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Artículos científicos

Competencias digitales en la enseñanza-aprendizaje en educación superior: revisión sistemática de la literatura

Digital competences in teaching and learning in higher education: a systematic literature review

Competências digitais no ensino e na aprendizagem no ensino superior: uma revisão sistemática da literatura

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Resumen

El estudio analiza, mediante una revisión sistemática, las teorías y enfoques vinculados con el desarrollo de las competencias digitales en la educación superior. Para ello, se aplicó el modelo PRISMA 2020 con el fin de examinar estudios empíricos, teóricos y de revisión publicados entre 2019 y 2024 en las bases de datos Scopus, SciELO, Web of Science y EBSCO. La estrategia de búsqueda incluyó los términos competencias digitales, educación superior, innovación pedagógica, rendimiento académico, aprendizaje colaborativo y tecnologías emergentes para identificar evidencia sobre su impacto educativo. Los hallazgos muestran que el fortalecimiento de las competencias digitales favorece la autonomía estudiantil, impulsa la innovación pedagógica y potencia el aprendizaje colaborativo; sin embargo, persisten limitaciones relacionadas con la infraestructura tecnológica, la formación docente y las brechas de acceso digital. En conjunto, la evidencia confirma que el desarrollo de competencias digitales es un factor clave para mejorar los procesos de enseñanza y aprendizaje, promover la inclusión educativa y fortalecer la sostenibilidad de la educación superior en el contexto del siglo XXI.

Palabras clave: Competencias digitales; educación superior; calidad educativa; revisión sistemática; PRISMA.

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Abstract

This study analyzes the theories and approaches related to the development of digital competencies in higher education through a systematic review. The PRISMA 2020 framework was applied to examine empirical, theoretical, and review studies published between 2019 and 2024 in the Scopus, SciELO, Web of Science, and EBSCO databases. The search strategy included the terms digital competencies, higher education, pedagogical innovation, academic performance, collaborative learning, and emerging technologies to identify evidence of their educational impact. The findings indicate that strengthening digital competencies fosters student autonomy, promotes pedagogical innovation, and enhances collaborative learning; however, persistent limitations related to technological infrastructure, teacher training, and digital access gaps remain. Overall, the evidence confirms that the development of digital competencies is a key factor in improving teaching and learning processes, promoting educational inclusion, and strengthening the sustainability of higher education in the 21st century.

Keywords: digital competencies; higher education; educational quality; systematic review; PRISMA.

Resumo

Este estudo analisa as teorias e abordagens relacionadas ao desenvolvimento de competências digitais no ensino superior por meio de uma revisão sistemática. O modelo PRISMA 2020 foi aplicado para examinar estudos empíricos, teóricos e de revisão publicados entre 2019 e 2024 nas bases de dados Scopus, SciELO, Web of Science e EBSCO. A estratégia de busca incluiu os termos competências digitais, ensino superior, inovação pedagógica, desempenho acadêmico, aprendizagem colaborativa e tecnologias emergentes, com o objetivo de identificar evidências de seu impacto educacional. Os resultados indicam que o fortalecimento das competências digitais fomenta a autonomia estudantil, promove a inovação pedagógica e aprimora a aprendizagem colaborativa; contudo, persistem limitações relacionadas à infraestrutura tecnológica, à formação docente e às lacunas de acesso digital. De modo geral, as evidências confirmam que o desenvolvimento de competências digitais é um fator-chave para aprimorar os processos de ensino e aprendizagem, promover a inclusão educacional e fortalecer a sustentabilidade do ensino superior no século XXI.

Palavras-chave: competências digitais; ensino superior; qualidade da educação; revisão sistemática; PRISMA.

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Introduction

Digital competencies have become a structural component of higher education within the context of digital transformation, directly impacting the quality of educational processes and students' academic performance (López-Núñez et al., 2024). This scenario not only expands access to education but also redefines training requirements, focusing on the development of critical and collaborative skills linked to employability (Guevara Fernández, 2024). However, their effective integration remains conditioned by persistent structural gaps in technological infrastructure, teacher training, and equitable access to digital resources (Cueva Chavez, 2024). Taken together, this demonstrates that their implementation depends not only on their theoretical relevance but also on unresolved systemic conditions.

In the university setting, students' digital skills are a determining factor in shaping meaningful learning and developing professional competencies in technology-mediated environments (García-Prieto et al., 2022). While some studies emphasize their direct impact on academic performance, others indicate that this effect is mediated by variables such as self-regulation and the institutional context (Martínez-Moreno et al., 2024). This divergence suggests that digital skills should not be understood as an isolated factor, but rather as a complex construct whose educational impact depends on its pedagogical integration. Consequently, their development requires more systemic and contextualized educational approaches.

