies, moving beyond content acquisition to become the core of the teaching process (Mahat et al., 2018; Shevchenko et al., 2021). This initiative has taken shape in Spain in the Aula del Futuro (Classroom of the Future), created by the Instituto Nacional de Tecnologías Educativas y de Formación del Profesorado (National Institute of Educational Technologies and Teacher Training, INTEF) (Tena & Carrera, 2020), which is configured to promote active teaching through elements such as open areas, movable and flexible furniture, advanced technology, online collaboration tools, board walls, green areas and personalised teaching materials, among others (Díaz, 2022; OECD, 2015). These spaces promote active and participatory learning, involving students in activities based on collaboration projects, problem solving and interactive discussions (Johnson et al., 2016).

In addition, as Bolliger and Halupa (2018) note, digital spaces can be equally innovative and effective for learning, so long as they are suitably designed and incorporated with the other elements present in the learning environment. Fullan et al. (2021) maintain that these spaces promote collaboration, creativity and interpersonal and leadership skills, fostering peer-to-peer learning. (Johnson et al., 2016).

Traditional classrooms have been the physical space par excellence since the first schools were founded. However, thanks to the development of educational technology, more flexible teaching models that are adapted to current needs have emerged. According to Knezek et al. (2019), learning spaces have been in constant evolution over the last few decades. Open classrooms appeared in the 1960s, fostering collaboration and teamwork.

Thematic classrooms were then introduced, in which the space was tailored to the subject being taught, along with multimedia classrooms incorporating technological tools (Al-Lal, 2021). With the arrival of the 21st century came the emergence of innovative learning spaces, characterised by their flexibility and adaptation to students' needs, learning styles and the principles of Universal Design for Learning (UDL, Benade, 2019), creating an environment that is accessible and comfortable for students, where the elements can be reconfigured and reorganised in response to evolving needs and learning objectives (Parody et al., 2022). In the same vein, Yang et al. (2018) maintain that the integration of digital and technological tools has been the key factor in converting conventional and virtual classrooms into smart classrooms. Innovative learning spaces seek to break with the traditional teaching model and promote active and autonomous participation by students during the learning process (Carvalho & Yeoman, 2021; Divyashree, 2018; Rovai, 2018). As society changes, so do pedagogical theories and models, and implementing innovative learning spaces is essential to satisfy the demands of a changing society and provide students with a quality education (Baque & Marcillo, 2020). In this sense, the need to implement innovative learning spaces grounded in pedagogical models—principally Piaget's constructivist model (1977) and Vygotsky's sociocultural model (1978)—is well founded. Therefore, innovative learning spaces such as teamwork spaces and flipped classrooms provide a collaborative environment that fosters social interaction and knowledge exchange.

In recent years, research has been done on innovative learning spaces, exploring the different types and analysing their effects on learning. Current literature suggests that the implementation of innovative learning spaces has positive effects on the teaching and learning process and on students' motivation, well-being and academic performance (Düzenli et al., 2018; Granito & Santana, 2016).

Although there is growing awareness of the importance of innovative learning spaces in education, scarce research has analysed their actual impact on the teaching and learning process. The present study aims to analyse the available scientific literature on the influence of innovative learning spaces on university teaching and learning between 2011 and 2024.

The specific objectives are: to examine the chronological productivity of studies (2011–2024); to identify scientific output according to the author's country of publication; and to map the relationships and groupings among publications, sources and authors in the field of innovative learning spaces through co-citation analysis.

2. Method

A systematic review of the scientific literature was performed in response to the research objectives.

2.1. Protocol and registration

This work was done following the guidelines set out in the PRISMA statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses; Urrútia & Bonfill, 2010). This protocol provides a framework for conducting research into scientific output in a rigorous, thorough and systematic manner (Uman, 2011).

2.2. Eligibility criteria

Before searching for and analysing information, and with the aim of reducing the impact of the biases inherent in the selection process, the eligibility criteria for inclusion and exclusion were established to specify the characteristics of the studies (Table 1).

Table 1. Study eligibility criteria

Criteria	Search	Inclusion criteria	Exclusion criteria
Initial filters	Publication date	2011–2024	Prior to 2011
	Language	English and Spanish	Articles published in other languages
	Type of document	Empirical research articles	Books, doctoral theses, other academic works and conference proceedings
1	Type of publication	Published full-text articles in peer-reviewed journals	Abstracts and articles published in journals without peer review
2	Type of review	Green Published (published final versions hosted in an institutional repository or a thematic repository) and Green Accepted (final peer-reviewed resource, which might not have been edited).	No peer review
3	Educational level	University	Not university

Source: Prepared by the authors

2.3. Search methodology

Having established the eligibility criteria, the decision was taken to search for scientific contributions indexed in Web of Science.

A search strategy combining descriptors and Boolean operators in English was used, making it possible to generate the following reproducible and replicable search: (innovative) AND ("learning space*" OR "learning environment*" OR "Active Learning Classroom*") AND ("higher education" OR university) AND (educa*). Some descriptors were combined with the Boolean operator OR to expand the search among synonyms or equivalent expressions and AND as a connecting nexus with the aim of restricting the search. The asterisk (*) was used to search for expressions both in the singular and in the plural, and inverted commas (" ") were used to establish the set of words that should be returned in the search results.

With regards to the search phrase, the systematic process was divided into two phases: Phase I, which involved searching for and identifying registers, and Phase II, which consisted of their screening. Figure 1 summarises both phases.

Phase I, corresponding to the initial search for and identification of registers, returned 1,005 results, and several initial filters were used to characterise the selection of results.

Open-access studies from 2011 to 2024 and empirical research articles were selected, yielding 438 articles for the eligibility analysis.

Phase II was performed using the Covidence program, a software tool for analysing systematic reviews (Kellermeyer et al., 2018). The search results obtained in Phase I were uploaded into this tool. Each record was then reviewed individually by reading its title and abstract, applying the inclusion and exclusion criteria set out in Table I, and extracting the final results.

