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ORIGINAL CONTRIBUTION

Research Competencies and Educational Innovation in Higher Education: A Bibliometric Analysis

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Abstract— The transformation of higher education has intensified the need to strengthen research competencies, educational innovation, and digital capabilities in university environments. However, conceptual fragmentation, institutional inequalities, and the lack of an integrated perspective continue to limit understanding of the field's scientific evolution. The objective of the study was to analyze the scientific evolution of research competencies and innovation in higher education. The research adopted a quantitative bibliometric systematic review design following the PRISMA 2020 guidelines. The search was conducted in the Scopus Elsevier database on May 24, 2026, using a Boolean strategy applied to the TITLE-ABS-KEY fields. Eligible records included articles and reviews published in English or Spanish between 2021 and 2026 and related to research competencies, educational innovation, and higher education. We screened records by title, abstract, and keywords according to predefined inclusion and exclusion criteria. After screening and eligibility assessment, the final corpus consisted of 28 scientific publications. The bibliometric analysis used VOSviewer 1.6.20, employing network visualizations, temporal overlay, and thematic density. The results showed an evolution from traditional research skills to interdisciplinary, digital, and innovation-oriented approaches. The central themes were higher education, research competencies, and educational innovation. The emerging topics included generative artificial intelligence, mentoring, formative research, and digital competencies. The reviewed literature also highlighted challenges associated with competency assessment, ethical governance, technological inequality, and institutional sustainability.

Index Terms— Research competencies, Educational innovation, Higher education, Digital competencies, Bibliometric analysis

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Introduction

Digital transformation, the growth of scientific knowledge, and rising demand for innovation are driving a structural transformation in higher education. Universities are thus expected to provide professional education as well as to strengthen scientific capacities, generate knowledge, and develop institutional responses to technological and social change (Chusniyah et al., 2025; Laaz & Rodríguez, 2026; Tjandra et al., 2024). In this

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context, research competencies have become more relevant because they include critical thinking and scientific production, academic literacy, problem-solving, and the ability to assess evidence in complex university environments (Duche-Pérez et al., 2024; George-Reyes et al., 2025; León et al., 2025).

Educational innovation has also expanded beyond new teaching methodologies. Current approaches increasingly include digital competencies, interdisciplinary learning, institutional transformation, and emerging technologies. In particular, generative artificial intelligence and digital academic platforms are changing practices related to information retrieval, scientific writing, autonomous learning, and knowledge production (Hung et al., 2025; Li et al., 2025). These developments offer new opportunities to strengthen research training but also pose challenges related to academic integrity, technological inequality, digital governance, and institutional sustainability.

The growing body of studies on research competencies, educational innovation, and digital transformation remains conceptually fragmented in the literature. Existing research has investigated research competencies, competency assessment, digital skills, and educational innovation from different conceptual and methodological perspectives (Krstikj et al., 2022; Pérez-Penup, Romero, et al., 2024; Suárez Morales et al., 2021). However, these lines of inquiry are often analyzed in isolation, constraining understanding of how research competencies, educational innovation, and emerging digital capabilities have converged within the recent development of higher education. Furthermore, the fast progress of artificial intelligence has brought about new abilities and institutional requirements that have not been completely incorporated into current theoretical structures (Hu, 2026; Vishnu et al., 2022; Yang et al., 2025).

The present study addresses this fragmentation as the primary research gap. While there are systematic reviews and bibliometric studies on specific dimensions, such as research competencies, digital competence, and broader competency frameworks, there is still a need for an integrated bibliometric examination of the recent scientific structure linking research competencies with educational innovation in higher education. Such an examination is especially pertinent for identifying central concepts, emerging themes, and changes in the relationships between research training, digital competencies, and innovation (Petrova, 2025).

Evidence from various geographical contexts also illustrates the international character of these transformations. Studies in Latin American universities, such as those in Peru, Colombia, and Mexico, have reported developments linked to research competencies, artificial intelligence, and educational innovation, as well as challenges concerning institutional capacity and technological infrastructure (Duche-Pérez et al., 2024; George-Reyes et al., 2025; Riveros-Anccasi et al., 2025). Because the bibliometric search was not geographically limited, these studies are treated as examples of broader international developments rather than a geographical delimitation of the present research.

Hence, the following research question was posed: How has scientific production on research competencies and educational innovation in higher education evolved, and what conceptual structures and emerging themes characterize this field? To answer this question, the study aimed to analyze, through a systematic bibliometric approach, the scientific evolution, conceptual structure, and emerging thematic trends in research-on-research competencies and educational innovation in higher education.

Literature Review

Research competencies in higher education

Research competencies are a fundamental axis in the transformation of education because they allow the articulation of critical thinking, problem formulation, analysis of information, academic writing, and production of knowledge (Chumpitaz Campos, Lomba Portela, et al., 2024). They are no longer interpreted as mere methodological skills but as capacities for intellectual autonomy, academic literacy and evidence-based decision-making. This broader conception is different from the traditional approaches that have concentrated mainly on the technical mastery of research procedures and reflects a progressive transition toward a multidimensional conception of research competence.

