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Critical competencies in university teacher training: a bibliometric study

Competencias críticas en la formación docente universitaria: estudio bibliométrico

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Abstract

University teacher education is essential to ensuring the quality of higher education, especially in light of current technological, pedagogical, and social changes. In this context, teachers' critical competencies take on particular importance due to their role in analyzing complex situations, making informed decisions, solving problems, and acting ethically in the classroom. Consequently, the objective of this study was to analyze the scientific landscape of critical competencies in university teacher education through a bibliometric analysis of the scientific literature, identifying trends, the evolution of research output, and the main characteristics of the field of study. The research was conducted using a descriptive bibliometric approach, considering indicators related to scientific productivity, the temporal distribution of publications, authors, countries, publication sources, and main thematic areas. The results showed a progressive evolution in scientific output, reflecting a growing academic interest in strengthening the capabilities of university faculty. Furthermore, a shift was identified from traditional training models toward approaches focused on critical thinking, research, pedagogical reflection, and educational innovation as fundamental components for addressing the contemporary challenges of higher education.

Keywords: Critical skills, university teacher education, bibliometric analysis.

Resumen

La formación docente universitaria representa un elemento esencial para garantizar la calidad de la educación superior, especialmente ante los cambios tecnológicos, pedagógicos y sociales actuales. En este contexto, las competencias críticas del profesorado adquieren importancia debido a su contribución al análisis de situaciones complejas, la toma de decisiones fundamentadas, la resolución de problemas y la actuación ética dentro del ejercicio docente. De allí que el presente estudio tuvo como objetivo analizar el panorama científico de las competencias críticas en la formación docente universitaria mediante un análisis bibliométrico de la literatura científica, identificando tendencias, evolución de la producción investigativa y principales características del campo de estudio. La investigación se desarrolló bajo un enfoque bibliométrico descriptivo, considerando indicadores relacionados con la productividad científica, distribución temporal de publicaciones, autores, países, fuentes de publicación y principales líneas temáticas. Los resultados evidenciaron una evolución progresiva de la producción científica, reflejando un creciente interés académico por fortalecer las capacidades del profesorado universitario. Asimismo, se identificó una transición desde modelos tradicionales de formación hacia enfoques orientados al pensamiento crítico, la investigación, la reflexión pedagógica y la innovación educativa como componentes fundamentales para responder a los desafíos contemporáneos de la educación superior.

Palabras clave: Competencias críticas, formación docente universitaria, análisis bibliométrico.

Introduction

Faculty preparation occupies a central place in efforts to improve the quality of higher education. Technological change, the renewal of pedagogical practice, and the demands of contemporary society have reshaped the responsibilities that instructors carry both inside and outside the classroom. Mastering a discipline is no longer sufficient in this context; teachers must also be equipped to interpret complex situations, weigh different alternatives, and exercise sound judgment when confronting educational problems. As Rivas-Huaman et al. (2025) note, university teaching is undergoing transformations that call for professionals capable of conducting research, making well-grounded decisions, and responding to the challenges of their practice both ethically and reflectively.

Although academic interest in these competencies has grown, the available knowledge remains scattered across studies that adopt different perspectives and methods. Some research addresses critical thinking, while other work focuses on research and digital competencies, pedagogical innovation, or the ethical dimension of teaching. Fernández-Sánchez et al. (2026) caution that this diversity reflects the complexity of university teacher education, yet it also makes the field as a whole difficult to grasp.

This study responds to the need for an organized reading of the knowledge produced on critical competencies in university teacher education. That need becomes especially pressing when one considers that teacher training shapes professional identity, reflection on practice, and the overall quality of educational processes, as Londoño Orozco and Sanabria Totaitive (2024) argue. Through bibliometric analysis, the study sought to trace the evolution of publications, the predominant themes, the most representative authors, collaboration networks, and the gaps that remain.

Studying critical competencies in university teacher education requires starting from the concepts and contributions that have shaped this field. Revisiting its theoretical foundations makes it possible to understand why these competencies are necessary for professional practice and how they have been addressed in higher education. Rivera Paipay et al. (2020) emphasize the importance of strengthening faculty members' scientific and research competencies to respond to complex educational contexts.