2.4. Bias and data analysis

The selection of the studies analysed was done independently in pairs with the aim of guaranteeing the quality of the research and avoiding bias. The Covidence tool, recommended by the Cochrane Collaboration, was used to make the selection and facilitate the revision and extraction of data in the systematic reviews. In this regard, cases where discrepancies arose were resolved by consensus, and Cohen's Kappa coefficient was calculated (k = 0.97).

$$k = \frac{p_0 - p_e}{1 - p_e}$$

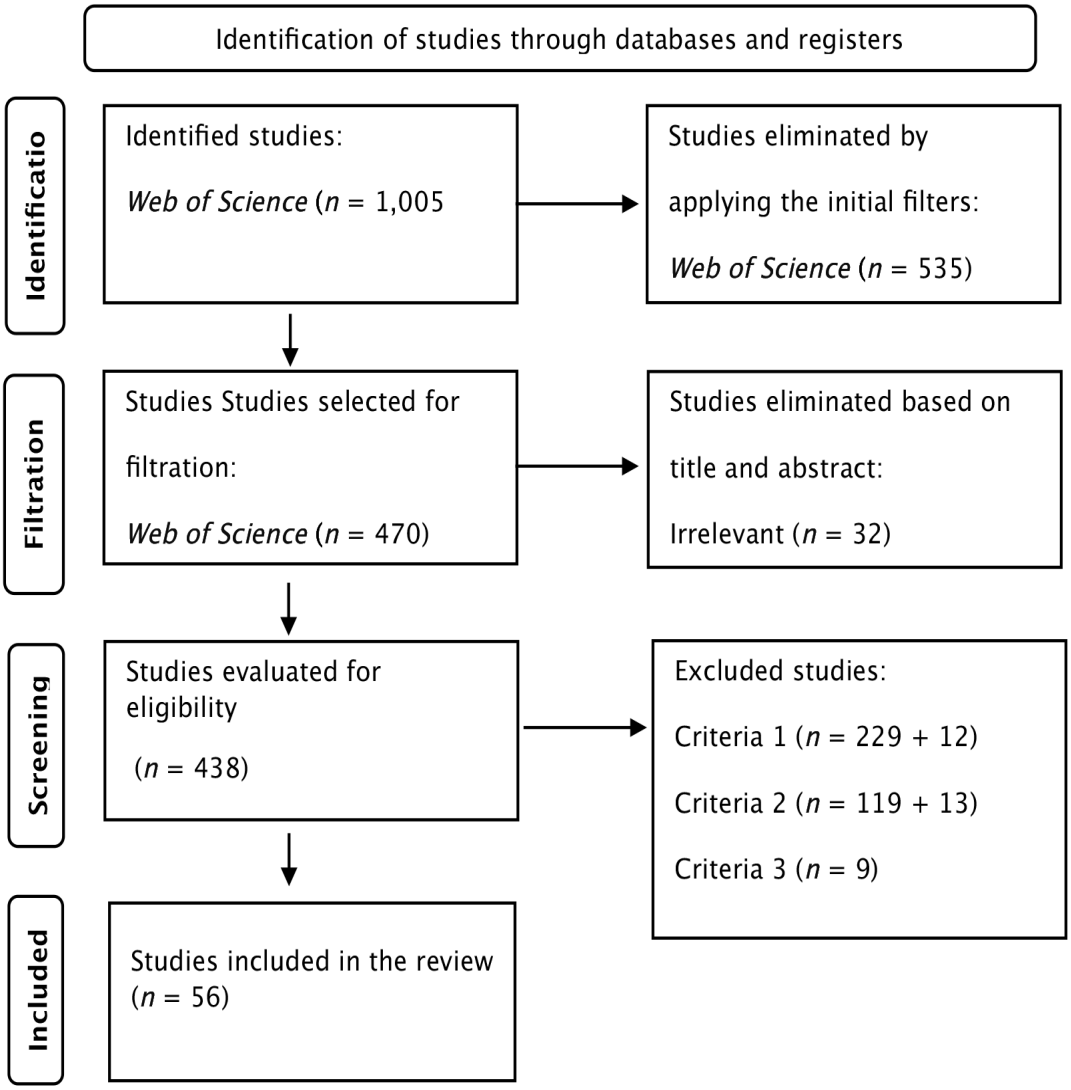
Note: P_0 is the relative agreement observed between evaluators and P_0 is the hypothetical probability according to chance. Finally, after the screening process, 56 articles meeting the established inclusion criteria were identified. Once the final selection of studies had been performed using the Covidence software, the data were exported to EzAnalyze (an Excel tool) to respond to specific Objectives 1 and 2 through descriptive statistics and figures that summarise the percentages of each variable. In response to specific Objective 3, a co-citation analysis of references, sources and authors was performed in order to identify the relations and citation patterns among the bibliographic references. This analysis offered insights into the structure of knowledge and the relationships among research areas. The co-citation analysis of authors yielded information about influence and collaboration among researchers in a specific field.

VOSviewer software was used for these analyses, using the "Association Strength" method to measure the strength of association based on citation weight and generating co-citation network maps to graphically illustrate the relations between the publications, sources and authors.

2.5 Flow chart

Figure 1 is a flow chart of the methodology used.

FIGURE 1. Flow chart



Source: Prepared by the authors, adapted from Page et al. (2021)

Note: The articles included in the review can be consulted at the following link.

Following the screening process, the outputs obtained were examined in relation to articles published in English and Spanish between 2011 and 2024, with full text available, on the role of innovative learning spaces.

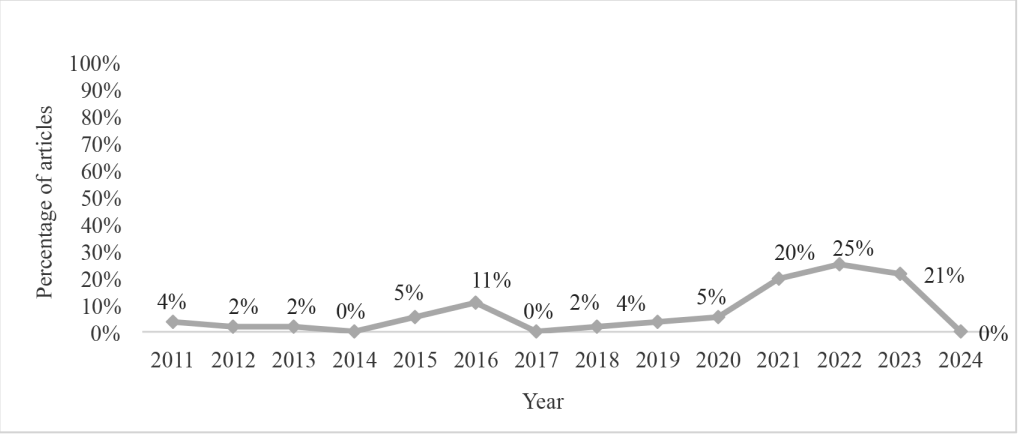
3. Results

The results obtained were then shown, organised according to the specific objectives of the study.