Teaching research skills requires pedagogical and institutional conditions that integrate technology, academic support, and curriculum design. Technology-mediated processes provide greater access to scientific resources, develop information literacy, and increase student engagement in university research (Javier et al., 2023). The development of research competencies also requires multi-disciplinary approaches linking research, professional practice, and university management. Research in higher education cannot be reduced to methodological subjects but must be articulated with real problems, collaborative projects, and institutional innovation processes (Aguir, 2025; Ligin et al., 2026; Turpo-Gebera et al., 2024). These perspectives are complementary, although they emphasize different aspects of research training. Technology-mediated approaches focus mainly on access, management, and use of scientific information. Multidisciplinary approaches emphasize applying research competencies in authentic and complex academic contexts.

In addition, research competencies are increasingly linked to processes of academic internationalization, scientific productivity, and university sustainability. Universities seek to develop the capacities associated with critical analysis, scientific communication and problem solving in a globalized context. Research training is hence relevant not only for individual academic development, but also for the consolidation of university ecosystems orientated to innovation, competitiveness, and the production of knowledge with social impact (Tjandra et al., 2024). This institutional perspective expands the concept of research competence beyond individual methodological performance and places it within a broader framework of university transformation processes.

Recent research also shows relationships among research competencies, academic creativity, autonomous learning, and online literacy. The

ability to process scientific information, to work with technological tools, and to participate in collaborative processes has become a necessary condition in university contexts (Pelaez-Sanchez et al., 2024). This relationship indicates the need for more integrative training approaches, in which scientific abilities and digital skills are developed together. Hence, research competencies can no longer be considered independently of the technological environments in which modern scientific activity is being carried out to an increasing extent.

Universities still have difficulties in evaluating research competencies and in creating institutional indicators that can measure scientific capacities in a comprehensive way. However, despite advances in methodological approaches, it is still difficult to develop standardized evaluation models that incorporate innovation, research, and digital transformation in higher education (Pereira et al., 2022). This limitation points to a relevant tension of a conceptual and methodological nature. Research competence is increasingly recognized as a multidimensional construct in the literature, but consensus remains lacking on the criteria and indicators needed to assess it across disciplines and institutional settings.

Educational innovation and university transformation

Innovation in education has taken on a strategic role within the transformation of higher education. Universities face the need to adapt their pedagogical, curricular, and organizational models to scenarios marked by digitalization, sustainability, and accelerated knowledge production (Bakir & Dahlan, 2023). Educational innovation therefore extends beyond the adoption of new teaching techniques and increasingly involves transformations in curriculum design, institutional organization, and the relationship between research, technology, and teaching.

Active methodologies have contributed to this process of university transformation. Problem-based learning, flipped classrooms, collaborative learning, and interdisciplinary approaches have become strategies capable of strengthening scientific competencies, critical thinking, and creativity in university settings (Divjak & Badari, 2024; Paucar-Curasma et al., 2025). These approaches emphasize pedagogical change in teaching and learning. However, their effectiveness depends on institutional conditions that allow innovative practices to be sustained beyond isolated classroom experiences.

Institutional dimensions of leadership, sustainability and knowledge management are becoming increasingly important to university innovation. Universities require organisational structures capable of integrating research, teacher training, digital transformation, and interdisciplinary cooperation (Aung & Hallinger, 2023; Sedkaoui et al., 2025). More recent research shows that university innovation is also related to academic collaboration, inclusive leadership, and organisational learning (Jimoh, 2025; Vesudevan et al., 2025). This evidence points to two complementary levels of educational innovation, one related to pedagogical practices, and the other to institutional capacity, and organisational transformation.

Institutional change is also related to sustainability, technological adaptation, and rapid scientific knowledge production (Sedkaoui et al., 2025). Innovation is thus projected as a strategy for strengthening institutional resilience, academic cooperation, and adaptability in scenarios of permanent change. At the same time university innovation has started to be associated with inclusion, academic well-being, and social sustainability. Active methodologies and collaborative models can improve students' participation, motivation, and collective knowledge building Bhuttah et al., 2024. These findings demonstrate that educational innovation produces results at various analytical levels, ranging from student learning and engagement to organisational sustainability and institutional transformation.

The differences between the pedagogical and the institutional perspectives are not necessarily contradictory findings. Rather they demonstrate that educational innovation takes place at interrelated levels that influence each other. Research competencies are better developed when methodological training is embedded in active learning, interdisciplinary projects and institutional strategies that support knowledge production. In this sense, educational innovation offers the pedagogical and organisational conditions through which research skills can develop beyond isolated methodological instruction.

Digital competencies and artificial intelligence in higher education

Digital transformation has reshaped the teaching, learning, and research processes in higher education. Digital skills are also a prerequisite for the access to scientific information, to the management of databases, to the development of academic work and to the participation in virtual-learning environments (Pelaez-Sanchez et al., 2024). Their importance cannot be reduced to any instrumental technological skill, since contemporary academic environments are increasingly demanding critical information management, scientific communication and responsible participation in digital contexts.

The inclusion of generative AI is beginning to reshape traditional models of university research and learning. Intelligent platforms and automated systems might support information retrieval, academic writing, document analysis, as well as autonomous learning, but also raise ethical and methodological issues (Alateyyat & Soltan, 2024). This dual state of affairs illustrates that technological progress doesn't inherently lead to educational gain. Its contribution is conditioned by the ability to combine technological possibilities with critical and methodological ones.

Artificial intelligence is also changing the skills needed for both university students and professors. Current academic education requires more and more competencies that are associated with digital citizenship, HCI (human-AI interaction), critical evaluation of information and adaptability to technology (Ribble & Gichuri, 2024). Thus, the integration of artificial intelligence in HE at both policy and practice level source requires stable institutional policies and teacher training trajectories. The pedagogical preparation, academic regulation and technical infrastructure that universities need to address in order to use intelligent technologies responsibly (Derbas et al., 2026; Dhamak et al., 2026).

