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ARTICLE

Analysis of Educational Technology and Teaching Practice in Higher Education Worldwide

Análisis de la Tecnología Educacional y Práctica Pedagógica Docente en Educación Superior a Nivel Mundial

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ABSTRACT

Educational technology has transformed university teaching by modifying teaching, interaction, assessment, and academic support practices in higher education. The aim of the study was to analyze Scopus-indexed research on educational technology and teachers' pedagogical practice in higher education during the 2020–2025 period. The research was framed within the positivist paradigm, using the bibliometric method, with a quantitative approach and a non-experimental, descriptive, cross-sectional design. The population consisted of scientific documents indexed in Scopus, from which a final sample of 1,144 records was obtained. Bibliometric and document analyses were used as techniques; Biblioshiny and VOSviewer were employed as tools to process productivity, citation, collaboration, and thematic co-occurrence indicators. The results showed sustained scientific production, concentration in influential sources, leadership of specific countries, international collaboration networks, and a thematic structure dominated by online learning, higher education, and pedagogical reorganization. It was concluded that the field moved from an initial response associated with the pandemic context toward a more consolidated agenda focused on pedagogical design, educational quality, and new digital mediations. Future studies are recommended to expand the analysis to other databases, regions, and educational modalities, as well as to deepen the pedagogical and ethical impact of artificial intelligence, learning analytics, and immersive environments.

KEYWORDS: Educational technology, higher education, teaching practice, online learning, bibliometric analysis.

RESUMEN

La tecnología educacional transformó la docencia universitaria al modificar las formas de enseñanza, de interacción, de evaluación y de acompañamiento académico en la educación superior. El objetivo del estudio fue analizar la investigación indexada en Scopus sobre tecnología educacional y práctica pedagógica docente en la educación superior durante el periodo 2020–2025. La investigación se enmarcó en el paradigma positivista, bajo el método bibliométrico, con enfoque cuantitativo, diseño no experimental, de tipo descriptivo y de corte transversal. El universo estuvo conformado por documentos científicos indexados en Scopus, de los cuales se seleccionó una muestra final de 1.144 registros. La técnica empleada fue el análisis bibliométrico y documental; como herramientas se utilizaron Biblioshiny y VOSviewer para procesar indicadores de productividad, citación, colaboración y coocurrencia temática. Los resultados evidenciaron una producción científica sostenida, con concentración en fuentes de impacto, liderazgo de determinados países, redes de colaboración internacional y una estructura temática dominada por el aprendizaje en línea, la educación superior y la reorganización pedagógica. Se concluyó que el campo avanzó desde una respuesta inicial asociada al contexto pandémico hacia una agenda más consolidada, orientada al diseño pedagógico, a la calidad educativa y a las nuevas mediaciones digitales. Se recomendó ampliar futuros estudios a otras bases de datos, regiones y modalidades educativas, así como profundizar en el impacto pedagógico y ético de la inteligencia artificial, la analítica del aprendizaje y los entornos inmersivos.

PALABRAS CLAVE: Tecnología educacional, educación superior, práctica docente, aprendizaje en línea, análisis bibliométrico.

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Introduction

Educational technology has significantly transformed university teaching over the past decade, changing teaching, learning, and assessment processes in higher education. Universities currently integrate virtual platforms, digital resources, learning management systems, and artificial intelligence-based tools to support academic training. This context has expanded opportunities for interaction, monitoring, and personalized learning while redefining the pedagogical roles of faculty members. Several studies agree that the quality of technology-mediated teaching depends not only on available resources but also on the pedagogical decisions made by teachers to design meaningful learning experiences (Almazova et al., 2020; Hews et al., 2022; Zhu et al., 2023).

Despite the rapid growth of scientific output on educational technology and pedagogical teaching practice, the available evidence remains scattered across disciplines, institutional contexts, and methodological approaches. The expansion of modalities such as online learning, hybrid education, and digital environments has generated a wide range of studies, making it difficult to identify established trends, influential authors, collaboration networks, and emerging thematic lines. Moreover, much of the literature is shaped by the context of the COVID-19 pandemic, potentially limiting a comprehensive understanding of the field's recent evolution and the transformations currently occurring in higher education (Bozkurt, 2022; Rapanta et al., 2021; Vijayan, 2021).