The growth in scientific production on digital competencies demonstrates their relevance in higher education, especially in relation to academic performance, self-regulated learning, and student engagement (Delgado et al., 2019). However, while some authors interpret this growth as a consolidation of the field, others warn that significant theoretical and methodological fragmentation persists (Saltos-Rivas et al., 2023). This tension reflects a lack of articulation between approaches, which limits the construction of a unified theoretical framework. Therefore, the need to move toward integrative reviews that consolidate existing knowledge is evident, especially in Latin American contexts (Moreno et al., 2018).

From a conceptual standpoint, digital competencies are understood as a construct comprised of knowledge, skills, and attitudes geared toward effective interaction with digital technologies in complex educational contexts (Padrón Álvarez et al., 2023; Stogiannos et al., 2024). Unlike reductionist approaches focused solely on the

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instrumental, these competencies involve a reflective, critical, and ethical use of technology, as well as the ability to manage information strategically in digital environments (Vovchasta et al., 2024). This distinction is fundamental, as it determines how institutions design their digital training policies.

In theory, the DigCompEdu model has become one of the most widely used frameworks for assessing teachers' digital competence, structuring this construct into dimensions related to knowledge, skills, attitudes, and professional ethics (Moreira-Choez et al., 2024; Zula et al., 2024). While some studies consider it a sufficient framework for measuring competencies, others argue that it requires contextual adaptations to capture the complexity of real educational environments (García et al., 2020;

Amador-Alarcón et al., 2022). This discussion shows that its value does not lie solely in its structure, but in their capacity for adaptation and critical interpretation in diverse contexts.

In the global educational context, universities face the need to shift from models focused on passive participation to approaches that promote the active and autonomous involvement of students in their learning process (Cabero-Almenara & Bond, M., Bedenlier, S., Marín, VI, & Händel, M., 2021; García Sánchez, OV, Zaldívar Colado, A., & Peña García, GM, 2022). However, this transition is uneven, as institutions with significant advances in pedagogical innovation coexist with others that maintain limiting traditional structures (Bekele Feyisa et al., 2024; Veytia Bucheli et al., 2024). Within this framework, digital competencies serve as a central link between technology and pedagogy, although their implementation remains heterogeneous and dependent on the institutional context (García-Prieto et al., 2022; Vovchasta et al., 2024).

Finally, the development of digital skills in university students is conditioned by internal and external factors that interact in complex ways. While some studies prioritize student attitude and motivation as the main determinants, others place greater emphasis on institutional conditions and access to technology (Rodríguez et al., 2019). This duality confirms that their development cannot be explained from a single dimension, but rather from a systemic and integrated approach. Consequently, strengthening these skills requires coordinated educational policies that combine teacher training, adequate infrastructure, and coherent pedagogical strategies.

The objective of this systematic review is to analyze the scientific production on digital skills in higher education, in order to identify the main theoretical approaches, the

factors that condition their development and integration in training processes and the pedagogical strategies that favor their strengthening in university contexts.

Research Method

The methodology used in this article follows the PRISMA 2020 guidelines for systematic reviews, adapted to the analysis of digital competencies in higher education. This approach allows for the identification of patterns, trends, and general conclusions from the existing literature through the collection, organization, and synthesis of scientific evidence, thus facilitating evidence-based decision-making (Moreno et al., 2018). Furthermore, the methodological process was structured in four phases: identification, selection, eligibility, and inclusion, in accordance with Page et al. (2021).

To obtain the data, a systematic and reproducible search of scientific articles was conducted in databases specializing in the educational and digital fields. As Núñez Rojas et al. (2024) point out, search criteria must be rigorously defined and keywords must correspond precisely to the central concepts of the research. In this study, terms in both Spanish and English were used to broaden the coverage of the international literature and ensure the retrieval of works published in both languages. The search terms used were: “digital competencies,” “higher education,” “educational quality,” “systematic review,” and “PRISMA.” The sources consulted were Scopus, SciELO, Web of Science (WOS), and EBSCO, which offered extensive coverage of studies related to the topic.

Boolean operators AND, OR, and NOT were used in the search to refine the results, allowing for the combination of search terms and improving the precision and coverage of the information (Guevara Fernández, 2024). Inclusion criteria were established to ensure the relevance and quality of the selected studies, such as publication within the last five years and the availability of texts in English, Spanish, or Portuguese, among others. Page et al. (2021) highlight the importance of these criteria for ensuring methodological consistency in systematic reviews. Finally, exclusion criteria were applied to eliminate duplicate articles and those whose focus was not directly related to the study's objective.