These perspectives show a dichotomy between approaches that focus on the possibilities of AI as an academic tool and those that focus on the institutional preconditions for its responsible adoption.

Research competencies, educational innovation, digital competencies, and artificial intelligence consequently represent interconnected dimensions of contemporary higher education. Research competencies provide the capacities required to formulate problems, analyze evidence and produce scientific knowledge. Educational innovation creates the pedagogical and institutional conditions for developing these capacities. Digital competencies enable scientific activity within technology-mediated environments, while artificial intelligence expands the possibilities of information processing and simultaneously increases methodological and ethical demands. Their convergence provides the conceptual basis for understanding why contemporary research training increasingly incorporates digital literacy, interdisciplinary learning, technological adaptation, critical judgement, and institutional transformation.

Methodology

Research design

The research was conducted using a quantitative approach through a systematic bibliometric review. The study focused on analyzing the scientific evolution of research competencies and innovation in higher education. This design made it possible to identify emerging patterns, thematic structures and trends in scientific production within the examined academic field. Similarly, the bibliometric approach made it easier to analyze the conceptual structure and the thematic development of research on educational innovation, university reform, and research competencies.

The study followed the PRISMA 2020 protocol guidelines to ensure methodological rigor. The identification, screening, eligibility, and inclusion of scientific papers indexed in Scopus Elsevier followed this methodology. Furthermore, the bibliometric visualization software VOSviewer version 1.6.20 was used to support the bibliometric analysis. The software supported the analysis of keyword co-occurrence networks, thematic relationships, and the temporal evolution of research on research competencies and educational innovation in higher education.

Data source

The information collection was carried out exclusively through the Scopus Elsevier database. This allowed for the retrieval of structured bibliographic information suitable for bibliometric analysis. The database also provided the bibliographic metadata required to examine annual scientific production, subject-area distribution, and keyword co-occurrence within the field of study.

Scopus was selected as the exclusive bibliographic source because it provides standardized bibliographic metadata compatible with bibliometric analysis and VOSviewer processing. The use of a single database also ensured consistency in the extraction and comparison of records. Nevertheless, the exclusive use of Scopus may have excluded relevant publications indexed in other databases, and this restriction is therefore acknowledged as a methodological limitation.

Search strategy

The search strategy used Boolean operators applied to Scopus TITLE-ABS-KEY fields. The equation was designed to retrieve publications related to research competencies, educational innovation, and higher education. Likewise, terms related to research skills, scientific capabilities and university innovation were incorporated. Boolean operators were applied to the TITLE-ABS-KEY fields. The initial search did not include a publication-year restriction. Document type, subject area, and language filters were incorporated into the search equation to retrieve publications related to research competencies, educational innovation, and higher education.

The search was conducted on May 24, 2026, through the Scopus Elsevier database. The search strategy was applied to the TITLE-ABS-KEY fields to ensure the retrieval of publications in which the study concepts were explicitly represented in the title, abstract, or author keywords.

The search equation used was as follows:

TITLE-ABS-KEY (”research competencies” OR ”research skills” OR ”research capability” OR ”research training”) AND (”educational innovation” OR ”innovation in higher education” OR ”university innovation”) AND (”higher education” OR ”university education”) AND (LIMIT-TO (DOCTYPE , ”ar”) OR LIMIT-TO (DOCTYPE , ”re”)) AND (LIMIT-TO (SUBJAREA , ”SOCI”) OR LIMIT-TO (SUBJAREA , ”BUSI”)) AND (LIMIT-TO (LANGUAGE , ”English”) OR LIMIT-TO (LANGUAGE , ”Spanish”))

Once the search in Scopus was completed, the retrieved records were exported in CSV format for cleaning and subsequent bibliometric analysis. The exported metadata included authors, titles, abstracts, keywords, references, institutional affiliations, and citation counts.

PRISMA selection process

The study selection process was carried out following the guidelines established by the PRISMA 2020 statement (Page et al., 2021). This procedure allowed for the systematic organization of the phases of identification, screening, eligibility, and inclusion of scientific publications related to research competencies and innovation in higher education (see Figure 1).