In response to this need, several researchers have conducted reviews and studies aimed at understanding the integration of digital technologies into higher education. Carrillo and Flores (2020) analyzed online teaching practices during the pandemic and identified the relevance of teacher presence and pedagogical design. Similarly, Rapanta et al. (2021) highlighted the need to balance technology and pedagogy in post-pandemic settings, while Chugh et al. (2023) reported that digital transformation in universities depends on technological, institutional, and human factors. However, these studies focus mainly on specific aspects of the phenomenon and do not provide a comprehensive bibliometric perspective that would identify trends in scientific output, the most influential actors, international collaboration networks, and the thematic structure currently organizing research on educational technology and teachers' pedagogical practice.

Against this background, the present study aimed to analyze Scopus-indexed research on educational technology and teachers' pedagogical practice in higher education during 2020–2025, using bibliometric techniques to characterize scientific output, publication sources, the most influential authors and documents, geographical distribution, collaboration networks, and the field's main thematic clusters. Accordingly, the following research question was addressed: How is scientific output on educational technology and teachers' pedagogical practice in higher education structured, and how does it evolve worldwide during 2020–2025?

Methodology

To address the stated objective and contribute to the research lines and the generation of knowledge, the study was conducted within the positivist paradigm, as it focused on the objective, systematic, and verifiable analysis of scientific output indexed in Scopus. This paradigm was appropriate because it assumes distance between the researcher and the object of study and prioritizes the analysis of observable, quantifiable data (Miranda Beltrán & Ortiz Bernal, 2020). The deductive method was also employed, because the analysis began with previously defined conceptual categories, such as educational technology, teachers' pedagogical practice, and higher education, to examine their behavior within the documentary corpus. This method reasons from general principles to particular cases and is therefore consistent with analyzing a scientific field through previously defined theoretical categories (Dávila, 2006). The approach was quantitative, since numerical indicators of output, citations, collaboration, and co-occurrence were analyzed (Hernández et al., 2014). Finally, the design was non-experimental, descriptive, and cross-sectional, because variables were not manipulated; rather, the bibliometric characteristics of documents published during 2020–2025 were described at a specific point in the

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analysis. This was consistent with descriptive studies, which characterize phenomena or documentary collections in terms of their relevant properties (Guevara Alban et al., 2020).

The population is understood as the defined, delimited, and accessible set of cases used as the basis for sample selection according to the study criteria (Arias-Gómez et al., 2016). It comprised 2,268 scientific documents initially identified in the Scopus database through the established search strategy. Subsequently, after applying the inclusion, exclusion, and documentary screening criteria, a final sample of 1,144 records from 2020–2025 related to educational technology and teachers' pedagogical practice in higher education was obtained.

Filters were applied to restrict the corpus to 2020–2025, documents at the final publication stage, in English or Spanish, and document types with greater academic comparability (articles and conference papers). Corpus screening was reported using a PRISMA diagram (Figure 1), following transparency criteria for identification and selection (Page et al., 2021). A total of 2,268 records were identified and, following filtering and eligibility criteria, a final sample of 1,144 documents was obtained. Duplicate records and evident metadata inconsistencies were subsequently reviewed.

A technique is understood as the set of systematic procedures used by researchers to collect, organize, and analyze the information needed to meet a study's objective (Hernández et al., 2014). Bibliometrics comprises quantitative procedures intended to measure, evaluate, and represent scientific output using productivity, impact, collaboration, and thematic-structure indicators. This technique made it possible to identify publication trends, relevant sources, influential authors, collaboration networks, and patterns of keyword co-occurrence (Donthu et al., 2021).

The search was conducted in the title, abstract, and keyword fields. To ensure conceptual consistency, terms were selected and refined using the UNESCO Thesaurus, prioritizing equivalents in English and Spanish. The strategy was organized into four combined blocks: (1) educational technology, using terms such as "tecnología educacional", "educational technology", "instructional technology", "learning technologies", "digital learning", "online learning", "educational software", and "teaching materials"; (2) pedagogical practice, using "teaching practice", "pedagogical practice", "teaching methods", "classroom practice", "instructional practice", and "pedagogy"; (3) university teaching, using "teacher", "professor", "University professors", "faculty", and "lecturers"; and (4) higher education, using "higher education", "tertiary education", and "university". Synonyms were connected using the OR operator, while blocks were combined using the AND operator. This strategy made it possible to retrieve records associated with the four study domains simultaneously.