3.1. Results by chronological productivity

To analyse the chronological productivity of studies, 56 research articles published between 2011 and 2024 were reviewed (see Figure 2). Of the 56 studies identified, 66% (37) were published between 2021 and 2024, with 2022 accounting for 25% of the total output. The remaining articles are distributed across the years, with the highest output in 2016 (11%, 6 articles) and 2020 contributing three articles (5%). In general, the number of published studies has risen in recent years, reflecting a growing interest in this regard, although no articles were published in 2024.

FIGURE 2. Chronological productivity of studies from 2011 to 2024



Source: Prepared by the authors

Note: The descriptive statistics used to prepare this figure were calculated using the EzAnalyze tool.

3.2. Results by author's country of publication

Of the 82 authors included in the analysis, 13% (11 authors) are from Spain, followed by 10% (8 authors in each case) from the England and the United States. They are followed by 7% (6 authors) from the Netherlands, 6% (5 authors in each case) from Australia, China and Taiwan, and 5% (4 authors) from Mexico. Countries such as Canada, Finland, Pakistan, Portugal, South Africa, South Korea, Turkey and Venezuela each contribute with two authors, representing 2% per country. The remaining countries have one author each (Algeria, Argentina, Brazil, France, Germany, Ghana, India, Italy, Jordan, Nigeria, Norway, Qatar, Saudi Arabia, Sweden and Ukraine).

3.3. Results based on co-citation analysis

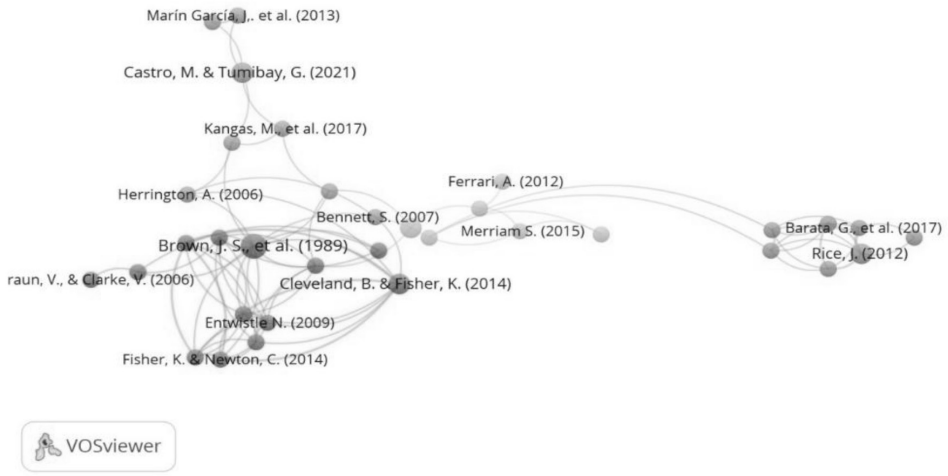
The results of the co-citation analyses are shown below, including references, sources, and authors.

3.4. Results of the co-citation analysis of references

Figure 3 shows the co-citation network map of the references cited in the 56 selected studies, using citation weight as the metric. From an initial set of 2,594 cited references, a cutoff threshold of 2 was applied, giving a total of 43 selected references.

An analysis of the co-citation network of references revealed four different groups of nodes.

FIGURE 3. VOSviewer co-citation map of references by number of citations



Source: Prepared by the authors

Table 2 provides a summary of the network and the thematic categories created.

TABLE 2. Thematic categories of the co-citation network map of references by

Cluster	Thematic categories	References with ≥ 2 citations
Cluster 1	Theoretical Foundation of Innovative Learning Spaces	Brown, J. S. et al. (1989) - 4 citations Cleveland, B. & Fisher, K. (2014) - 3 citations Braun, V. & Clarke, V. (2006). Entwistle, N. (2009). Fisher, K. & Newton, C. (2014) - 2 citations Fisher, K. (2005) - 2 citations Geitz, G. & de Geus, J. (2019) - 2 citations Jones, C. et al. (2010) - 2 citations Kirschner, P. et al. (2006) - 2 citations Lindblom-Ylänne, S. (2003) - 2 citations Lizzio, A. et al. (2002) - 2 citations Miles M. (1994) - 2 citations Vygotsky L. S. (1978) - 2 citations

Cluster 2	Impact of Innovative Learning Spaces	Castro, M. & Tumibay, G. (2021) - 3 citations Bennett, S. (2007) - 2 citations Herrington, A. (2006) - 2 citations Kangas, M. et al. (2017) - 2 citations Marín García, J. et al. (2013) - 2 citations Marin-Garcia, J. et al. (2016) - 2 citations Stone, C. (2016) - 2 citations Van den Akker, J. (1999) - 2 citations
Cluster 3	Pedagogical Innovations and Educational Technologies	Rice, J. (2012) - 3 citations Barata, G. et al. (2017) - 2 citations DeLone, W. & McLean, E. (2003) - 2 citations Ferguson, R. (2012) - 2 citations Hew, K. F. et al. (2016) - 2 citations Sousa-Vieira, M. et al. (2017) - 2 citations Viberg O. (2018) - 2 citations
Cluster 4	Situated or Contextualised Learning	Lave, J. & Wenger, E. (1991) - 3 citations Ferrari, A. (2012) - 2 citations Merriam, S. (2015) - 2 citations Spradley, J. (2016) - 2 citations Stake, R. (1995) - 2 citations Yin, R. (2009) - 2 citations

Source: Prepared by the authors

Cluster 1 references comprise key studies on learning theories and cognitive models that shape teaching and learning, with a focus on cognition and knowledge construction in education. According to its theme, this cluster has therefore been categorised as "Theoretical Foundation of Innovative Learning Spaces", as authors such as Brown et al. (1989), Fisher and Newton (2014), Fisher (2005), Vygotsky (1978) and others examine these fundamental aspects for understanding the influence of innovative learning spaces on university education.

Cluster 2 includes authors such as Castro and Tumibay (2021), Bennett (2007) and Herrington (2006), among others, whose central topic is the "Impact of Innovative Learning Spaces". These studies focus on analysing the impact of innovative learning environments on the teaching–learning process, specifically underlining the relevance of learning space design.

Cluster 3 includes references to "Pedagogical Innovations and Educational Technologies", and covers research into innovations in the university education environment. Authors such

as Rice (2012), Hew et al. (2016), DeLone, Ferguson and others investigate new pedagogical strategies, teaching methodologies and emerging technologies.