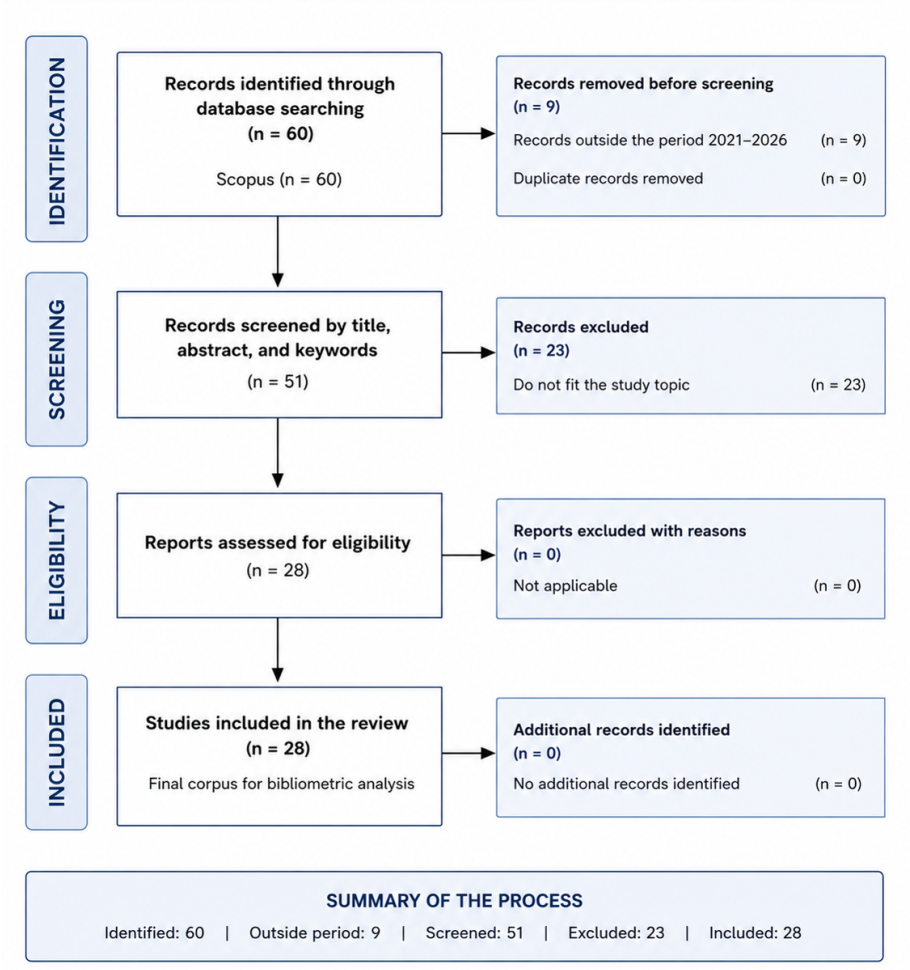


Fig. 1 *PRISMA 2020 flow diagram of the document selection process*

Before the screening stage, the retrieved records were restricted to publications indexed between 2021 and 2026. Only scientific articles and reviews published in English or Spanish were considered. The search was also limited to the subject areas of Social Sciences and Business, Management and Accounting because of their direct relationship to higher education, innovation and knowledge management.

In the identification phase, 60 scientific records indexed in Scopus were initially retrieved. Then, nine documents were removed because they fell outside the 2021-2026 period. No duplicate records were identified during the initial screening process. After this initial review, 51 publications were subjected to the screening process through the analysis of titles, abstracts, and keywords. At this stage, 23 documents were excluded because they did not have a direct relationship to the research objective; or the thematic field of research competencies and innovation in higher education.

The screening and eligibility assessment were conducted by a single reviewer using predefined inclusion and exclusion criteria. Titles, abstracts, and keywords were examined systematically to determine the thematic relevance of each record to the research objective. Because the selection process was conducted by one reviewer, no inter-reviewer disagreement resolution procedure was required.

Subsequently, 28 publications were evaluated in the eligibility phase. The inclusion criteria included publications related to research competencies, research skills, educational innovation, and the transformation of higher education. Likewise, studies linked to innovative methodologies and research training processes in universities were included.

On the other hand, research focused exclusively on education, technical engineering, biomedical innovation, or technological applications without a direct connection to research competencies in higher education was excluded. In addition, documents that did not present a conceptual connection with university innovation or the development of scientific capacities were excluded. Finally, the bibliometric corpus was composed of 28 scientific publications deemed relevant for the thematic and bibliometric analysis of the study.

Data Analysis

The data analysis combined descriptive bibliometric indicators and science-mapping techniques to examine the structure and thematic evolution of the documentary corpus (Donthu et al., 2021). Descriptive analysis was used to examine annual scientific production and the distribution of publications by subject area.

VOSviewer version 1.6.20 was used to conduct keyword co-occurrence analysis and generate network, overlay, and density visualisations (Bukar et al., 2023). The network visualisation identified the conceptual relationships among the keywords included in the corpus. For the keyword co-occurrence analysis, the minimum number of occurrences of a keyword was set at one. Under this criterion, all 142 keywords identified in the bibliometric corpus met the threshold and were included in the analysis. The overlay visualisation supported the examination of their temporal evolution during the analysed period, while the density visualisation showed the areas of greatest thematic concentration.

The minimum occurrence threshold was maintained at one because increasing the threshold substantially reduced the number of visible keywords and excluded emerging terms that were relevant to the objective of identifying recent thematic developments. Given the relatively small corpus of 28 publications, retaining a threshold of one allowed the analysis to preserve low-frequency but conceptually meaningful topics while still enabling the identification of central thematic relationships.

The interpretation focused on the central concepts, thematic connections and emerging topics associated with research competencies, educational innovation, and higher education. This procedure allowed the identification of the principal conceptual axes and recent developments within the analysed scientific field.

Ethical considerations

The research did not require ethics committee approval because it was conducted exclusively using secondary bibliographic information obtained from scientific publications indexed in Scopus. The study did not involve human participants, interviews, or surveys. Neither personal data nor direct intervention with individuals or social groups were analysed.

Results

Scientific production trends

A recent focus on digital transformation, research training, pedagogical innovation and the use of artificial intelligence in higher education was evident in the examined scientific output. This pattern demonstrates how the discipline has moved away from methods centred on generic research skills and towards more comprehensive approaches that integrate research with digital capabilities, active learning, and university change.

Similarly, an expansion themes related to scientific capacities, formative research, digital literacy, and curricular innovation processes was observed in this studies. This pattern shows that research training has consolidated as a strategic component within the contemporary renewal of higher education.