Tools are understood as resources used by researchers to record, organize, and analyze the information needed to achieve the study objectives (Hernández et al., 2014). In this research, the Scopus database was used to retrieve scientific records, while Biblioshiny (bibliometrix) and VOSviewer were used to process, visualize, and analyze bibliometric indicators, co-authorship networks, thematic maps, and co-occurrence structures.

Biblioshiny (bibliometrix) was used to summarize bibliometric indicators and generate the thematic map and Three-Field Plot (Aria & Cuccurullo, 2017). VOSviewer was also used to visualize highly legible networks, particularly country-level co-authorship and keyword co-occurrence networks (Van Eck & Waltman, 2010). The statistical analysis was descriptive, understood as a set of procedures for organizing, summarizing, and clearly presenting research data using tables, figures, frequencies, and numerical indicators (Rendón-Macías et al., 2016).

This study employed descriptive statistics, including absolute frequencies, growth rates, citation indicators, and bibliometric indices (h-index, g-index, and m-index), as well as network analysis and co-occurrence maps to identify relationships among authors, countries, sources, and keywords in the analyzed corpus. Corpus screening was reported through the PRISMA diagram, following criteria for transparency in document identification, selection, and inclusion (Page et al., 2021). Duplicates and evident inconsistencies in metadata were subsequently reviewed; see Figure 1.

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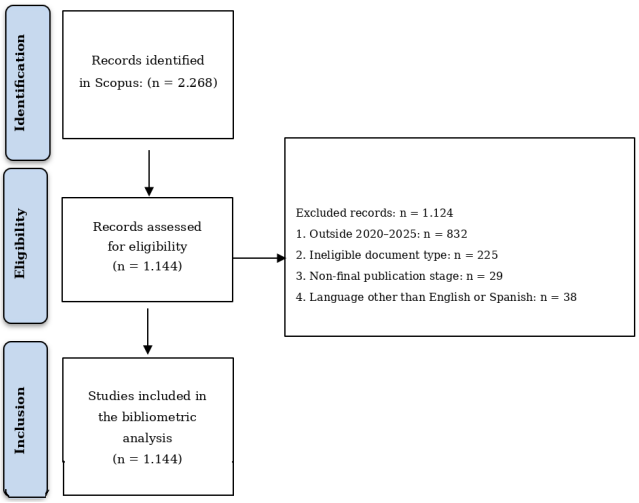
Figure 1

Flowchart Showing the Process of Obtaining Final Records According to the PRISMA Model.



Note. Documentary selection process according to the PRISMA model. Authors' own work based on Scopus data (2026).

The research complied with the principles of scientific integrity and the responsible use of academic information. Ethics committee approval was not required because it was based exclusively on the analysis of scientific documents available through institutionally accessible databases, without involving human or animal participants or identifiable personal data. Appropriate citation of consulted sources and compliance with ethical standards for scientific research and publication were also ensured.

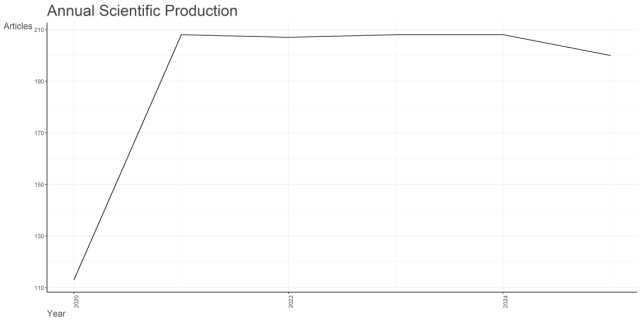
Results

The results showed that research on educational technology and teachers' pedagogical practice in higher education maintained sustained scientific output during 2020–2025, characterized by the consolidation of a core of highly influential academic sources, documents, and countries. International collaboration networks and a thematic structure dominated by online learning, higher education, and pedagogical transformations associated with educational digitalization were also identified. Furthermore, bibliometric analyses revealed the coexistence of established research lines and emerging topics related to artificial intelligence and new technological forms of mediation, shaping the field's recent scientific agenda.