The purpose of this study is to analyze the theories and approaches that address digital competencies in higher education through a systematic review based on the PRISMA 2020 guidelines (Page et al., 2021). The selection process phases are illustrated in Figure 1, which shows the flowchart. Initially, 118 articles related to the study topic were identified. Subsequently, after applying the pre-established inclusion and exclusion

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criteria, the number of studies was reduced to 19. These articles were selected for in-depth analysis and constitute the most relevant basis for the discussion (see Figure 1).

Table 1 uses four databases: Scopus (47 studies), SciELO (22 studies), Web of Science (31 studies), and EBSCO (18 studies). These databases were searched using strategies that included Boolean operators and combinations of search terms. A total of 118 research papers related to digital competence in higher education and educational quality were identified. Scopus yielded the largest number of records, highlighting the strong international scientific output on the topic. SciELO, Web of Science, and EBSCO also contributed a considerable number of indexed research papers. This high initial number underscores the need to apply inclusion and exclusion criteria to filter and select the most relevant evidence.

Table 1. Results of the initial search in the database using combined terms

Palabras combinadas	Scopus	Scielo	WOS	EBSCO	Total
"competencias digitales" AND "educación superior" AND "calidad educativa"	18	7	11	6	42
"competencias digitales" AND "educación superior" AND "calidad educativa" AND "revisión sistemática"	12	5	8	5	30
"competencias digitales" AND "educación superior" AND "calidad educativa" AND "PRISMA"	9	6	7	4	26
"competencias digitales" AND "educación superior" AND "calidad educativa" AND ("revisión sistemática" OR "PRISMA")	8	4	5	3	20
TOTAL	47	22	31	18	118

Source: Own elaboration

Table 2. Article selection criteria

Criterios de Inclusión	Criterios de Exclusión
a) Investigaciones que examinan cómo las habilidades digitales contribuyen a la calidad del proceso educativo en las universidades.	a) Documentos de conferencias, libros completos, capítulos u otros tipos de publicaciones.
b) Estudios publicados entre 2020 y 2024.	b) Estudios anteriores al año 2020.
c) Artículos de acceso abierto.	c) Investigaciones con acceso restringido.
d) Competencia digital como tema principal.	d) Trabajos no relacionados con habilidades o competencias digitales.
e) Artículos en español, inglés o portugués.	e) Artículos en otros idiomas (francés, chino u otros).
f) Textos no duplicados.	f) Publicaciones duplicadas o repetidas.
g) Artículos que incluyan el descriptor en título y resumen.	g) Estudios sin descriptor en título o resumen.
h) Artículos disponibles en texto completo.	h) Artículos sin versión completa disponible.
i) Estudios empíricos (experimental, cuasi experimental, preexperimental o cualitativos).	i) Revisiones teóricas o de literatura.
j) Estudios en educación superior.	j) Estudios en niveles educativos distintos a la universidad.

Source: Own elaboration

Figure 1 presents the PRISMA flowchart used for the systematic analysis of the literature on digital competencies in higher education. In the initial identification phase, a total of 118 articles were retrieved from the Scopus, SciELO, Web of Science, and EBSCO databases. Subsequently, the established inclusion and exclusion criteria were applied, allowing for the refinement of the records and advancement to the screening and eligibility phase. As a result of this progressive selection process, the studies were evaluated based on their methodological and thematic relevance, ultimately yielding 19 articles that met the defined criteria for inclusion in the systematic review.