Scientific production showed an overall increase during the analysed period, although the pattern was not linear. The number of publications increased from one document in 2021 to three in 2022, four in 2023, and nine in 2024, which represented the highest annual production within the corpus. Seven publications were recorded in 2025. In 2026, four publications had been identified by the search date; however, this value corresponds to partial-year data and should not be interpreted as evidence of a decline in scientific production (see Figure 2).

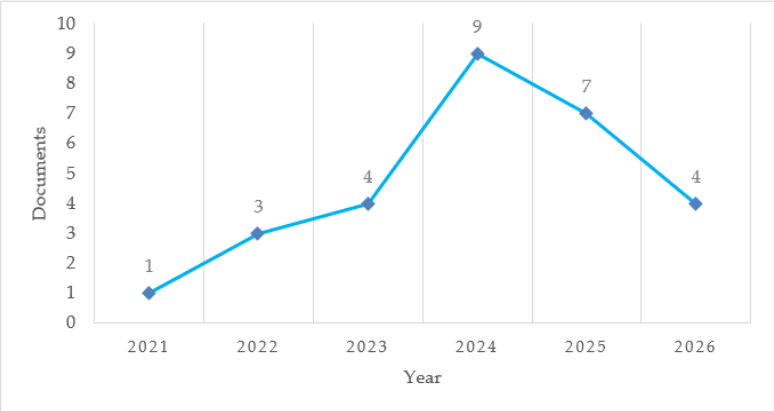


Fig. 2 *Scientific production by year*

Moreover, the scientific production also reflected a multidisciplinary orientation. The research not only addressed educational innovation and research training; but also academic creativity, mentorship, digital competencies, and challenge-based learning. This thematic diversity confirms that the field continues to expand its conceptual and methodological approaches.

The distribution by thematic areas showed a predominance of the Social Sciences, followed by Computer Science and Arts and Humanities. Smaller contributions were identified in Business Management and Accounting, Psychology, Mathematics and Decision Sciences. This distribution confirms the multidisciplinary nature of the field and demonstrates that research competencies and university innovation are connected to different academic disciplines (see Figure 3).

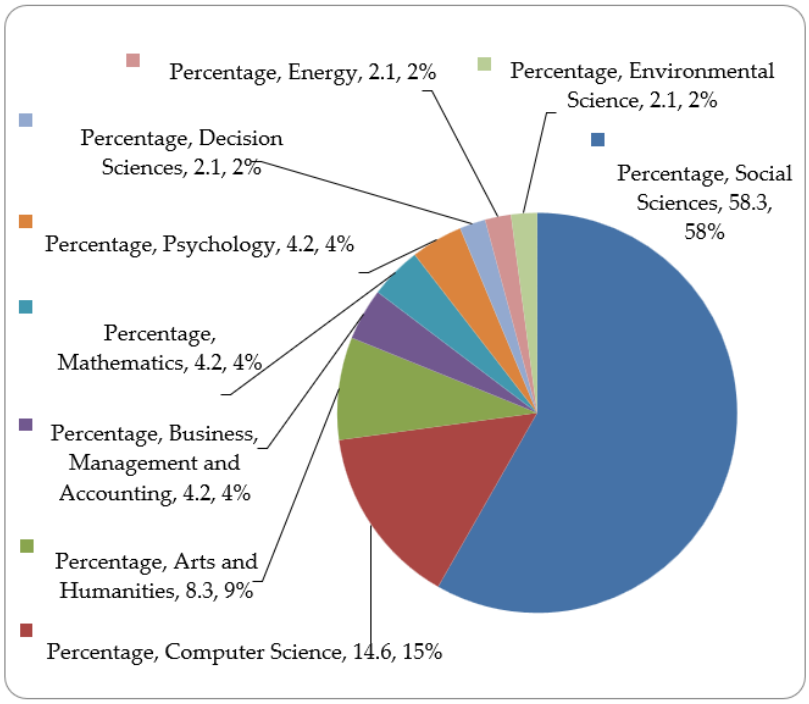


Fig. 3 *Distribution of scientific production by subject area*

The distribution by subject area was calculated from 48 subject-area assignments associated with the 28 publications included in the corpus. As individual publications may be classified under more than one Scopus subject area, the number of subject-area assignments exceeds the total number of documents.

These results show that the field does not develop from a single discipline, but rather from a convergence of education, technology, management, and social sciences. The predominance of Social Sciences confirms that the main debate continues to focus on training processes, pedagogical innovation, and the development of academic capacities. However, the presence of Computer Science shows that digitalisation and artificial intelligence are beginning to occupy a more visible place in scientific production on research competencies. This combination of areas suggests that research training is shifting towards more interdisciplinary approaches, in which university innovation depends as much on pedagogical practices as on technological and institutional capabilities.

The 28 publications included in the corpus accumulated 241 citations, with an average of 8.61 citations per document and a median of 2.5 citations. Citation impact was unevenly distributed across the corpus. The most cited publication was Research Competencies to Develop Academic Reading and Writing: A Systematic Literature Review (2021), with 58 citations, followed by The impact of students' use of ChatGPT on their research skills: The mediating effects of autonomous motivation, engagement, and self-directed learning (2025), with 43 citations, and Artificial intelligence in higher education institutions: review of innovations, opportunities and challenges (2025), with 32 citations. These documents account for an important proportion of the citation impact observed within the analysed corpus.