Figure 2 shows the annual development of scientific output in the corpus between 2020 and 2025. The series begins in 2020 with 113 articles and rises sharply in 2021 to 208, nearly doubling the previous year's volume. Thereafter, the series remains very stable, with 207 articles in 2022, 208 in 2023, and 208 in 2024, followed by a slight decline to 200 articles in 2025.

Figure 2

Annual Scientific Output (2020–2025) in the Scopus Corpus.



Note. Annual development of scientific documents retrieved from Scopus during 2020–2025. Authors' own work based on Scopus data (2026).

Table 1 summarizes the local impact of the corpus's leading sources and includes performance indicators, publication counts (NP), and total citations (TC). Education and Information Technologies and Education Sciences lead in h-index, with a value of 11, suggesting a consistent base of papers gaining traction within the field. Education Sciences stands out with a g-index of 23 and 612 citations, whereas Education and Information Technologies accumulated 366 citations across 18 publications. Frontiers in Education (Switzerland) and Sustainability (Switzerland) follow closely, both with an h-index of 9, alongside journals such as Australasian Journal of Educational Technology and Frontiers in Psychology, with an h-index of 8. These results indicate a relatively stable core of publication outlets centered on the topic examined.

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Table 1

Local Impact of the Leading Sources in the Scopus Corpus, 2020–2025.

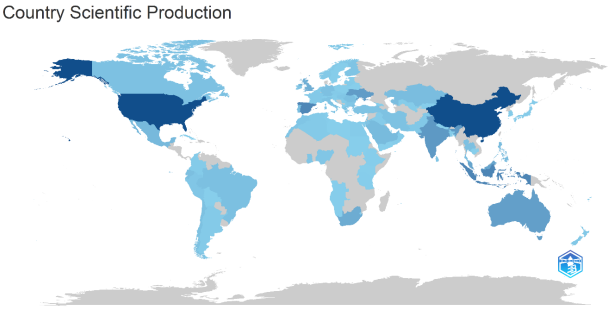
Source	h-index	g-index	m-index	TC	NP
EDUCATION AND INFORMATION TECHNOLOGIES	11	18	1.833	366	18
EDUCATION SCIENCES	11	23	1.571	612	23
FRONTIERS IN EDUCATION	9	16	1.5	269	17
SUSTAINABILITY (SWITZERLAND)	9	11	1.5	256	11
AUSTRALASIAN JOURNAL OF EDUCATIONAL TECHNOLOGY	8	12	1.143	391	12
FRONTIERS IN PSYCHOLOGY	8	12	1.333	516	12
COGENT EDUCATION	7	11	1.4	150	23
INTERNATIONAL JOURNAL OF EMERGING TECHNOLOGIES IN LEARNING	7	12	1	166	15
ONLINE LEARNING JOURNAL	7	12	1	632	12
BMC MEDICAL EDUCATION	6	10	1	127	10
HELIYON	6	9	0.857	136	9
INTERACTIVE TECHNOLOGY AND SMART EDUCATION	6	7	0.857	102	7
CONTEMPORARY EDUCATIONAL TECHNOLOGY	5	5	0.714	263	5
ELECTRONIC JOURNAL OF E-LEARNING	5	7	0.833	63	8
INTERNATIONAL JOURNAL OF INTERACTIVE MOBILE TECHNOLOGIES	5	6	0.714	90	6
INTERNATIONAL JOURNAL OF LEARNING, TEACHING AND EDUCATIONAL RESEARCH	5	8	0.714	75	12
RIED-REVISTA IBEROAMERICANA DE EDUCACIÓN A DISTANCIA	5	6	0.833	62	6
TECHTRENDS	5	5	0.714	59	5
BRITISH JOURNAL OF EDUCATIONAL TECHNOLOGY	4	6	0.667	258	6
COMPUTERS AND EDUCATION	4	4	0.571	79	4

Note. The table presents the leading sources in the corpus according to local impact and scientific productivity indicators. Authors' own work based on Scopus data (2026).

Figure 3 shows the geographical distribution of scientific output in the corpus; greater color intensity indicates a higher concentration of publications by country. Asia and North America show pronounced leadership, with China (399) and the United States (398) as major hubs. Indonesia (220) and Spain (212) also stand out, followed by India (158), Ukraine (149), and Australia (138), indicating a pattern of high research activity across different regions and university systems. By contrast, much of Africa and Latin America appears in lighter or intermittent shades, suggesting less sustained, albeit still visible, participation in the mapped scientific landscape.