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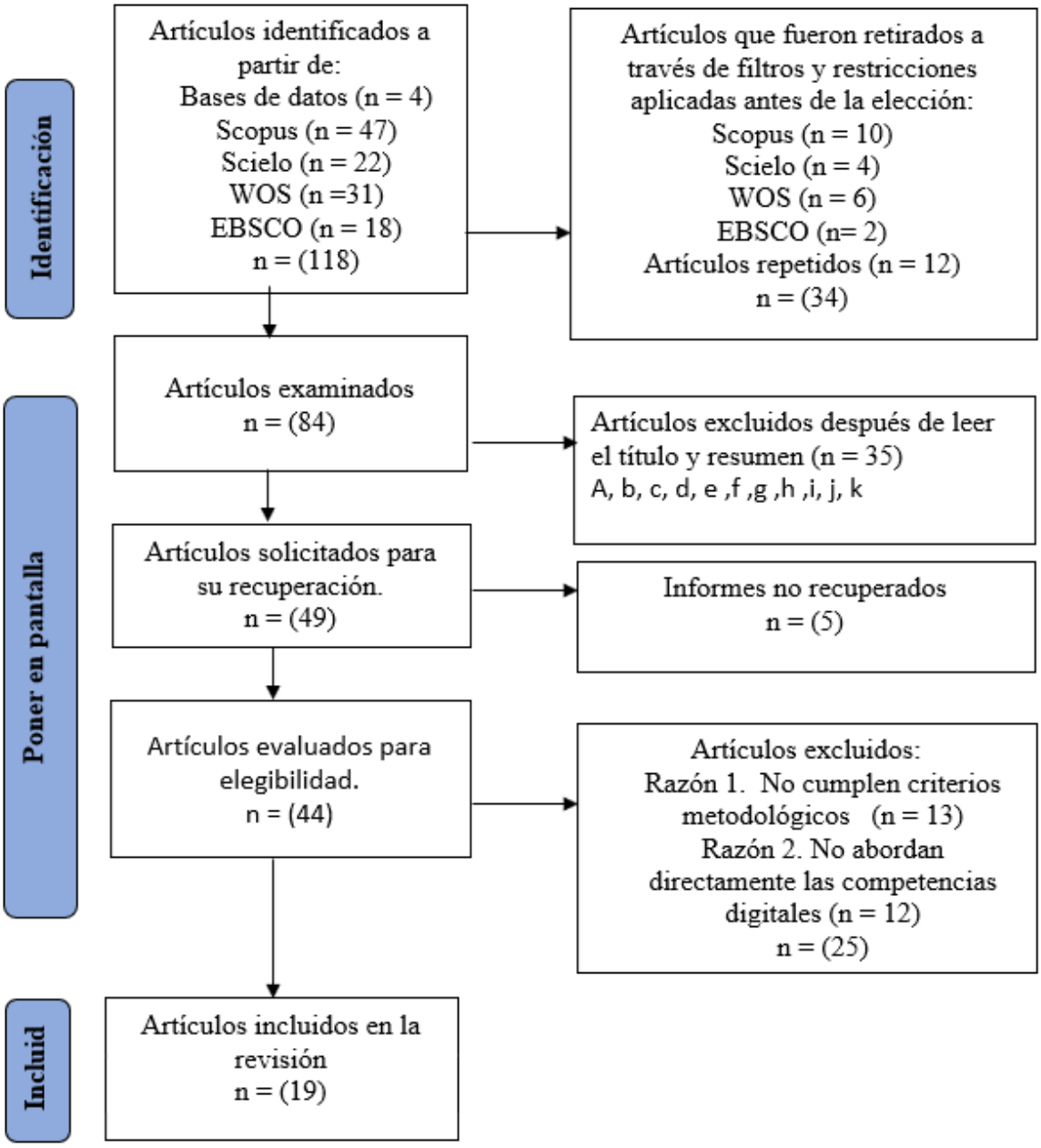
Figure 1. PRISMA Flowchart



Source: Own elaboration

For this systematic review, the selected studies were collected using an Excel spreadsheet, which served as the tool for systematizing and analyzing the information. For each identified study, the following variables were recorded: (a) authors, (b) year of publication, (c) country, (d) title, (e) methodological design, (f) data collection technique, (g) sample, (h) author keywords, (i) abstract, (j) data analysis technique, and (k) main results related to digital competencies and their influence on the quality of the teaching-learning process in the context of higher education. This categorization allowed for a structured and coherent organization of the information, facilitating comparisons between

studies and the development of a more rigorous, integrative analysis of the available evidence.

Results

Table 3 organizes the selected studies by author, year of publication, title, and database of origin. The analyzed works address diverse perspectives related to information and communication technologies (ICTs), digitization, and their impact on higher education. Pre-established inclusion and exclusion criteria were applied to the selection of studies, allowing for a rigorous data cleaning process and ensuring the quality of the collected evidence. The included publications come from highly relevant scientific databases such as Scopus, SciELO, EBSCO, and Web of Science (WoS). The results show a diverse thematic distribution, primarily focused on ICTs and digital competencies applied to the teaching and learning process. Overall, the table provides a structured presentation of the study selection process and the quality of the evidence included in the systematic review.

Table 3. Distribution of publications according to authors, year, title and database .