Regarding scientific contributors,George-Reyes et al. (2023) were the most recurrent authors, with two publications each, while the remaining authors appeared in one publication. At the institutional level, Tecnologico de Monterrey showed the highest representation, with affiliations associated with five publications, followed by Universiti Malaya and Tarbiat Modares University, each associated with two publications.

Geographically, Mexico had the highest representation in the corpus with six publications, followed by Peru with five, Spain with four and Malaysia with three. Iran, the United States, Ecuador, and China were each represented in two publications. Regarding publication sources, Frontiers in Education and the Journal of E-Learning and Knowledge Society were the most recurrent journals, with three documents each. Frontiers in Education also concentrated the highest citation impact among the publication sources, with 109 citations.

Keyword co-occurrence analysis

The keyword co-occurrence analysis identified a thematic network structured around research competencies, educational innovation, and university transformation. The minimum occurrence threshold was set at one. Under this criterion, all 142 keywords identified in the bibliometric corpus met the established threshold and were included in the analysis. The network visualisation allowed the identification of the principal conceptual relationships and thematic concentrations within the analysed field.

The network visualisation showed that ”higher education” occupied the most central position within the bibliometric map. This term articulated direct relationships with ”educational innovation,” ”research competencies,” ”research training,” ”digital competencies,” and ”formative research.” Within the analysed corpus, this central position suggests that higher education functions as an integrating axis connecting educational innovation, research competencies, and related digital and applied research themes (see Figure 4).

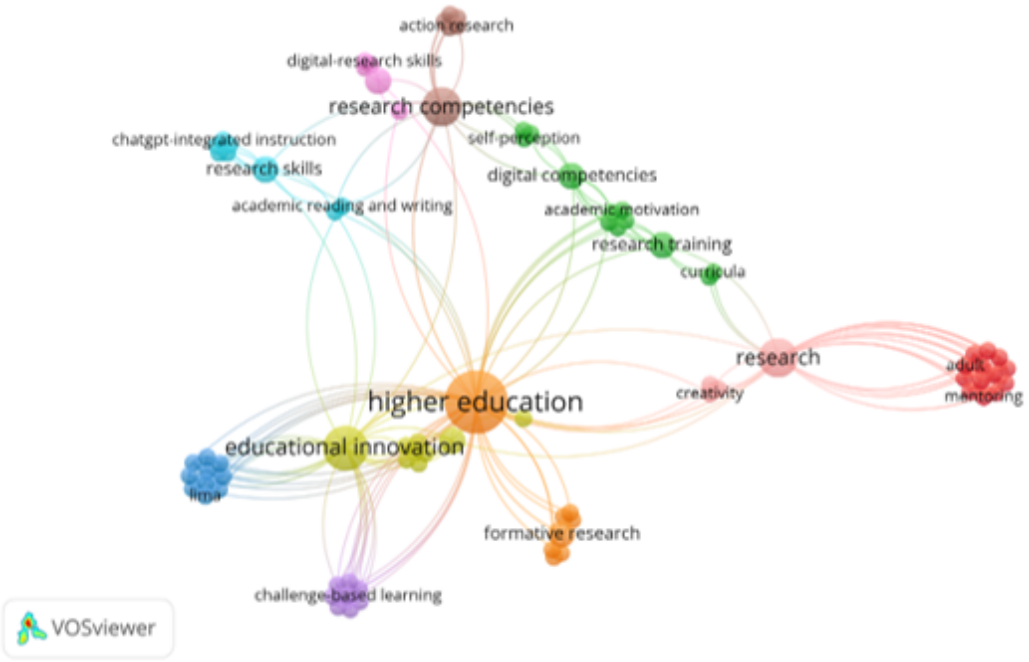


Fig. 4 *Network visualisation of keyword co-occurrence*

Moreover, ”research competencies” showed relevant connections with ”research skills,” ”academic reading and writing,” ”digital-research skills,” and ”action research.” Within the analysed corpus, these relationships suggest an association between research competencies and academic reading, scientific writing, digital skills and applied research. Similarly, ”educational innovation” appeared to be associated with ”challenge-based learning,” ”formative research,” and ”higher education.” Within the analysed corpus, this association suggests a possible convergence between pedagogical innovation, active methodologies and research training in higher education.

Likewise, the network identified emerging nodes related to ”ChatGPT-integrated instruction,” ”academic motivation,” ”mentoring,” and ”creativity.” The presence of these terms suggests emerging scholarly attention to artificial intelligence, academic support, student motivation and digital transformation within the analysed literature. The overlay visualisation allowed the temporal positioning of the keywords according to their average publication year within the analysed corpus. The most recent terms focused mainly on ”ChatGPT-integrated instruction,” ”academic motivation,” ”mentoring” and ”formative research.” Within the analysed corpus, this pattern suggests a recent thematic shift towards artificial intelligence, academic support, and the development of digital skills (see Figure 5).