Figure 3

Scientific Output by Country in the Scopus Corpus, 2020–2025.



Note. Geographical distribution of scientific output according to authors' countries of affiliation. Authors' own work based on Scopus data (2026).

Figure 4 presents the Three-Field Plot linking countries of affiliation, authors, and author keywords; the thickness of the flows indicates the strength of the connections. The left-hand axis shows a clear predominance of China, followed by countries making substantial contributions, including Spain, the United States, Indonesia, India, and Malaysia. More specific contributions also appear from Romania, the Philippines, and Portugal,

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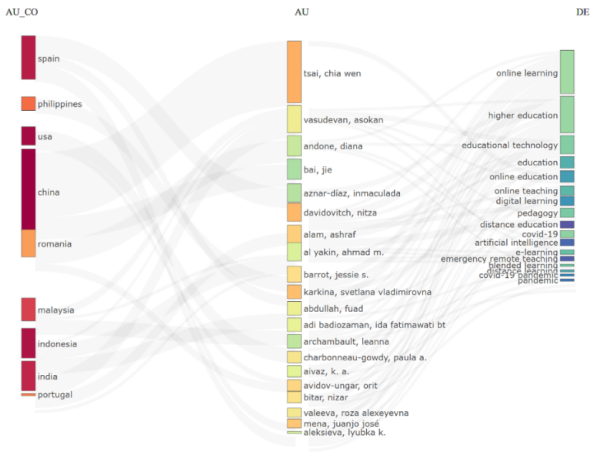
among other national contexts. On the central axis, Tsai, Chia Wen stands out as the most connected node, alongside Vasudevan, Asokan; Davidovitch, Nitza; Aznar-Díaz, Inmaculada; and Bai, Jie. This configuration suggests continuity in certain lines of work and the involvement of diverse teams. On the right-hand axis, the dominant labels are online learning, higher education, and educational technology, followed by related terms such as online education, online teaching, digital learning, pedagogy, and distance education. Contextual references to COVID-19, the pandemic, and emergency remote teaching remain visible, together with an emerging component associated with artificial intelligence.

The diagram reveals an agenda organized around a robust thematic core: online learning in higher education. In this sense, online learning serves as the organizing axis of the field, while terms associated with remote teaching continue to connect authors and countries. This pattern is consistent with the methodological disruption experienced by teaching practices during the period analyzed.

Figure 4

Three-Field Plot (Countries–Authors–Keywords) of the Scopus Corpus.

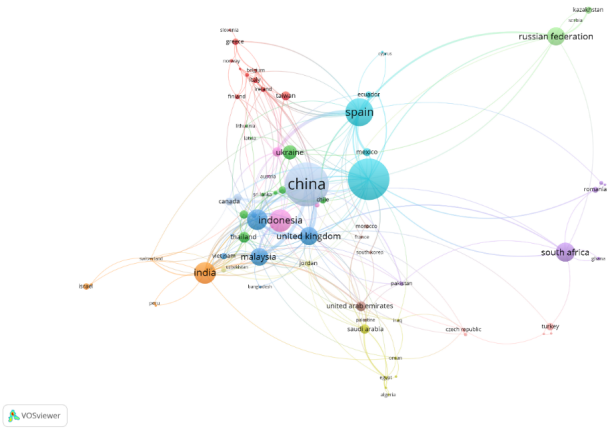


Note. Relationship among the most frequent countries, authors, and keywords in the analyzed corpus. Authors' own work using Biblioshiny and Scopus data (2026).

Figure 5 shows the corpus's country-level co-authorship network. Node size indicates greater relative presence, whereas links represent international collaboration; colors group countries with more frequent cooperation ties. China stands out at the center of the map as one of the most visible nodes, with multiple connections, indicating its coordinating role within the network. A European cluster is also identifiable, with Spain and the United Kingdom acting as highly connected hubs linked to both nearby countries and actors outside Europe. India, Indonesia, and Malaysia likewise emerge as important nodes in Asia, with connections reinforcing interregional collaboration. More distant hubs with clearly defined links, including South Africa and Russia, are also apparent; they connect to the core through specific, less dense pathways, suggesting more focused collaboration circuits.