University teacher training is not confined to an initial stage, nor does it end once a professional degree has been earned. It is an ongoing process through which the knowledge and abilities needed to meet the demands of higher education are continually strengthened. Peña-Vicuña and Acosta-Peña (2023)

argue that this preparation contributes to the professionalization of teaching and must encompass pedagogical, didactic, research-related, technological, and ethical components.

Over the past few decades, this training has moved away from a sole focus on content transmission and has begun to pay greater attention to the comprehensive development of professional abilities. Toledo Lara (2021) identifies this shift as part of the new trends guiding the preparation of university faculty in a changing educational landscape.

Teacher training, as Benavides León and López Rodríguez (2020) point out, currently faces a range of challenges stemming from the social, technological, and educational changes that have transformed teaching and learning in higher education. Chief among these challenges are the need to strengthen digital competencies, incorporate innovative methodologies, address student diversity, and promote learning-centered pedagogical practices.

Another major challenge in teacher training concerns the consolidation of a professional identity grounded in critical reflection, research, and lifelong learning. University faculty, according to Sánchez Mendiola (2023), must move beyond traditional teaching models and take on the role of mediator, researcher, and innovator within educational processes.

Critical competencies in university teacher education constitute a set of abilities that allow faculty to analyze, interpret, and respond reflectively to the challenges that arise in teaching and learning. For Bezanilla-Albisua et al. (2018), these competencies go beyond mastery of disciplinary content, since they integrate skills such as critical thinking, problem-solving, informed decision-making, effective communication, research, and ethical reflection on educational practice.

Within higher education, Vendrell Morancho (2024) considers critical competencies to have become essential for confronting the transformations brought about by digitalization, internationalization, and new learning-centered teaching models. University instructors must therefore be able to critically evaluate available information, adopt innovative pedagogical strategies, generate knowledge through research, and adapt to constantly evolving educational settings.

For Robles Pihuave (2019), critical competencies are structured around several dimensions that, taken together, strengthen the professional performance of university instructors and foster higher-quality educational practice. Among the most relevant are critical thinking, problem-solving ability, informed decision-making, effective communication, ethical reflection, and research competence.

Tolentino Escarcena and Sánchez Trujillo (2025) likewise note that the dimensions of critical competencies do not operate in isolation but rather complement one another to address the challenges that higher education currently faces. Integrating cognitive, research-related, technological, and ethical skills fosters educational innovation, adaptation to dynamic learning environments, and the generation of relevant solutions to complex problems.

For Coacalla Castillo et al. (2025), critical thinking constitutes one of the essential competencies in university teacher education, as it enables faculty to analyze information objectively, question assumptions, evaluate evidence, and render well-founded judgments across a range of academic situations.

Similarly, Landabur Ayala et al. (2024) point out that decision-making and ethical reflection are indispensable components of responsible university teaching. Decision-making involves selecting the most appropriate courses of action based on an analysis of evidence, contextual needs, and educational objectives, while ethical reflection steers those decisions toward principles of equity, responsibility, inclusion, and academic integrity.

According to Salazar Peralta et al. (2025), critical competencies play a fundamental role in higher education, as they allow faculty to respond effectively to the demands of a constantly changing academic environment. The expansion of digital technologies, the internationalization of education, the accelerated generation of knowledge, and the need to train professionals capable of tackling complex problems have all heightened the importance of these competencies in teaching practice.

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Similarly, Gaona-Portal et al. (2024) hold that strengthening critical competencies contributes to improving the quality of higher education by promoting teaching processes grounded in research, ongoing reflection, and pedagogical innovation. These competencies allow instructors to continually assess their own professional practice, adapt instructional strategies to contextual needs, and foster training oriented toward autonomous learning, creativity, and ethical commitment.