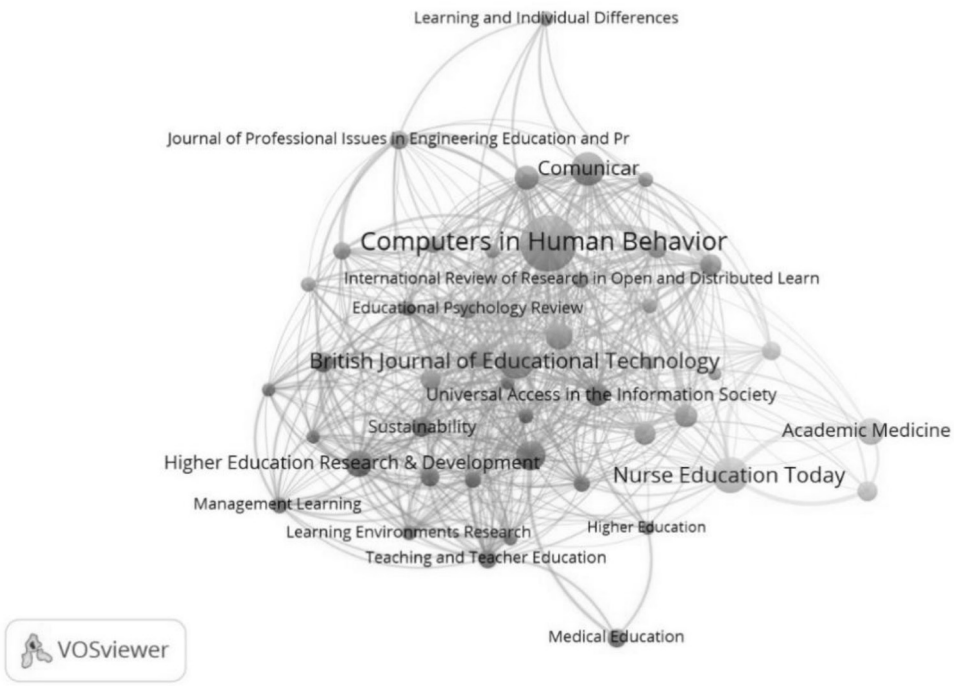
Finally, Cluster 4 includes authors such as Lave and Wenger (1991) and Merriam (2015), who have looked into the development of learning in real-world situations, underlining the importance of the environment, case studies and practice in higher education. Consequently, this cluster is referred to as "Situated or Contextualised Learning", and the included studies provide a valuable perspective on how learning spaces are adapted to the social context to favour meaningful learning.

3.5. Results of the co-citation analysis of sources

Figure 4 shows the co-citation map of the cited sources, once again using citation weight as the metric. For this analysis, an initial set of 1,742 cited sources was taken, and a threshold of 6 was applied, so that only sources that were cited at least six times were included to ensure representativeness on the topic. This resulted in a total of 46 sources selected for representation in the co-citation map.

In the co-citation network, four groups of nodes were created from the 46 sources with at least six citations.

FIGURE 4. VOSviewer co-citation network map of sources by number of citations



Source: Prepared by the authors

Table 3 provides a detailed summary of the network and the thematic categories that emerged from the analysis. Each group of nodes represents a common theme that covers various studies and discussions in the educational field.

Table 3. Thematic categories of the co-citation network of sources by number of citations

Cluster	Thematic categories	Name of the journals with ≥ 6 citations
Clúster 1	Enseñanza y aprendizaje en educación superior	Teaching in Higher Education (22 citas) Higher Education Research & Development (18 citas) Universal Access in the Information Society (14 citas) International Journal of Educational Technology in Higher Education (11 citas) Sustainability (11 citas) Assessment & Evaluation in Higher Education (10 citas) Medical Education (10 citas) Teaching and Teacher Education (10 citas) Educational Psychology (8 citas) Educational Technology & Society (8 citas) Management Learning (8 citas) Educational Science (7 citas) Learning Environments Research (7 citas) Thesis (7 citas) Educational Research Review (6 citas) Higher Education (6 citas) Learning and Instruction (6 citas) Studies in Educational Evaluation (6 citas) Studies in Higher Education (6 citas)
Clúster 2	Tecnología en educación	Computers in Human Behavior (68 citas) British Journal of Educational Technology (31 citas) The Internet and Higher Education (19 citas) European Journal of Engineering Education (14 citas) Journal of Engineering Education (14 citas) Proceedings of the Social and Behavioral Sciences (13 citas) Harvard Business Review (12 citas) Educational Psychology Review (10 citas) Journal of Educational Computing Research (10 citas) Australasian Journal of Educational Technology (8 citas) Education and Information Technologies (7 citas) Review of Educational Research (7 citas) Working Papers on Operations Management (7 citas) Thinking Skills and Creativity (6 citas) WPOM-Working Papers on Operations Management (6 citas)

Clúster 3	Innovación pedagógica	Comunicar (27 citas) Journal of Computer Assisted Learning (16 citas) Computers & Education (13 citas) Journal of Professional Issues in Engineering Education and Practice (10 citas) Frontiers in Psychology (9 citas) International Review of Research in Open and Distributed Learning (8 citas) Interactive Learning Environments (7 citas) Learning and Individual Differences (7 citas)
Clúster 4	Educación en ciencias de la salud	Nurse Education Today (31 citas) Academic Medicine (18 citas) Medical Teacher (12 citas) BMC Medical Education (10 citasPrincipio del formulario)

Source: Prepared by the authors

Cluster 1 comprises journals that cover fundamental aspects of "Teaching and Learning in Higher Education", with an emphasis on educational technology as a key component for improving the quality and accessibility of education at this level. Journals such as *Teaching in Higher Education* and *Higher Education Research & Development*, with the greatest number of citations (22 and 18 respectively), focus on teaching, learning, pedagogical strategies, improving the quality of education, and teacher training in university contexts. The journals *International Journal of Educational Technology in Higher Education* and *Universal Access in the Information Society*, with 14 and 11 citations, explore the use of technology in higher education, including the development and implementation of technological tools, online learning platforms, accessibility, and inclusive technologies for education.

Cluster 2, comprising fifteen sources, focuses on the topic of "Technology in Education". Relevant sources in this cluster include journals such as *Computers in Human Behavior* (68 citations), *British Journal of Educational Technology* (31 citations), and *The Internet and Higher Education* (19 citations), and cover topics relating to the use of technology to improve teaching, learning, and the educational experience in general.