Figure 5

Country-Level Co-authorship Network of the Scopus Corpus.



Note. Scientific collaboration network among countries, based on co-authorship ties identified in the corpus. Authors' own work using VOSviewer and Scopus data (2026).

Table 2 lists the 20 most globally cited documents in the corpus, together with their annual citation performance and normalized citation counts. Carrillo (2020) ranks first with 695 citations, followed by Johnson (2020) with 456 and Rapanta (2021) with 370. They are followed by Cope (2021) with 343 citations and Fabriz (2021) with 246. Citation impact is substantially concentrated: the five leading documents account for 2,110 citations, approximately half the recorded total. Nevertheless, the document ranked twentieth has 91 citations; therefore, the difference between the first and last positions reveals a clearly defined elite that remains connected to the other influential works.

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Studies related to online teaching, higher education, and adjustments to teaching practice during and after the pandemic predominate. Experiences associated with online teaching, distance education, and emergency remote teaching are particularly prominent citation themes, while a shift toward postdigital debates and more stable pedagogical approaches is taking shape. Moreover, the presence of articles from psychology, medical education, and specific disciplines suggests the formation of a cross-cutting field in which educational technology is examined in terms of both its implementation and its effects on teaching practices, experiences, and learning outcomes.

Table 2

Most Globally Cited Documents (Top 20) in the Scopus Corpus, 2020–2025.

Paper	Total Citations	TC per Year	Normalized TC
CARRILLO (2020). EUR J TEACH EDUC	695	99.29	20.32
JOHNSON (2020) ONLINE LEARN J	456	65.14	13.33
RAPANTA (2021). POSTDIGIT SCI EDUC	370	61.67	20.11
COPE (2021). EDUCPHILOS THEOR	343	57.17	18.64
FABRIZ (2021). FRONT PSYCHOL	246	41.00	13.37
ALMAZOVA (2020). EDUC SCI	219	31.29	6.40
KIDD (2020). EUR J TEACH EDUC	194	27.71	5.67
MULENGA (2020). CONTEMP EDU TECH	192	27.43	5.61
CHU, (2022). AUSTRALAS J EDUC TECHNOL	163	32.60	14.05
AKOUR (2021). JMIR MED EDUC	148	24.67	8.04
SINDIANI (2020). ANN MED SURG	148	21.14	4.33
TARTAVULEA (2020) AMFITEATRU ECON	148	21.14	4.33
BORDOLOI (2021). ASIAN ASSOC OPEN UNIV J	138	23.00	7.50
SHU (2023). SYSTEMS	117	29.25	13.91
CABERO-ALMENARA (2022). BR J EDUC TECHNOL	110	22.00	9.48
O'CONNOR (2022). STUD HIGH EDUC	110	22.00	9.48
SÁEZ-LÓPEZ, 2020, EDUC SCI	102	14.57	2.98
JIN (2021). FRONT PSYCHOL	97	16.17	5.27
HUANG (2020). J CHEM EDUC	95	13.57	2.78
SAHA (2021). J AFFECTIVE DISORD	91	15.17	4.95

Note. The table presents the documents with the highest number of global citations within the analyzed corpus. TC = total citations. Authors' own work based on Scopus data (2026).

Figure 6 shows the keyword co-occurrence network of the analyzed corpus. Node size represents the frequency with which terms appear, while lines indicate recurring associations between concepts; colors organize the field into thematic clusters. Online learning, higher education, and COVID-19 stand out at the core of the network, accompanied by related concepts such as blended learning, online teaching, and distance education. This arrangement reveals a dominant focus on higher education mediated by virtual environments. A cluster centered on educational experience and instructional practice is also identified, with terms such as students, teaching, teaching methods, and curricula linked to applied subfields, including engineering education and learning systems. Finally, a cluster emerges featuring vocabulary associated with specific contexts and measurement processes, including pandemic, distance education, and terms related to healthcare education environments. This pattern suggests a broad, cross-cutting empirical base organized around the digitalization of higher education.