According to Ignacio Orrillo et al. (2025), higher education currently faces a range of challenges tied to digital transformation, the accelerated generation of knowledge, student diversity, and the need to respond to increasingly complex social problems. Within this scenario, teaching competencies take on a fundamental role, as they enable faculty to develop the capacity to adapt to new educational contexts, integrate innovative strategies, and promote teaching processes oriented toward meaningful learning.

Sotomayor Soloaga et al. (2024) likewise maintain that meeting the contemporary challenges of higher education requires instructors capable of reflecting on their own practice, making well-grounded decisions, and generating creative responses to the needs of the academic environment.

For Gregorio-Chaviano et al. (2020), bibliometric analysis is a widely used methodology for assessing the development and evolution of a scientific field through the quantitative study of academic publications. Its application makes it possible to examine the behavior of scientific output using indicators related to the number of publications, citations, authors, institutions, countries, journals, and collaboration networks.

In recent years, as Gómez Guerra et al. (2024) note, bibliometric analysis has gained growing relevance owing to the rise in scientific output and the need to synthesize large volumes of information systematically. Beyond quantifying research activity, this methodology makes it possible to explore relationships among authors, institutions, and keywords through techniques such as co-authorship, co-citation, and term co-occurrence.

For Gómez Velasco et al. (2022), scientific collaboration networks represent the cooperative relationships that researchers, institutions, and countries establish for the joint production of knowledge. Within bibliometrics, these networks are analyzed primarily through co-authorship, which makes it possible to identify the most consolidated research groups, the authors with the greatest connective capacity, and the intensity of existing collaborations.

Cárdenas-Tapia (2021) further notes that analyzing scientific collaboration networks makes it possible to recognize patterns of internationalization, identify research communities, and assess the degree of integration among universities, research centers, and countries.

For Sáez-Ibáñez et al. (2018), bibliometric indicators are essential tools for assessing the behavior and impact of scientific output within a field of knowledge. These indicators make it possible to measure aspects related to the productivity, visibility, and influence of research, providing objective information on the evolution of a scientific field.

Beyond productivity and impact indicators, bibliometric studies also incorporate relational metrics that shed light on the structure of scientific communities and the dynamics of collaboration among researchers. In this regard, Flores-Fernández and Aguilera-Eguía (2020) explain that co-authorship analysis identifies networks of academic cooperation; co-citation reveals the relationship among authors or documents that are frequently cited together; and keyword co-occurrence makes it possible to recognize the topics of greatest interest and the emerging trends within a research field.

Recent research, according to Mendioroz Lacabra et al. (2023), reflects a growing interest in the study of critical competencies in university teacher education, driven by technological change, the transformation of educational models, and the new demands placed on higher education.

Emerging lines of research reveal a growing convergence among critical competencies, artificial intelligence, digital transformation, and educational innovation. Cárdenas-Velasco et al. (2025) note that

the formative use of artificial intelligence can support the development of research competencies, provided it is accompanied by pedagogical guidance, technological preparedness, and ethical criteria.

The present study set out to analyze the scientific landscape of critical competencies in university teacher education through a bibliometric analysis of the specialized literature. The evolution of this field, its main trends, and the participation of the authors, institutions, and countries with the greatest scientific presence were examined.

In line with this purpose, the study addressed the following research questions: How did scientific output on critical competencies in university teacher education evolve over the period under study? And what were the main challenges and knowledge gaps identified within this field of research?

Methodology

The work presented in this article was developed using a descriptive bibliometric approach aimed at analyzing the evolution, structure, and trends of scientific output related to critical competencies in university teacher education. This method made it possible to examine the behavior of scientific knowledge through indicators of scientific productivity and thematic analysis, identifying patterns associated with the temporal distribution of publications, authors, countries, institutions, publication sources, and principal lines of research. The bibliometric analysis afforded a comprehensive view of the field's research development, revealing emerging trends, knowledge gaps, and opportunities for future research (Aria & Cuccurullo, 2017; Donthu et al., 2021).