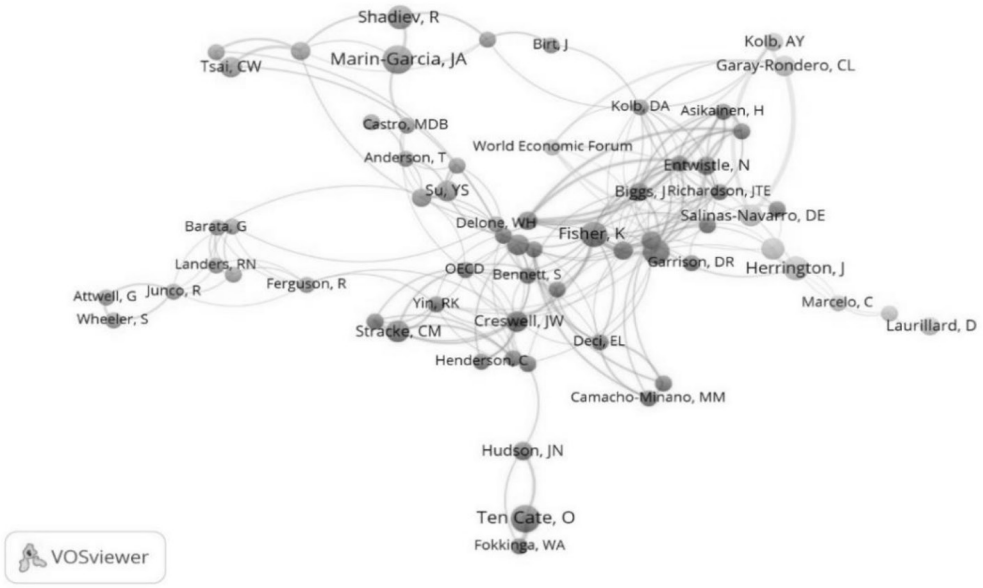
Cluster 3 comprises eight sources relating to "Pedagogical Innovation", which seek to enrich education in a variety of fields and contexts. The journals *Comunicar* (27 citations), *Journal of Computer Assisted Learning* (16 citations) and *Computers & Education* (13 citations) cover aspects relating to new practices, methodologies, technologies and strategies that contribute to the development and improvement of the educational field in general.

Finally, Cluster 4 comprises four sources centred on "Education in Health Sciences": *Nurse Education Today* (31 citations), *Academic Medicine* (18 citations), *Medical Teacher* (12 citations) and *BMC Medical Education* (10 citations). This group of common journals covers the training of healthcare professionals, clinical practice, educational methodology in the field of health and other aspects relating to health science education.

3.6. Results of the co-citation analysis of authors

Figure 5 shows the of co-citation network of the cited authors, once again with citation weight as the measure. A total of 2,191 cited authors were used for this analysis. A threshold of 3 was established, yielding a total of 68 authors to be represented on the map.

FIGURE 5. VOSviewer co-citation network map of authors by number of citations



Source: Prepared by the authors

Note: Web of Science only includes the first author cited in a document.

Note: The co-citation analysis includes references from any period, as it identifies the most often-cited theoretical influences in the selected articles from 2011–2024.

Within the co-citation network of authors who received a significant number of citations (at least 3 citations), four groups of nodes were identified, as shown in Table 4.

TABLE 4. Author co-citation network by number of citations (at least 3 citations)

Cluster	Thematic categories	Authors with ≥ 3 citations
Cluster 1	Pedagogical Focuses	Ten Cate, O. (9 citations); Fisher, K. (8 citations); Vermunt, J. D. (8 citations); Stracke, C.M. (6 citations); Creswell, J. W. (5 citations); Dillenbourg, P. (5 citations); Bandura, A. (4 citations); Biggs, J. (4 citations); Brown, J. S. (4 citations); Entwistle, N. (4 citations); Hudson, J. N. (4 citations); Miles, M. B. (4 citations); Asikainen, H. (3 citations); Bennett, S. (3 citations); Byers, T. (3 citations); Camacho-Minano, M. M. (3 citations); Deci, E. L. (3 citations); Fenwick, T. (3 citations); Fokkinga, W. A. (3 citations); Garrison, D. R. (3 citations); Henderson, C. (3 citations); Kember, D. (3 citations); Lave, Jean (3 citations); Lindblom-Ylänne, S. (3 citations); Nerantzi, C. (3 citations); OECD (3 citations); Parpala, A. (3 citations); Richardson, J. T. E. (3 citations); Ryan, R. M. (3 citations); UNESCO (3 citations); Van den Akker, J. (3 citations); Vygotsky, L. S. (3 citations); Yin, R. K. (3 citations); Zhu, C. (3 citations).
Cluster 2	Technology in Education	Tsai, C. W. (5 citations); Huang, Y. M. (4 citations); Attwell, G. (3 citations); Barata, G. (3 citations); Delone, W. H. (3 citations); Ferguson, R. (3 citations); Junco, R. (3 citations); Landers, R. N. (3 citations); Pekrun, R. (3 citations); Rice, J. W. (3 citations); Sousa-Vieira, M. E. (3 citations); Wheeler, S. (3 citations).
Cluster 3	Intercultural Focus	Marin-Garcia, J. A. (10 citations); Shadiev, R. (7 citations); Su, Y. S. (5 citations); Kangas, M. (4 citations); Anderson, T. (3 citations); Birt, J. (3 citations); Bower, M. (3 citations); Castro, M. D. B. (3 citations); Furman, M. (3 citations); Kolb, D. A. (3 citations); Krathwohl, D. R. (3 citations).
Cluster 4	Experiential Learning	Herrington, J. (7 citations); Jackson, D. (6 citations); Salinas-Navarro, D. E. (6 citations); Garay-Rondero, C. L. (5 citations); Kolb, A. Y. (4 citations); Laurillard, D. (4 citations); Koper, R. (3 citations); Marcelo, C. (3 citations); World Economic Forum (3 citations).

Source: Prepared by the authors

Cluster 1 comprises 34 authors and centres on “Innovative Focuses”. Notable authors here include Ten Cate, whose research examines medical education and teaching and learning in clinical settings, and Vermunt, whose research reviews the development of innovative teachers and the exploration of new pedagogies aimed at challenge-based learning, thereby seeking to promote more meaningful and effective learning experiences. These lines of work make it possible to understand how innovative learning spaces can be designed and used to improve

teaching and learning in university settings, whether this is by introducing effective learning strategies or by implementing innovative practices in education.