In the upper quadrant, near the vertical axis, a group consisting of human, education, humans, learning, and pandemic appears, characterized by high density and intermediate centrality. It thus constitutes a conceptually cohesive core capable of serving as a cross-cutting framework. In the lower-right quadrant, which corresponds to basic or cross-cutting themes, the group comprising COVID-19, pedagogy, blended learning, distance learning, and online education is visible. Its high centrality and lower density indicate a linking function across several subtopics, although its internal connections remain dispersed.

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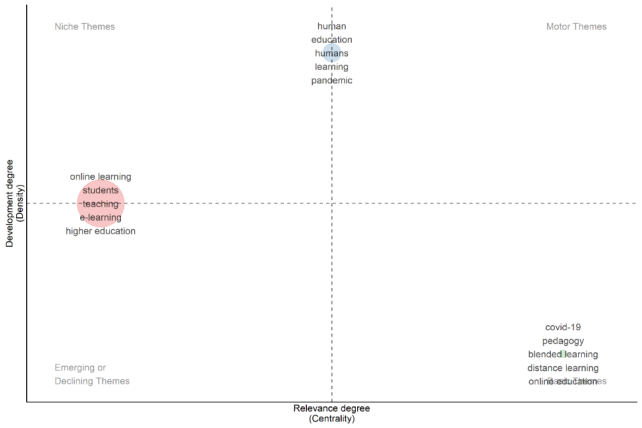
Figure 6

Thematic Map (Centrality–Density) of the Scopus Corpus.



Note. Thematic map constructed from the centrality and density of key terms in the analyzed corpus. Authors' own work using Biblioshiny and Scopus data (2026).

Overall, the results showed that research on educational technology and teachers' pedagogical practice in higher education maintained sustained scientific output during 2020–2025, supported by a core of highly influential academic sources, authors, and documents. A geographical distribution concentrated in particular countries was also identified, alongside international collaboration networks and a thematic structure dominated by online learning, higher education, and the reorganization of teaching practices. Likewise, bibliometric maps revealed the coexistence of established research lines and emerging topics associated with artificial intelligence and new forms of digital mediation, outlining the current landscape of the scientific field examined.

Discussion

The findings address the research question by showing that scientific output on educational technology and teachers' pedagogical practice in higher education is structured around a dominant thematic core encompassing online learning, higher education, and pedagogical transformations resulting from the pandemic context. This organization suggests that the field evolved from an emergency phase focused on ensuring academic continuity toward a more consolidated stage in which pedagogical design, the quality of interaction, technology-mediated assessment, and new forms of scientific collaboration have gained relevance. Consequently, educational technology does not emerge as an isolated object but as a dimension interconnected with teaching decisions, institutional conditions, and educational modalities that reshape university teaching.

This finding is consistent with Johnson et al. (2020), who argue that the pandemic triggered an abrupt reorganization of university teaching, forcing teachers and institutions to adapt resources, materials, and assessment strategies within a short period. However, the bibliometric findings indicate that this momentum was not limited to a temporary response; instead, it drove a sustained expansion of research on online teaching, higher education, and pedagogical practice. This trend also relates to Carrillo and Flores (2020), who emphasize that technology-mediated teaching requires teacher presence, support, and intentional instructional design, elements that help explain the centrality of terms associated with online learning, teaching, and higher education in the analyzed corpus.

The results are also consistent with those of Bozkurt (2022) and Rapanta et al. (2021), who caution that planned online education should not be confused with emergency remote teaching. This distinction is relevant because the thematic map reveals the coexistence of related labels, such as blended learning, distance learning, online education, and emergency remote teaching, which may lead to imprecise interpretations unless clearly defined conceptually. Thus, the main contribution of the bibliometric analysis is to show that the field requires greater terminological and methodological precision to avoid weak comparisons among educational modalities governed by different pedagogical logics.

Similarly, collaboration networks and influential publication clusters indicate that scientific debate on educational technology has become internationalized, although geographical asymmetries in research output remain. This finding aligns with Chugh et al. (2023), who argue that implementing educational technology in higher education depends on institutional factors, stakeholder perceptions, adoption frameworks, and evaluation metrics. In this respect, the concentration of publications in particular countries and outlets

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suggests that digital transformation in universities is not progressing uniformly but is conditioned by academic capacity, infrastructure, funding, and scientific cooperation networks.