To assemble the documentary corpus, a systematic search of the scientific literature was conducted in academic databases of recognized international standing, drawing primarily on Scopus, Web of Science, SciELO, and ERIC. These databases were chosen for their broad scientific coverage, the rigor of their indexing processes, and their relevance to the fields of education and the social sciences. The search strategy was designed by combining terms related to the object of study, such as "critical competencies," "critical thinking," "university teacher training," "higher education," "teacher professional development," and "pedagogical reflection," using the Boolean operators AND and OR to ensure a pertinent retrieval of documents.

The process of identifying and selecting documents followed the recommendations set out in the PRISMA 2020 statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), used as a transparency protocol to organize the search, screening, and selection of the bibliographic corpus. The inclusion criteria considered original scientific articles, empirical studies, and reviews published between 2017 and 2026, available in full text, written in Spanish or English, and directly related to critical competencies in university teacher education. Duplicate records, book chapters, theses, conference papers, editorials, letters to the editor, and publications with no direct bearing on the topic under investigation were excluded.

Figure 1. *PRISMA method.*

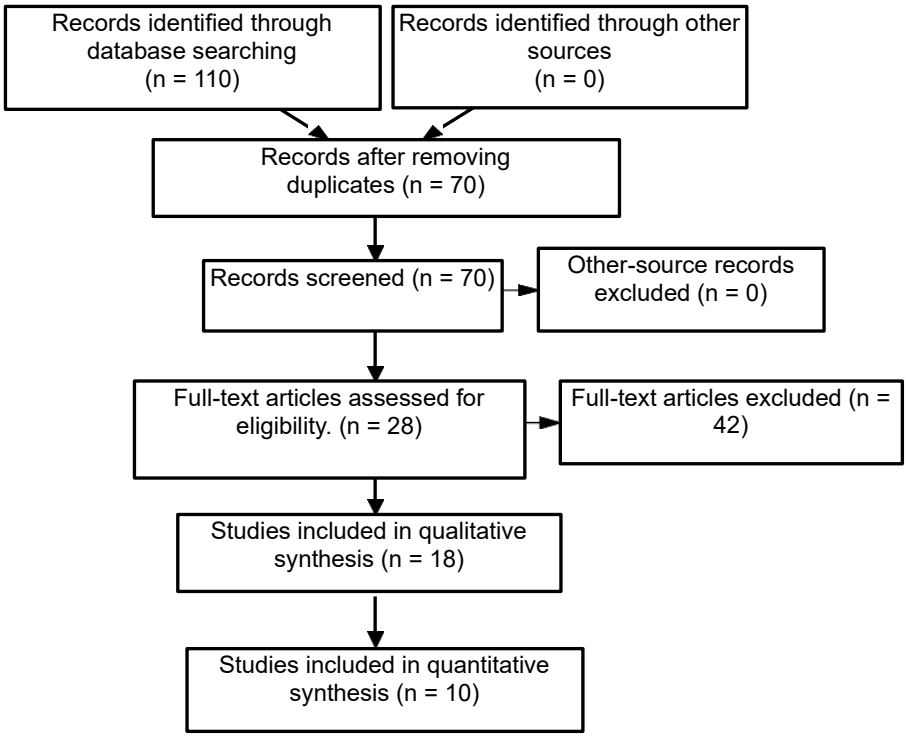


Table 1. *Contributions of the studies analyzed.*

No.	Author(s)	Year	Topic	Key contributions
1	Aria and Cuccurullo	2017	Bibliometric analysis using *bibliometrix*	Introduced an R-based tool for analyzing scientific output, collaboration networks, keyword co-occurrence, and the conceptual structure of a field.
2	Benavides León and López Rodríguez	2020	Ongoing faculty training	Highlighted the need for continuous, contextualized, and comprehensive faculty updating in response to pedagogical, technological, and professional change.
3	Bezanilla-Albisua et al.	2018	Critical thinking among faculty	Demonstrated the importance of critical thinking for analyzing information, forming judgments, solving problems, and grounding pedagogical decisions.
4	Cárdenas-Tapia	2021	Scientific collaboration networks	Showed that co-authorship networks foster knowledge exchange, research productivity, and the consolidation of academic communities.
5	Cárdenas-Velasco et al.	2025	Artificial intelligence and research competencies	Argued that artificial intelligence can strengthen information search, processing, and analysis when used with proper training and ethical criteria.