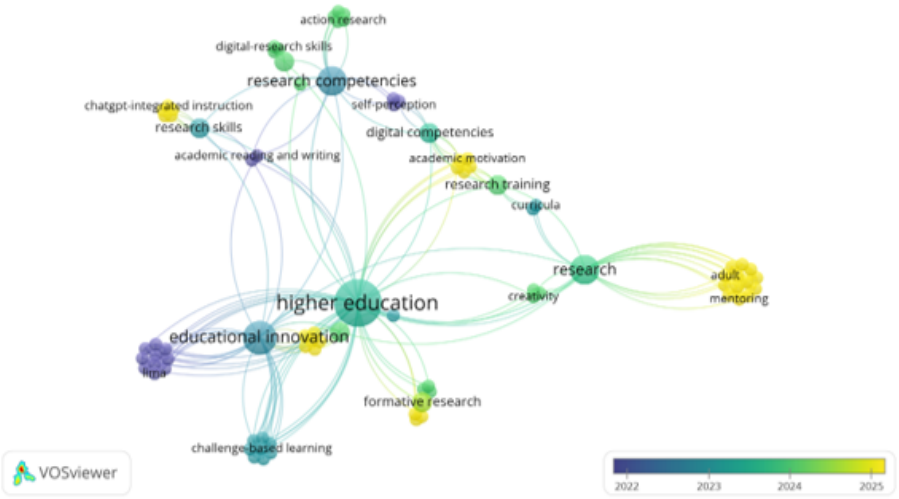


Fig. 5 *Overlay visualisation of thematic evolution Note: The colour scale represents the average publication year associated with each keyword and does not indicate the complete chronological range of the documents included in the corpus.*

Throughout the network, very similar labels like “research competences”, “higher education” and “educational innovation” appeared turned were common. Although later on categories such as academic motivation, mentorship and artificial intelligence were raised there were two stable conceptual axes. In the same way, the topic evolution analysis demonstrated a gradual transition from the traditional research training methods toward the methods of digital, multidisciplinary and collaborative. In the context of the corpus under analysis, this pattern indicates a thematic drift towards increasingly digital, multi-disciplinary, and collaborative approaches to research training.

The density plot revealed the highest theme concentration at ”higher education,” ”research competencies,” and ”educational innovation.” In this bibliometric network, these terms had the highest thematic concentration because of their prevalence and closeness to other keywords related to them. (Figure 6).

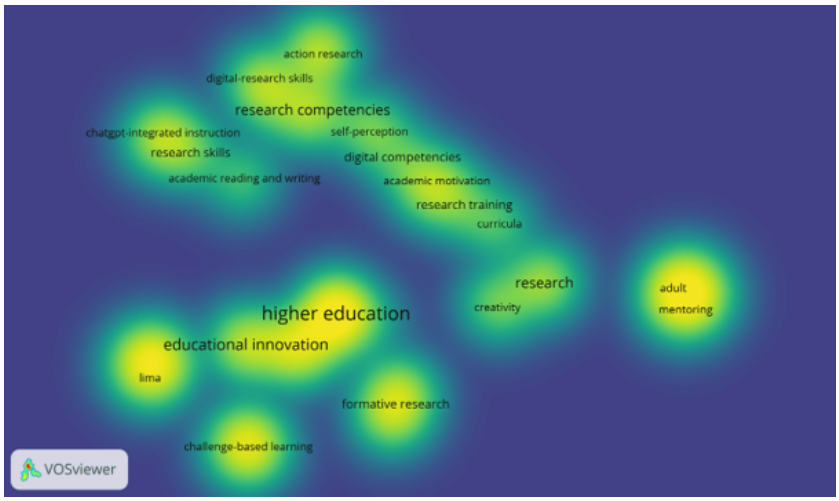


Fig. 6 *Density visualisation of thematic concentration*

There were also clusters on ”digital competencies,” ”research skills,” ”research training,” and ”formative research.” When considering the bibliometric network, digital competencies, research skills, research training, and formative research were thematically close, implying that there were conceptual relations involving these issues in the studied text. On the other hand, the thematic phrase density for items such as ”mentoring,” ”creativity,” ”challenge-based learning,” and ”ChatGPT-integrated instruction” was relatively low. While these words had a lesser thematic density, their inclusion matter as they signal nascent trajectories closely linked to artificial intelligence, pedagogy innovation, and academic support in higher education.

As a whole, the bibliometrics visualisation infers an increasing thematic connectivity between education reform, digital competences and research training. These trends suggest an emerging interdisciplinary orientation in the literature under review, but do not constitute proof of a new hegemonic higher education.

Discussion

The emphasis on research competences and educational innovation indicate that the recent literature is trending towards an integrated perspective on research training in higher education (HE) in educational studies. Research competence is no longer to be seen as a solitary methodological competence, but increasingly intertwined with pedagogical innovation, digital literacy, and wider processes of academic transformation. This convergence is consistent with evidence showing that contemporary research training incorporates complex thinking, scientific communication and digitally mediated academic practices (George-Reyes et al., 2025; León et al., 2025). However, given the limited corpus analysed, this pattern should be interpreted as an emerging configuration within the selected literature rather than as a definitive transformation of the entire higher education research field.

The social sciences' dominance and the concentration of publications in 2024 attest to the field's recent rise in prominence and continued association with discussions about education. Nonetheless, the existence of Computer Science and other multidisciplinary fields indicates that university innovation and research skills are starting to be connected to broader technological, digital and organisational conversations (Chusniyah et al., 2025). Likewise, the thematic evolution identified through the temporal overlap visualisation showed a recent growth in research linked to artificial intelligence, academic motivation and mentorship. The appearance of the term "ChatGPT-integrated instruction" in the recent thematic structure indicates that generative AI has begun to emerge as a topic within the analysed literature on research competencies and higher education (Abdelhalim, 2024; Li et al., 2025; Xu et al., 2025). Given the limited corpus, this finding should be interpreted as evidence of growing scholarly attention rather than as proof of a general transformation of university teaching and research.