The findings also indicate that teachers' digital competence constitutes a cross-cutting area of discussion, especially where technological integration intersects with inclusion, diversity, and pedagogical quality. Cabero-Almenara et al. (2022) argue that teachers' digital competence is crucial for supporting students with functional diversity, while Bray et al. (2024) note that technology's value depends on its integration with inclusive designs rather than merely on tool availability. Consistent with these views, the analyzed corpus indicates that teachers' pedagogical practice is shifting toward a more complex understanding in which the use of platforms, digital resources, and virtual environments requires instructional criteria, institutional support, and assessment of educational outcomes.

The emergence of topics linked to artificial intelligence, learning analytics, and immersive environments also reveals an agenda in transition. Cope et al. (2021) note that artificial intelligence changes how knowledge is assessed and produced in educational settings, while Galindo-Domínguez et al. (2024) caution that its adoption by teachers still faces limitations related to training, trust, ethics, and pedagogical criteria. Similarly, Ruiz Viruel et al. (2025) highlight the potential of artificial intelligence in active methodologies while emphasizing the need for teacher training and institutional guidelines. Thus, the results suggest that these technologies do not yet dominate the field but are beginning to shape new research directions in personalization, feedback, academic integrity, and data-informed decision-making.

The study's limitations include its restriction to Scopus-indexed documents published in English and Spanish during 2020–2025; it therefore does not represent all research available in other databases, languages, or regional publishing circuits. Furthermore, the period examined is strongly influenced by the pandemic, potentially overrepresenting terms associated with remote education, online learning, and academic continuity. It must also be acknowledged that bibliometrics identifies patterns of output, citation, collaboration, and thematic co-occurrence but does not directly assess pedagogical quality or the effectiveness of teaching practices examined in the included studies.

Building on these findings, future studies should extend the analysis to complementary databases such as Web of Science, ERIC, and SciELO to compare international visibility with regional research output. Comparative studies will also be needed to distinguish online, hybrid, blended, and emergency remote education more precisely, incorporating pedagogical indicators to evaluate not only the presence of technology but also its effects on learning, assessment, inclusion, and student participation. Finally, the future agenda should examine the impact of artificial intelligence, learning analytics, and immersive environments from ethical, pedagogical, and institutional perspectives, preventing technological innovation from advancing without robust evidence of its actual contribution to the quality of higher education.

Conclusions

The study is important because it characterizes Scopus-indexed scientific output on educational technology and teachers' pedagogical practice in higher education during 2020–2025 and provides an organized overview of an expanding field. The findings show that research centers on online learning, higher education, pedagogical transformations arising from the pandemic, and the consolidation of new forms of digital mediation. The analysis also reveals the existence of especially influential academic sources, documents, and countries, contributing to an understanding of the international scientific agenda concerning the relationship among technology, university teaching, and educational quality.

In accordance with the specific objectives, the findings suggest that the future of research in this field will depend on greater conceptual and methodological precision in distinguishing modalities such as online education, hybrid education, blended learning, and emergency remote teaching. This distinction will enable more comparable evidence and prevent broad conclusions about educational experiences that respond to different institutional conditions. Likewise, bibliometric analysis shows that teachers'

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pedagogical practice should be studied as a system of decisions involving instructional design, feedback, authentic assessment, inclusion, workload, and institutional support, beyond the mere use of digital platforms or tools.

For future research, extending the corpus to other databases, including Web of Science, ERIC, and SciELO, is recommended to compare international research output with regional evidence and reduce coverage bias. Comparative analyses by discipline, region, institution type, and educational modality will also be necessary to identify differences in the adoption and effectiveness of educational technologies. Finally, further investigation of artificial intelligence, learning analytics, and immersive environments is suggested from pedagogical, ethical, and institutional perspectives, ensuring that technological innovation is assessed by its actual contribution to learning rather than solely by its level of adoption.

Declaration of Conflicts of Interest

The author declares that there are no conflicts of interest related to the conduct of this study or the interpretation of its findings. Furthermore, the author confirms that no personal, academic, or financial relationships could have influenced the research process or its results.

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Ethics Statement

This study did not require approval from an institutional ethics committee, as it was based exclusively on the bibliometric analysis of scientific publications indexed in Scopus, without involving human participants, animal subjects, or identifiable personal data. The research adhered to the principles of scientific integrity, responsible data management, proper attribution of sources, and ethical academic publishing.

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