No.	Author(s)	Year	Topic	Key contributions
6	Coacalla Castillo et al.	2025	Critical thinking and decision-making	Emphasized that critical thinking allows evidence to be weighed, alternatives to be evaluated, and reflective decisions to be made within the university context.
7	Donthu et al.	2021	Guidelines for bibliometric analysis	Provided methodological guidance for assessing the productivity, impact, thematic relationships, and evolution of a scientific field.
8	Fernández-Sánchez et al.	2026	Critical competencies in teacher education	Integrated the pedagogical, ethical, and methodological challenges of critical faculty training and underscored the need for comprehensive training models.
9	Flores-Fernández and Aguilera-Eguía	2020	Bibliometric indicators	Explained the usefulness of indicators for assessing productivity, citation, impact, and scientific visibility, taking into account the context of each discipline.
10	Gaona-Portal et al.	2024	Digital competencies	Identified digital competencies as essential capabilities for educational innovation and the critical use of technology in higher education.
11	Gómez Guerra et al.	2024	Latin American scientific output	Showed that bibliometric analysis makes it possible to trace the growth of scientific output, identify the most productive countries, and recognize regional trends.
12	Gómez Velasco et al.	2022	Scientific output and collaboration	Highlighted the importance of cooperation networks for increasing the visibility and impact of research, as well as the productivity differences among countries.
13	Gregorio-Chaviano et al.	2020	Bibliometrics in Latin America	Demonstrated the usefulness of bibliometrics for identifying patterns of growth, authorship, collaboration, and institutional participation within a scientific field.
14	Ignacio Orrillo et al.	2025	Research competencies	Underscored the need to strengthen the ability to formulate problems, apply methods, analyze evidence, and communicate scientific findings.
15	Landabur Ayala et al.	2024	Critical thinking and disposition toward study	Linked critical thinking to attitudes, motivation, and dispositional strategies toward university learning.
16	Londoño Orozco and Sanabria Totaitive	2024	Training of university faculty	Highlighted pedagogical training, professional identity, reflection on practice, and continuous faculty updating.
17	Mendioroz Lacabra et al.	2023	Faculty research competence	Analyzed the perceptions and research performance of faculty in training, underscoring the need to incorporate hands-on research experiences.

No.	Author(s)	Year	Topic	Key contributions
18	Peña-Vicuña and Acosta-Peña	2023	Faculty professionalization	Noted that pedagogical training contributes to the professionalization of university teaching, but requires continuity, institutional support, and recognition.
19	Rivas-Huaman et al.	2025	University teaching worldwide	Offered an international perspective on the evolution, trends, and emerging lines of research related to university teaching.
20	Rivera Paipay et al.	2020	Faculty scientific competencies	Demonstrated the importance of scientific competencies for seeking information, conducting research, and responding to complex educational situations.
21	Robles Pihuave	2019	Development of critical thinking	Systematized the skills, characteristics, and application models required to develop critical thinking in innovative educational contexts.
22	Sáez-Ibáñez et al.	2018	Indicators of scientific output	Showed how productivity, authorship, collaboration, and citation indicators help describe the evolution and impact of a scientific publication.
23	Salazar Peralta et al.	2025	Student research competencies	Identified capabilities associated with information seeking, methodological command, critical analysis, and scientific communication.
24	Sánchez Mendiola	2023	Contemporary teacher training	Proposed rethinking teacher training through continuous, flexible, reflective processes oriented toward innovation in response to technological and social change.
25	Sotomayor Soloaga et al.	2024	Leadership competency	Incorporated leadership as a necessary competency for guiding teams, managing change, and contributing to the improvement of university institutions.
26	Toledo Lara	2021	Trends in teacher training	Identified pedagogical updating, technological adoption, research, and professional reflection as defining trends of twenty-first-century teacher training.
27	Tolentino Escarcena and Sánchez Trujillo	2025	Critical reading and research	Emphasized that critical reading strengthens source evaluation, comprehension of scientific texts, argumentation, and the development of research work.
28	Vendrell Morancho	2024	Critical thinking in higher education	Identified strategies for overcoming difficulties in developing critical thinking and recommended its explicit integration into the curriculum through active methodologies.