Cluster 2 comprises 12 authors and centres on "Technology in Education". Authors of note include Tsai, who directs his studies towards aspects like computational intelligence, data mining, cloud computing and the Internet of Things (IoT); Huang, whose works examine educational technology and the use of digital devices; and Attwell, who focuses on the implementation of technological tools to optimise learning and improve the efficacy of the educational process in different contexts. The perspectives provided by these authors are essential for understanding how to design and assess innovative learning spaces that make the best use of technology and ICT in higher education.

Cluster 3 comprises 11 authors and represents the "Intercultural Focus" category. Significant authors in this group include, among others, Marín-Garcia, who focuses on assessing performance and active learning in higher education, and Rustam Shadiev, who is interested in technology applied to language learning and intercultural education. These authors demonstrate the impact of intercultural collaboration and educational innovation on innovative learning spaces in university education.

Finally, Cluster 4 comprises nine authors and covers the category of "Situated or Contextualised Learning". Key contributors here include Jan Herrington, who focuses on promoting the effective use of educational technologies in school and university learning environments. In addition, Salinas-Navarro investigates experiential learning in spaces based on lean thinking. These authors underline the importance of experiential learning and knowledge management in improving university teaching and learning, key aspects in creating innovative learning spaces.

4. Discussion

The study has yielded evidence on the available scientific output available related to the influence of innovative learning spaces on teaching and learning in higher education between 2011 and 2024. The results obtained not only confirm the growth of academic interest in this field, but also advance scientific knowledge by identifying thematic patterns and co-citation relationships that enrich our understanding of how innovative learning spaces impact higher education. In comparison with previous reviews, such as Radcliffe's (2008), which examined the design of physical spaces, this study offers a more integrative perspective by combining theoretical foundations, measurable impact, technological innovations, and situated or contextualised learning, as reflected in the four established clusters. This integration enables progress in designing educational settings that meet the needs of the university of the future, aligning with global trends towards flexibility and the contextualisation of learning.

These same results allow us to reach a series of more specific conclusions. Based on the results obtained in relation to chronological productivity, we can first conclude that the amount of research published in recent years has risen significantly. This trend indicates that the academic community recognises the importance of exploring these spaces, thereby highlighting the relevance of this field of study (Vite, 2014).

Secondly, the results on authors' nationalities show that research in this field is not limited to a small group of countries, as contributions from a range of nations have been identified. It is interesting to note that Nordic countries, which are considered benchmarks in educational innovation, have limited representation, with only Finland contributing with 2% of the authors. This scant representation could be due to search biases, such as the exclusion of publications in Nordic languages or searches in alternative databases, or to a lower output of empirical articles that comply with the inclusion criteria, such as stage of education. Indeed, existing literature identifies the Nordic countries as leaders in innovative pedagogical focuses in the pre-primary education stage (Navarro-González, 2023). Future studies should explore additional sources to include these perspectives, as well as expand the educational levels at which the review is performed. Nonetheless, the results indicate that Spain, the United States

and England contribute with the greatest number of authors in this field. This geographic distribution emphasises the importance of adapting classroom design to different cultures and educational environments around the world, as observing the way in which environmental, physical or perceptive variables differ according to the social group (González-Zamar & Abad-Segura, 2020) is an important aspect, and these countries register a greater dedication to this focus.

Thirdly, the co-citation analysis identified four thematic clusters that structure knowledge in this field: Theoretical Foundations, Impact of Ipaces, Pedagogical Innovations and Situated Learning. These clusters provide an innovative vision, as they integrate perspectives that previous studies covered in isolation. For example, while Cleveland and Fisher (2014) focused on the physical impact of spaces, the situated or contextualised learning cluster (Lave & Wenger, 1991) highlights how real contexts promote meaningful learning. This multidimensional focus not only enriches the literature, but also provides a foundation for designing educational policies that combine physical, digital and contextual settings, responding to the needs of a more inclusive and adaptive higher education.

Although the 56 selected studies do not explicitly address the Covid-19 lockdowns, these had a marked impact on university learning spaces, accelerating the adoption of virtual environments and hybrid teaching models (Lozano-Díaz et al., 2020; Engel & Coll, 2022). This transition underlined the importance of digital spaces as innovative environments, capable of promoting collaboration and flexibility in learning, as mentioned in the introduction.

5. Conclusions

The relationships and groupings in the field of innovative learning spaces through co-citation analysis reveal a clear four-block structure: a) Theoretical Foundation of Innovative Learning Spaces; b) the Impact of Innovative Learning Spaces; c) Pedagogical Innovations and Educational Technologies; and d) Innovative Learning Spaces and Social Context. These results underline the complexity and importance of understanding innovative learning spaces in higher education, illustrating the diversity of focuses and their potential to exert a positive influence on the educational process.

The network of source co-citations is divided into four main clusters: the first, which examines "Teaching and Learning in Higher Education", covers journals related to higher education. Publications like *Teaching in Higher Education* and *Higher Education Research & Development* focus on pedagogical strategies, educational quality and teacher training. Other journals such as *International Journal of Educational Technology in Higher Education* and *Universal Access in the Information Society* centre on the use of technology, online learning platforms and accessibility for higher education. The second cluster, "Technology in Education", comprises journals that explore the use of educational technology, such as *Computers in Human Behavior*, *British Journal of Educational Technology* and *The Internet and Higher Education*. The third cluster examines "Pedagogical Innovation", underlining the importance of this aspect in innovative learning spaces with important journals such as *Comunicar*, *Journal of Computer Assisted Learning* and *Computers & Education*. The fourth cluster, "Education in Health Sciences" includes journals such as *Nurse Education Today*, *Academic Medicine*, *Medical Teacher* and *BMC Medical Education*, which focus on the training of healthcare professionals, clinical practice and the specific educational methodology in this field. Indeed, these clusters indicate the existence of a variety of journals focusing on higher education that address pedagogical strategies, educational quality, technology and teacher training.

Findings relating to the network of author co-citations reveal four principal clusters. The first relates to "Innovative Focuses", with authors such as Ten Cate and Vermunt. The second focuses on "Educational Technology", with researchers like Tsai, Huang and Attwell. The third cluster addresses the "Intercultural Focus", with influential authors such as Marín-Garcia and Rustam Shadiev. The fourth cluster relates to "Situated or Contextualised Learning", including

such distinguished contributers as Jan Herrington and Salinas-Navarro. These clusters highlight the importance of diverse focuses and perspectives in the creation of innovative learning environments in higher education.