The thematic focus on digital competencies, formative research, and academic literacy suggests that the analysed literature is increasingly connecting research training with collaborative and interdisciplinary educational approaches (Aparicio-Gómez et al., 2024; Pacheco et al., 2025; Suyo-Vega et al., 2024). In other words, active methodologies and Science, Technology, Engineering, and Mathematics (STEM) approaches are increasingly discussed in relation to critical thinking, creativity and research capabilities. These trends align with studies that highlight the importance of problem-based learning, pedagogical innovation, and emerging technologies within the processes of university transformation.

The lower-density presence of mentorship, creativity and challenge-based learning suggests emerging scholarly interest in academic support and active methodologies as potential components of research competency development (Bhuttah et al., 2024; Ransdell et al., 2021).

Nonetheless, conceptual and methodological limitations could also be found according to the bibliometric study. Research competences, university innovation and innovation-related competencies continue to be difficult to define consistently. In addition, limitations related to curricular evaluation, ethical integration of technologies and the construction of standardised interdisciplinary models continue to be observed (Krstikj et al., 2022; Pereira et al., 2022; Suárez Morales et al., 2021). These limitations indicate fragmentation within the analysed scientific field.

This fragmentation can also be explained by the absence of shared frameworks for evaluating research competencies in diverse university contexts. Although there have been advances in defining competencies and reviewing evaluation models, there is still limited articulation between curricular indicators, teaching practices and scientific production outcomes (Krstikj et al., 2022). Therefore, the field needs to move towards comparable criteria that allow for the analysis not only of what competencies are developed but also of how they are integrated into academic programs, how they are institutionally supported and how they are linked to sustainable innovation processes in higher education.

The reviewed literature also identified challenges related to technological infrastructure, institutional sustainability and access to digital resources in different higher education contexts (George-Reyes et al., 2025; Gonzales et al., 2025; Suárez Morales et al., 2021). Although the bibliometric results identified differences in the geographical representation of publications, these publication counts do not by themselves provide evidence of institutional conditions, financing capacity or sustainability policies. Therefore, these aspects should be interpreted as contextual issues reported by individual studies within the corpus rather than as country-level bibliometric conclusions.

Artificial intelligence and digital skills appeared among the recent thematic developments identified in the corpus. However, the bibliometric evidence supports an increase in scholarly attention to these topics rather than conclusions about the extent of institutional governance, digital ethics or sustainable implementation across universities. These dimensions are discussed in the reviewed literature as areas that require further examination and institutional development (Daner et al., 2026; Petrova, 2025; Wainaina & Sun, 2025).

The findings also highlight the necessity of improving the academic traceability of research training. In addition to encouraging student research, universities must document how these abilities are acquired, the assistance students receive, the standards used to assess their development and the connections between these procedures and curriculum enhancement (Oldac & Olivos, 2025). The shift from declarative research training to verifiable, assessable training connected to institutional judgements on academic excellence would be made possible by this traceability.

The lower thematic density of mentoring, creativity, challenge-based learning and ChatGPT-integrated instruction suggests that these topics remain comparatively emergent within the analysed corpus. Accordingly, future research could examine these areas more systematically to determine whether they consolidate as stable lines of inquiry in research training and educational innovation. Likewise, the prominence of higher education, research competencies, educational innovation and digital competencies indicates that future studies may benefit from examining how these conceptual axes interact across different institutional and disciplinary contexts (Ransdell et al., 2021).

The geographical concentration of publications in Mexico, Peru, Spain and Malaysia, together with the predominance of Social Sciences and the increasing presence of Computer Science, also suggests opportunities for comparative research across countries and disciplines. These

bibliometric patterns support the need for future studies that assess whether the identified thematic relationships are reproduced in broader and more diverse samples of higher education research.

Strengths and limitations

The main strength of the study was the construction of a refined corpus consistent with the research objective. This allowed for the interpretation of the field's evolution through its central thematic relationships rather than solely from descriptive indicators. Moreover, the combination of systematic selection criteria and bibliometric maps favoured an integrated interpretation of emerging trends.

Among the limitations, the analysis was restricted to Scopus Elsevier during the period from 2021-2026 and to publications in English and Spanish. Therefore, some relevant studies published in other databases, languages, or periods may have been excluded from the corpus. Additionally, the search equation was based on predefined terminology related to research competencies, educational innovation and higher education; consequently, studies employing alternative or less frequently used terminology may not have been retrieved. Likewise, the results should be interpreted as a bibliometric approximation of the field and not as a detailed qualitative evaluation of the content of each publication.

Conclusion

The study provides a bibliometric overview of the recent scientific development of research competencies and educational innovation in higher education based on 28 publications indexed in Scopus between 2021 and 2026. The analysis identified higher education, research competencies and educational innovation as the principal conceptual axes of the corpus, while digital competencies, formative research, mentoring, and artificial intelligence appeared as recent or emerging thematic developments.

The bibliometric contribution of the study lies in integrating scientific production trends, citation indicators, geographical and institutional representation, publication sources and keyword co-occurrence patterns within a single analytical framework. The findings also reveal a multidisciplinary structure in which Social Sciences predominate, while Computer Science shows an increasing presence in the analysed literature.

Given the limited corpus and the use of a single database, these findings should be interpreted as patterns within the selected literature rather than as general conclusions about higher education institutions or university policies. Future research should expand the evidence base across additional databases, languages, countries and disciplinary contexts to determine whether the identified thematic relationships remain stable in broader samples.

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Conflict of interest

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Generative AI statement

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