Source: Own elaboration.

To organize and synthesize the information contained in the selected corpus, an analysis matrix was developed that included author, year of publication, topic addressed, and main contributions. This matrix allowed for a systematic comparison of the 28 studies and made it possible to identify their methodological and thematic contributions related to university teacher education, critical thinking, research competencies, and bibliometric analysis.

During the initial search phase, 110 bibliographic records were identified across the selected databases. Duplicate documents were then removed, and a preliminary review of titles and abstracts made it possible to select the studies with the closest thematic relevance. After the eligibility assessment, documents that failed to meet the established criteria were excluded, yielding a final corpus of 28 scientific articles that served as the documentary basis for the bibliometric analysis. These studies were organized using an information extraction matrix that considered variables such as author, year of publication, country, journal, keywords, methodology, and main contributions.

The bibliometric analysis was carried out using descriptive indicators intended to characterize scientific output on critical competencies in university teacher education. Indicators related to the annual evolution of publications, geographic distribution, publication sources, representative authors, keyword frequency, and the methodological features of the selected studies were analyzed. This procedure made it possible to identify research trends, patterns of scientific production, and the main approaches addressed within the field of study.

The data obtained were organized and systematized in a bibliographic matrix built in Microsoft Excel, a tool used for classifying, screening, and descriptively analyzing the information gathered. From this matrix, bibliometric indicators were analyzed relating to the temporal evolution of publications, the geographic distribution of the studies, publication sources, authors, keywords, and the methodological characteristics of the selected documents.

Results and discussion

The bibliometric analysis conducted on the 28 scientific articles that made up the final corpus made it possible to identify the main characteristics of scientific output related to critical competencies in university teacher education. Based on the bibliometric indicators examined, it was possible to trace the temporal evolution of publications, the geographic distribution of the studies, the journals with the greatest presence, the most frequently used keywords, and the methodological characteristics of the research, thereby offering an overall picture of the field's development and trends.

The results obtained reveal the progressive growth of scientific interest in critical competencies in university teacher education in recent years. The analysis also made it possible to identify the geographic contexts with the greatest academic output, the predominant thematic lines, and the methodological approaches most frequently used by researchers, offering elements that contribute to understanding the evolution of scientific knowledge and future research prospects in this area.

Table 1. *Temporal distribution of scientific publications (n = 28).*

Year of publication	Number of articles	Percentage (%)
2017	1	3.57
2018	2	7.14
2019	2	7.14
2020	4	14.29
2021	4	14.29
2022	0	0.00
2023	4	14.29

Year of publication	Number of articles	Percentage (%)
2024	6	21.43
2025	7	25.00
2026	2	7.14
Total	28	100.00

Source: Own elaboration based on the documentary corpus.

A progressive increase in scientific output on critical competencies in university teacher education can be observed over the period analyzed. Although the number of publications was limited between 2017 and 2019, a sustained growth in research interest becomes evident from 2020 onward, reaching its highest concentration in 2025, con 7 articles (25.00%), followed by 2024, con 6 publications (21.43%). These results reflect growing attention within the scientific community toward strengthening critical competencies in higher education, particularly amid ongoing processes of educational transformation and pedagogical innovation.

Table 2. *Distribution of scientific output by country of the first author's affiliation.*

Country	Number of articles	Percentage (%)
Peru	8	28.57
Colombia	4	14.29
Spain	4	14.29
Chile	4	14.29
Ecuador	3	10.71
Mexico	2	7.14
Italy	1	3.57
India	1	3.57
Cuba	1	3.57
Total	28	100.00

Source: Own elaboration based on the documentary corpus.