In summary, these results emphasise the need to consider a variety of focuses and practices in order to promote more meaningful university education, while making full use of the wide range of resources, methodologies and technologies available for configuring these advanced learning environments. Consequently, innovative learning spaces are educational environments designed to improve skills development and student learning by creating flexible, collaborative, creative and adaptable environments. These spaces will be fundamental pillars of future education with the potential to enrich learning at all stages, from primary school through to university (Dede, 2010; OECD, 2015).

While this systematic review has identified a number of trends and patterns in innovative learning spaces, certain limitations must be acknowledged. These include potential bias in the selection of studies—despite the use of an exhaustive search strategy—and the constraints of VOSviewer, which does not allow the automatic integration of registers from multiple sources. Manual combination could have generated bias; therefore, a single database was used to ensure the consistency of the analysis. Although these restrictions do not compromise the validity of the results, future research could consider methods to combine multiple data sources, which would enrich the scope of the bibliometric analysis in this sphere.

Consequently, suggestions for future research would focus on the selection of studies to gain a better understanding of how innovative learning spaces can be effective in different educational contexts and educational stages. It would also be important to identify the factors that contribute to their success, as well as to explore tools complementary to VOSviewer for analysing semantic relations or temporal dynamics, thereby enriching understanding of the subject.

Author contributions:

Eva Jiménez-García: Conceptualisation; data curation; formal analysis; methodology; writing – original draft.

Judit Ruiz-Lázaro: Conceptualisation; writing – review & editing; data curation; supervision; project administration.

María Huetos-Domínguez: Writing – review & editing; research; supervision.

Artificial Intelligence (AI) Policy:

The authors state that they did not use artificial intelligence (AI) to prepare their articles.

Funding:

This article was funded and completed within the framework of Research Project CIPI/23.154, “Analysis of the implementation of an innovative learning space in the area of education of the Universidad Europea de Madrid”.

References

Al-Lal, M. F. (2021). Aula inteligente: definición y evolución. *Didasc@ lia: Didáctica y Educación*, 12(2), 96-118.

Araiza-Vázquez, M. J., Figueroa-Garza, F. G., & Pedraza-Sánchez, E. Y. (2023). Estimación del rendimiento de los estudiantes en una experiencia de aprendizaje móvil. *Formación Universitaria*, 16(1), 33-44. http://dx.doi.org/10.4067/S0718-50062023000100033

Baque, P. G. C., & Marcillo, C. (2020). Estrategias pedagógicas innovadoras en entornos virtuales de aprendizaje. *Dominio de las Ciencias*, 6(3), 56-77. http://dx.doi.org/10.23857/dc.v6i3.1274

Bautista, G., Escofet, A., & López, M. (2019). Diseño y validación de un instrumento para medir las dimensiones ambiental, pedagógica y digital del aula. *Revista Mexicana de Investigación Educativa*, 24(83), 1055-1075.

Benade, L. (2019). Flexible Learning Spaces: Inclusive by Design? *New Zealand Journal of Educational Studies*, 54, 53-68. https://doi.org/10.1007/s40841-019-00127-2

Bolliger, D. U., & Halupa, C. (2018). Online student perceptions of engagement, transactional distance, and outcomes. *Distance Education*, 39(3), 299-316. https://doi.org/10.1080/01587919.2018.1476845

Carvalho, L., & Yeoman, P. (2021). Performativity of materials in learning: The learning-whole in action. *International Journal of Educational Research*, 10(1), 28-42. https://doi.org/10.7821/naer.2021.1.627

Cleveland, B., & Fisher, K. (2014). The evaluation of physical learning environments: A critical review of the literature. *Learning Environments Research*, 17(1), 1-28. https://doi.org/10.1007/s10984-013-9149-3

Dede, C. (2010). Comparing frameworks for 21st century skills. In J. Bellanca, & R. Brandt (Eds.), 21st century skills: Rethinking how students learn (pp. 51-76). Solution Tree Press.

Desbrow, J. M., & Domínguez, S. C. (2020). El espacio como elemento facilitador del aprendizaje y de atención a la diversidad. *Revista de Estilos De Aprendizaje*, 13(25), 1-3. https://doi.org/10.55777/rea.v13i25.2092

Díaz, L. A. (2022). El Aula del Futuro en la Europa del siglo XXI: de la teoría y la práctica, de lo digital y lo físico. En *Pedagogía de las cosas: quiebras de la educación de hoy* (pp. 287-293). Ediciones Octaedro SL.

Divyashree, M. (2018). Flipped Classroom-An Innovative Methodology for Effective Teaching Learning Process. *Asian Journal of Management*, 9(1), 451-456. http://dx.doi.org/10.5958/2321-5763.2018.00070.7

Düzenli, T., Alpak, E., Çiğdem, A., & Tarakçı Eren, E. (2018). The Effect of Studios on Learning in Design Education. *Journal of History Culture and Art Research*, 7(2), 191-204. http://dx.doi.org/10.7596/taksad.v7i2.1392

Engel Rocamora, A., & Coll Salvador, C. (2022). Entornos híbridos de enseñanza y aprendizaje para promover la personalización del aprendizaje. *RIED-Revista Iberoamericana de Educación a Distancia*, 25(1), 225-242.https://doi.org/10.5944/ried.25.1.31489

Fullan, M., Quinn, J., McEachen, J., Gardner, M., & Drummy, M. (2021). *Sumergirse en el aprendizaje profundo: Herramientas atractivas*. Ediciones Morata.

González-Zamar, M. D., & Abad-Segura, E. (2020). Diseño del espacio educativo universitario y su impacto en el proceso académico: análisis de tendencias. *Revista de Estilos de Aprendizaje*, 13(25), 1-13.

Granito, V. J., & Santana, M. E. (2016). Psychology of Learning Spaces: Impact on Teaching and Learning. *Journal of Learning Spaces*, 5(1), 1-8.

Johnson, L., Adams Becker, S., Estrada, V., & Freeman, A. (2016). NMC/CoSN Horizon Report: 2016 K-12 Edition. The New Media Consortium. https://files.eric.ed.gov/fulltext/ED570463.pdf

Kellermeyer, L., Harnke, B., & Knight, S. (2018). Covidence and rayyan. *Journal of the Medical Library Association*, 106(4), 580.