ID	Autores	Año	Título	Base de Datos
1	Cueva Chávez, M. A.	2025	Uso de las TIC en estudiantes de educación superior.	Scielo
2	Zula, Yasin & Sahid	2024	Una investigación del modelo de satisfacción del aprendizaje de los estudiantes.	Scopus
3	Veytia Bucheli, Gómez-Galán, Cáceres Mesa & López Catalán	2022	Las tecnologías digitales al servicio del diseño universal para el aprendizaje.	Scopus
4	Poveda-Pineda, D., & Cifuentes-Medina, L.	2020	Incorporación de las TIC durante el proceso de aprendizaje en la educación superior.	Scielo
5	Stogiannos, N., Jennings, M., St George, C., Culbertson, J., Salehi, H., Furterer, S., Pergola, M.,	2024	The ASRT AI educator survey: uso de IA en educación.	Scopus

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7	Vovchasta, I., Kan, I., Hlavatska, O., Sovach, D., & Makukhina, O.	2024	La digitalización y su papel en el desarrollo de habilidades duras en Ucrania.	Scopus
8	Bekele Feyisa, A., Kálmán, L., & Horváth, S.	2024	Percepción de docentes sobre la tecnología digital como factor de calidad.	EBSCO
9	Martínez Moreno, M., Castillo Elizondo, M., Banda Muñoz, F., & Treviño Cubero, R.	2023	Competencias digitales y enseñanza no presencial en estudiantes de Nivel Medio Superior.	Scielo
10	Guevara Fernández, J. A.	2024	Desarrollo de competencias digitales docentes y su trascendencia en procesos educativos.	Scielo
11	García-Prieto, P., López-Aguilar, R., & Delgado-García, C.	2022	Competencia digital del alumnado universitario y rendimiento académico en tiempos de COVID-19. Relación entre competencias digitales, pensamiento crítico y aprendizaje autorregulado.	Scopus
12	Gómez Zuñiga, A., & Zevallos Loyola, M.	2024	Relación entre competencias digitales, pensamiento crítico y aprendizaje autorregulado.	Scielo
13	Fernández Pérez, La Madrid Rojas, Vivar Bravo, Tantaruna Díaz y Rosario Hernández	2023	Tecnologías digitales y aprendizaje autorregulado en una universidad de Abancay.	Scielo
14	Padrón Álvarez, L., Torres Fernández, E., Ponce Vega, R., Moscoso Caro, M., & Alva Castillo, C.	2023	Las competencias digitales en la educación superior: preparando a estudiantes para un mundo digitalizado	Scielo
15	Delgado, Á., Vázquez-Cano, E., Belando, M., & López, E.	2019	Análisis bibliométrico del impacto de la investigación educativa en diversidad funcional y competencia digital: Web of Science y Scopus.	WoS
16	García, D., Villareal, J., Cuéllar, O., Echeverri, C., Henao, C. y Botero, M.	2020	Competencia digital en docentes universitarios: evaluación de relación entre actitud, formación y alfabetización en el uso de TIC en entornos educativos.	Scopus

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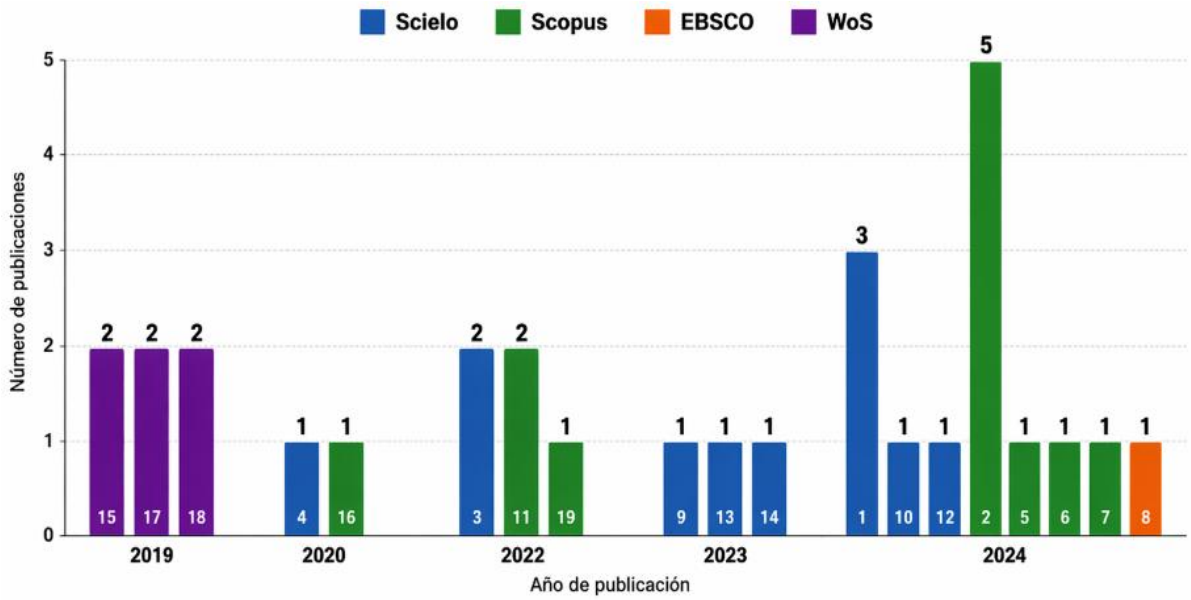
17	Rodríguez, A., Trujillo, J. y Sánchez, J.	2019	Impacto de la productividad científica sobre competencia digital de los futuros docentes: aproximación bibliométrica en Scopus y Web of Science.	Wos
18	Rodríguez, A., Raso, F., & Ruiz, J.	2019	Competencia digital, educación superior y formación del profesorado: un estudio de meta-análisis en la Web of Science.	Scopus
19	Mador-Alarcón, M., Torres-Gastelú, C., Lagunes-Domínguez, A., Medina-Cruz, H., & Arguello-Rosales, C.	2022	Perceptions of Environmental Protection of University Students: A Look through Digital Competences in Mexico.	Scopus