The geographic distribution of scientific output shows greater participation from researchers affiliated with institutions in Peru, with 8 publications (28.57%), followed by Colombia, Spain, and Chile, each with 4 articles (14.29%). To a lesser extent, research was identified from Ecuador (10.71%), Mexico (7.14%), and Italy, India, and Cuba, each with a single publication (3.57%). These results show that research on critical competencies in university teacher education is heavily concentrated in Ibero-American countries, reflecting the growing interest of higher education institutions in the region in strengthening teaching competencies in response to contemporary educational challenges.

Table 3. *Distribution of publications by scientific journal.*

Scientific journal	Number of articles
Revista InveCom	2
Estudios Pedagógicos (Valdivia)	2
Perspectiva Educacional	2

Scientific journal	Number of articles
Revista Cátedra	1
Educación y Educadores	1
Investigación Administrativa	1
Revista de Informetría (Journal of Informetrics)	1
Revista de Investigación Empresarial (Journal of Business Research)	1
Revista de la Sociedad Española del Dolor	1
Revista Científica UISRAEL	1
Revista Alergia México	1
Revista Historia de la Educación Latinoamericana	1
Biomédica	1
Horizontes. Revista de Investigación en Ciencias de la Educación	1
Praxis & Saber	1
El Ágora U.S.B.	1
Revista Electrónica de Investigación Educativa	1
Revista Tecnológica-Educativa Docentes 2.0	1
INNOVA Research Journal	1
ReHuSo	1
Revista de Psicología (Santiago)	1
Investigación en Educación Médica	1
Dilemas Contemporáneos: Educación, Política y Valores	1
Desde el Sur	1
Revista de la Educación Superior	1
Total	28

Source: Own elaboration based on the documentary corpus.

The scientific output analyzed is spread across 25 scientific journals, reflecting a wide dispersion of publications related to critical competencies in university teacher education. Revista InveCom, Estudios Pedagógicos (Valdivia), and Perspectiva Educacional accounted for the largest number of articles, with two publications each, while the remaining journals each contributed a single article. This diversity of sources reflects the interdisciplinary nature of the topic and the growing interest of various specialized journals in education, pedagogical innovation, and faculty development in addressing the strengthening of critical competencies within the university setting.

Table 4. *Main keywords of the documentary corpus (top 10).*

No.	Keyword	Frequency	Percentage (%)
1	Higher education	19	13.67
2	Teacher training	8	5.76
3	Bibliometrics	8	5.76
4	Critical thinking	7	5.04
5	Research competencies	7	5.04

No.	Keyword	Frequency	Percentage (%)
6	Scientific output	7	5.04
7	Scientific research	5	3.60
8	Bibliometric analysis	5	3.60
9	Faculty professional development	4	2.88
10	University teacher training	4	2.88

Source: Own elaboration based on the documentary corpus.

The keyword analysis revealed that scientific output related to critical competencies in university teacher education is concentrated primarily in the field of higher education, the most frequent term within the documentary corpus. Concepts linked to teacher training, bibliometrics, and critical thinking also stand out, showing that the research addresses both the strengthening of faculty members' professional abilities and the study of how scientific knowledge in this area has evolved.

The outcome of this bibliometric analysis shows that scientific output on critical competencies in university teacher education has undergone a progressive evolution and displays a thematic orientation centered on higher education, critical thinking, teacher training, and the development of research competencies. The distribution of publications, countries, journals, and keywords made it possible to identify the field's main trends, underscoring the importance of strengthening training processes oriented toward pedagogical reflection, research, and educational innovation.

The results showed that the study of critical competencies was directly related to the transformations higher education is undergoing and to the new responsibilities assumed by faculty. The frequency achieved by the term "higher education" confirmed that the production analyzed was concentrated in university settings where reflection, research, and informed decision-making took on particular importance. This finding is consistent with Benavides León and López Rodríguez (2020), who argued that ongoing faculty training must respond to changes in the educational environment by updating pedagogical, research, and professional capabilities.

The recurring appearance of categories such as critical thinking, research competencies, and teacher training likewise showed that the publications did not reduce faculty preparation to mastery of disciplinary content. On the contrary, they assigned a prominent place to analysis, reflection, and knowledge production as part of professional performance. Bezanilla-Albisua et al. (2018) recognized critical thinking as a necessary ability for interpreting complex situations, supporting pedagogical decisions, and fostering deeper learning. Along similar lines, Robles Pihuave (2019) indicated that its development depended on strengthening cognitive skills and applying training strategies that encourage autonomous, reflective practice.