Knezek, G., Christensen, R., & Furuta, T. (2019). Validation of a teacher educator technology competencies survey. *Journal of Technology and Teacher Education*, 27(4), 465-498.

Lave, J., & Wenger, E. (1991). Situated learning: *Legitimate peripheral participation*. Cambridge University Press. https://doi.org/10.1017/CBO9780511815355.

Lozano-Díaz, A., Fernández-Prados, J.S., Figueredo Canosa, V., & Martínez Martínez, A.M. (2020). Impactos del confinamiento por el COVID-19 entre universitarios: Satisfacción Vital, Resiliencia y Capital Social Online. *International Journal of Sociology of Education, Special Issue: COVID-19 Crisis and Socioeducative Inequalities and Strategies to Overcome them*, 79-104.

Mahat, M., Bradbeer, C., Byers, T., & Imms, W. (2018). *Innovative Learning Environments and Teacher Change: Defining key concepts*. University of Melbourne, LEaRN. http://www.iletc.com.au/publications/reports

Navarro-González, I. (2023). La educación infantil en los países nórdicos: iniciativas innovadoras. *IE Revista de Investigación Educativa de la REDIECH*, 14, e1911. https://doi.org/10.33010/ie_rie_rediech.v14i0.1911

OECD. (2015). *Students, computers and learning: Making the connection*. OECD Publishing. https://doi.org/10.1787/9789264239555-en

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., & Mulrow, C. D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *British Medical Journal*, 372(71), 1-9. https://doi.org/10.1136/bmj.n71

Parody, L. M., Leiva, J. J., & Santos-Villalba, M. (2022). El Diseño Universal para el Aprendizaje en la Formación Digital del Profesorado desde una Mirada Pedagógica Inclusiva. *Revista Latinoamericana de Educación Inclusiva, 16*(2), 109-123. http://dx.doi.org/10.4067/S0718-73782022000200109

Piaget, J. (1977). *The development of thought: Equilibration of cognitive structures*. Viking Press.

Radcliffe, D. (2008). A pedagogy-space-technology (PST) framework for designing and evaluating learning places. In D. Radcliffe, H. Wilson, D. Powell, & B. Tibbetts (Eds.), Learning spaces in higher education: Positive outcomes by design (pp. 9-16). The University of Queensland.

Rovai, A. P. (2018). Building a sense of community at a distance: What remains important in the digital age? *Journal of Education and Learning*, 7(2), 103-112. https://doi.org/10.4000/dms.2685

Shevchenko, L., Makhynia, N., Polishchuk, G., Sotska, H., Koval, V., & Grygorenko, T. (2021). The Training of Future Teachers for Innovative Teaching Activities. *Postmodern Openings*, 12(1), 21-37. https://doi.org/10.18662/po/12.1/243

Tena, R., & Carrera, N. (2020). The Future Classroom Lab as a Framework of Development for Competency-and Project-based Learning. *Revista Mexicana de Investigación Educativa*, 25(85), 449-468.

Uman, L. S. (2011). Systematic Reviews and Meta-Analyses. *Journal Of The Canadian Academy Of Child & Adolescent Psychiatry*, 20(1), 57-59. https://doi.org/10.1007/BF03305643

Urrútia, G., & Bonfill, X. (2010). Declaración PRISMA: una propuesta para mejorar la publicación de revisiones sistemáticas y metaanálisis. *Medicina Clínica*, 135(11), 507-511. https://doi.org/10.1016/j.medcli.2010.01.015

Vite, H. R. (2014). Ambientes de aprendizaje. *Ciencia Huasteca Boletín Científico de la Escuela Superior de Huejutla*, 2(4) 1-7. https://doi.org/10.29057/esh.v2i4.1069

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Weiss, A. (2019). Infraestructura educativa y su incidencia en el proceso de enseñanza y aprendizaje. *Revista Paraguaya de Educación*, 8(1), 75-87.

Yang, J., Weiying, H. P., & Huang, R. (2018). Evaluation of smart classroom from the perspective of infusing technology into pedagogy. *Smart Learning Environments*, 58(20), 1-11. https://doi.org/10.1186/s40561-018-0070-1

Author biographies

Eva Jiménez-García. Accredited Doctor of Education with an Extraordinary Doctorate Award (2016) and a Bachelor's Degree in Pedagogy from the Universidad Complutense de Madrid. She currently works as head of research and head of the Educational Research Centre (CIE-UE) in the Faculty of Education at the Universidad Europea de Madrid. Associate Professor in Research Methods and Diagnosis in Education (ANECA). Her research interests focus on the measurement and evaluation of educational systems. She is a member of the Medida y Evaluación de Sistemas Educativos (MESE) research group at the Universidad Complutense de Madrid. Member of the Advisory Committee of the journal *Tendencias Pedagógicas* and member of the Assessment Committees of two impact journals.

http://orcid.org/0000-0001-6541-3517

Judit Ruiz-Lázaro. Doctor of Education from the Universidad Complutense de Madrid (2021) with an International Doctorate mention, Doctorate awarded with the grade of *Outstanding Cum Laude*, and Extraordinary Doctorate Award. Accredited as Associate Professor by ANECA (2024). She has an ongoing recognised six-year research period. She is currently an Assistant Professor at the Universidad Nacional de Educación a Distancia (UNED, Department of Didactics, School Organisation, and Special Didactics). Her most recent studies and publications focus on university entrance assessment in the Spanish context, the analysis of teacher training in Spain and the use of artificial intelligence in education. She is a member of the Medida y Evaluación de Sistemas Educativos (MESE) consolidated research group at the Universidad Complutense de Madrid (UCM) and Innedu-UEM at the Universidad Europea de Madrid.

https://orcid.org/0000-0003-2036-0428

María Huetos-Domínguez. Bachelor's Degree in Education Studies from the Universidad Complutense de Madrid. Her comprehensive academic background includes a Master's Degree in Research in Applied Psychology from the Universidad de Castilla-La Mancha (UCLM). She is currently studying towards a doctorate at the Universidad Nacional de Educación a Distancia (UNED). University teacher on the University Master's programme in Educational Innovation. Her professional background is in education, with a focus on innovative educational experiences, the design of teaching materials and career guidance. She is also a member of the INNEDU-UEM Research Group. She has participated in projects on innovation and the enhancement of teaching quality, particularly those centred on university guidance. Her research interests include guidance and innovative teaching and learning spaces.

https://orcid.org/0000-0001-5527-4920