Source: Own elaboration

Figure 2 shows the annual distribution of publications (2019–2024) in the SciELO, Scopus, EBSCO, and Web of Science (WoS) databases, differentiated by color according to each source. It can be observed that in 2019, contributions were similar between Scopus and WoS, while in 2020 there is a general decrease in the number of publications registered in the analyzed databases. From that year onward, an increasing trend in scientific output is identified, which intensifies progressively until reaching its peak in 2024, with Scopus and WoS standing out particularly for their greater increase. Overall, the figure shows an upward trend in scientific output over the analyzed period, with sustained growth in recent years.

Figure 2. Distribution of publications according to authors, year, title and database



Source: Own elaboration

Table 4 presents the methodological characteristics of the analyzed studies on digital competencies in higher education, organized according to research design, data collection instrument, and methodological approach. The results show a predominance of descriptive and non-experimental designs, as well as the widespread use of questionnaires as the primary data collection instrument. Regarding methodological approaches, quantitative, qualitative, and mixed-methods studies were identified, with a clear trend toward the quantitative approach. This predominance suggests an orientation of scientific production toward the analysis of measurable variables and the generalization of results within the educational context. Overall, the table summarizes the main methodological procedures used in research on digital competencies in higher education, providing a structured overview of the approaches employed in this field of study.

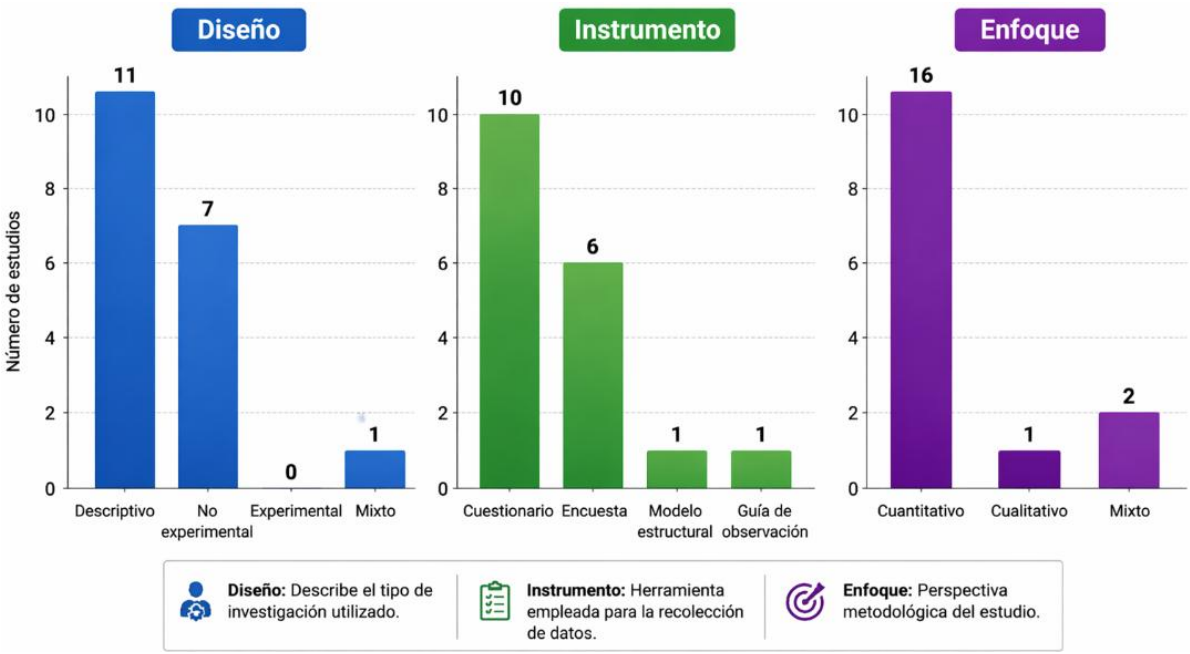
Table 4. Methodological characteristics of the study on digital skills in higher education