The indicators examined also revealed a growing interest in understanding how research on teacher training and its associated professional competencies had developed. Analyzing productivity, keywords, and the relationships among the works helped identify the topics with the greatest presence, as well as those that still required attention. This use of bibliometrics is consistent with the approach taken by Aria and Cuccurullo (2017) and Donthu et al. (2021), who regarded it as a useful strategy for studying the evolution and organization of the literature through indicators of productivity, impact, and thematic linkage.

The prominence attained by research, digital, and leadership competencies shows that university teacher training demands comprehensive preparation that goes beyond the acquisition of disciplinary knowledge. Ignacio Orrillo et al. (2025), Mendioroz Lacabra et al. (2023), and Rivera Paipay et al. (2020) all emphasize the need to strengthen the ability to formulate problems, analyze evidence, and produce scientific knowledge within the educational sphere. This perspective is complemented by Tolentino Escarcena and Sánchez Trujillo (2025), who link critical reading to the development of research

competencies, and by Cárdenas-Velasco et al. (2025), who incorporate artificial intelligence as an emerging tool for supporting these processes. On the technological front, Gaona-Portal et al. (2024) note that digital competencies constitute an indispensable component for responding to the transformations of higher education. Peña-Vicuña and Acosta-Peña (2023) and Toledo Lara (2021), in turn, argue that faculty professionalization requires ongoing processes of pedagogical updating, reflection on practice, and adaptation to new institutional demands. Finally, Sotomayor Soloaga et al. (2024) broaden this view by incorporating leadership as a relevant competency, while Coacalla Castillo et al. (2025) and Vendrell Morancho (2024) reinforce the importance of critical thinking for grounding decisions, confronting complex problems, and promoting improvements within university settings.

Finally, the findings reflect that critical competencies in university teacher education constitute an interdisciplinary field still in the process of consolidation, one in which pedagogical, research-related, ethical, and technological dimensions converge. The emergence of terms related to educational innovation, digital competencies, and artificial intelligence points to a shift toward more complex training models, in which university faculty must integrate new tools and perspectives to strengthen their professional practice. Along these lines, Sánchez Mendiola (2023) argues that teacher training today requires rethinking faculty members' professional capabilities to confront changing educational scenarios, while Londoño Orozco and Sanabria Totaitive (2024) stress the need to strengthen the identity and professionalization of university faculty through ongoing processes of training and critical reflection.

Conclusions

The analysis conducted showed that research on critical competencies in university teacher education advanced gradually over the period studied. This growth reflected heightened academic concern for the capabilities faculty need to function effectively in higher education. A shift was also observed in how professional preparation is understood: traditional approaches gradually gave way to proposals incorporating critical thinking, research, reflection on practice, and educational innovation.

Among the main challenges identified was the need to establish systematic training processes that bring together the cognitive, pedagogical, research-related, and ethical dimensions of teaching practice. Despite the recognition given to critical competencies, their development still faced difficulties tied to the lack of sustained institutional strategies, the absence of clear mechanisms for evaluating them, and the limited availability of models adaptable to different university contexts.

The review also revealed a limited number of empirical studies devoted to assessing the effects of programs specifically designed to strengthen these competencies among faculty. Although the literature showed progress in the study of critical thinking, research capacity, and faculty professionalization, there remains a clear need to expand work based on mixed-methods and longitudinal designs. Such approaches could offer a deeper understanding of how these capabilities develop and how they bear on the quality of teaching.

The findings confirmed that critical competencies constitute a relevant component of faculty preparation, as they come into play in interpreting complex situations, exercising reasoned decision-making, and renewing educational practice. The trends and thematic lines identified point to a field that is still taking shape and that offers numerous possibilities for future research. Its consolidation will depend on new studies that connect reflection, ethics, and innovation with the actual conditions under which university teaching takes place.

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