ID	Diseño	Instrumento	Enfoque
1	No experimental	Modelo estructural	Cuantitativo
2	Descriptivo	Cuestionario	Cuantitativo
3	Descriptivo	Cuestionario	Cualitativo
4	Descriptivo	Cuestionario	Cuantitativo
5	Descriptivo	Encuesta	Mixto
6	No experimental	Cuestionario	Cuantitativo
7	Descriptivo	Guía de observación	Mixto
8	Descriptivo	Cuestionario	Cuantitativo
9	Descriptivo	Encuesta	Cuantitativo
10	Descriptivo	Encuesta	Cuantitativo
11	No experimental	Encuesta	Cuantitativo
12	No experimental	Cuestionario	Cuantitativo
13	No experimental	Cuestionario	Cuantitativo
14	Descriptivo	Cuestionario	Cuantitativo
15	Descriptivo	Encuesta	Cuantitativo
16	No experimental	Cuestionario	Cuantitativo
17	Descriptivo	Encuesta	Cuantitativo
18	No experimental	Encuesta	Cuantitativo
19	Descriptivo	Cuestionario	Cuantitativo

Source: Own elaboration

Figure 3 reflects the methodological features of educational research on digital competencies. In the "Design" section, descriptive design predominates (11 studies), followed by non-experimental (7) and mixed (1) designs. In "Instrument," questionnaires are most common (10), followed by surveys (6), with studies employing structural models or observation guides being far less frequent. Finally, in the "Approach" section, the quantitative approach is accepted by the majority of studies (16 studies), while some qualitative (1) and mixed (2) approaches are specified.

Figure 3. Methodological characteristics of the study on digital skills in higher education



Source: Own elaboration

Table 5 presents the main contributions derived from the analyzed categories, which address the research questions and are supported by selected studies from Scopus, SciELO, Web of Science (WoS), and EBSCO. It highlights the role of digital skills as a key factor in improving educational quality and academic performance, due to their ability to foster adaptability, proactivity, and access to educational content. Furthermore, information and communication technologies (ICTs) contribute to strengthening communication and collaborative work among students, promoting more dynamic and interactive learning. Similarly, the perceptions of teachers and students regarding the integration of digital technologies are analyzed, identifying both advantages and limitations. Among the latter, the need to adapt pedagogical practices, the lack of specific

training, and technical difficulties stand out. In this context, strategies are proposed to strengthen the digital skills of teachers and students, such as ongoing training, the integration of ICTs into curricula, and the implementation of institutional policies that promote digital transformation. Finally, the reviewed studies highlight the importance of consolidating this digitization process to improve the quality of teaching and learning in higher education.

Table 5. Contributions of the categories according to the research questions

N.º	Pregunta	Aporte	ID
1	¿Cuál es la función de las habilidades digitales en la optimización de la calidad del proceso educativo en la educación superior de acuerdo con las investigaciones elegidas?	Las competencias digitales mejoran la calidad de la educación, promueven el aprendizaje y la participación y favorecen el acceso al conocimiento. Las tecnologías de la información y comunicación (TIC) también mejoran la comunicación y el trabajo en grupo entre alumnos y docentes.	1, 4, 5, 6, 7, 8, 10, 13, 14, 16, 17, 19
2	¿De qué manera se ha medido la influencia de las habilidades digitales en el desempeño académico y la experiencia educativa de los alumnos en la universidad?	Las competencias digitales mejoran el acceso a la información, la participación activa y, el aprendizaje customizado, lo que lleva a una mejora de la calidad de la educación. También puede favorecer un mayor grado de autonomía en el aprendizaje y mejorar la interacción en una clase virtual.	2, 11, 12, 14, 17, 18, 19
3	¿Cuáles son las opiniones y posturas de los maestros y alumnos acerca de la incorporación de tecnologías digitales en la educación, según lo que se ha leído en la literatura?	Tanto el profesorado como el alumnado consideran que las TIC son útiles, no obstante destacan que una falta de preparación y las problemáticas tecnológicas son inconvenientes. La falta de preparación de la tecnología y el temor al cambio son también inconvenientes que se repiten.	5, 6, 7, 8, 9, 10, 13, 14, 16, 19

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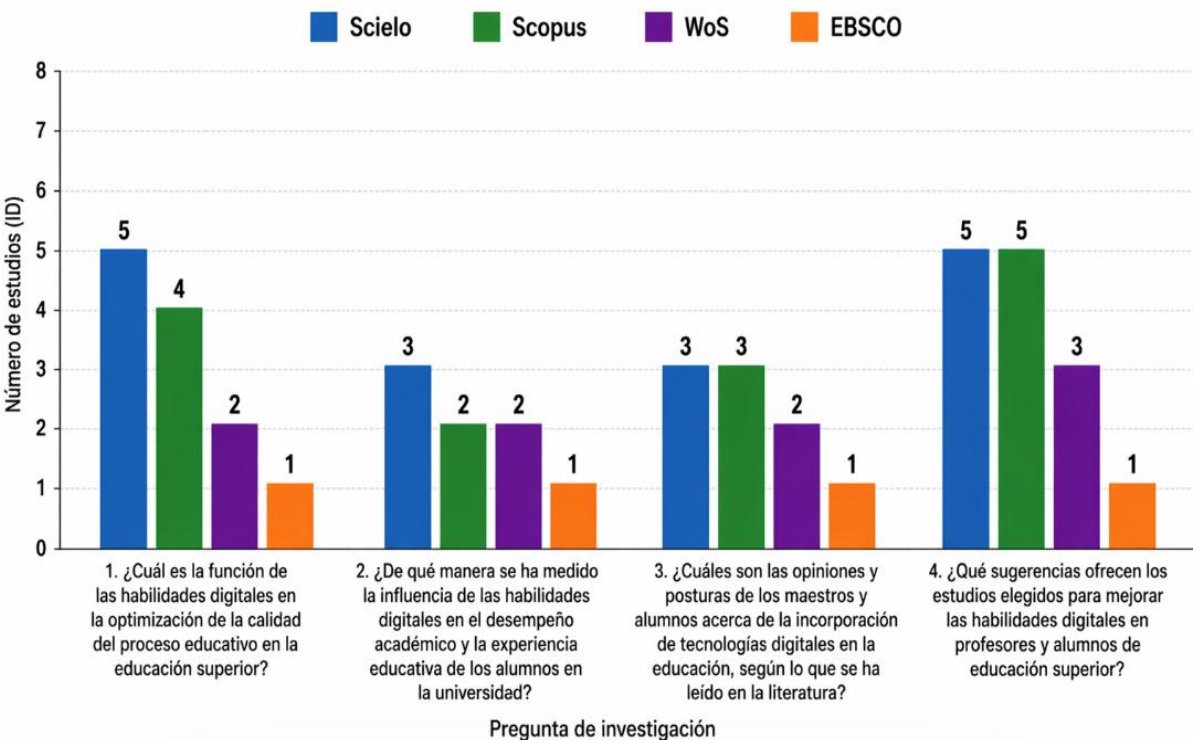
4	¿Qué sugerencias ofrecen los estudios elegidos para mejorar las habilidades digitales en profesores y alumnos de educación superior?	Se invita a ofrecer más apoyo a la formación del profesorado, a incluir las TIC en el diseño curricular, a establecer unas normas internas para que el cambio sea duradero y a vertebrar una cultura digital de cooperación, así como a aplicar plataformas tecnológicas con un alto grado de efectividad.	1, 2, 4, 5, 7, 9, 10, 13, 14, 15, 16, 17, 18, 19

Source: Own elaboration

Figure 4 shows the distribution of selected studies from the Scielo, Scopus, Web of Science (WoS), and EBSCO databases according to the questions about digital skills in higher education. Scielo and Scopus have the most contributions across all questions, with five studies for each of the first two questions and three for the subsequent ones. WoS and EBSCO have fewer contributions, with a maximum of three studies per question. Suggestions for improving digital skills in teachers and students are most represented in Scopus and Scielo.

Figure 4. Contributions according to the categories linked to the research queries, based on the selected studies from Scielo, Scopus, Wos and EBSCO.



Source: Own elaboration

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Discussion

Digital skills have become a fundamental necessity in higher education due to the transformative nature of information and communication technologies (ICTs). In this regard, universities must prepare students not only with academic knowledge but also with digital skills that enable them to thrive in an increasingly technological environment. According to Poveda-Pineda and Cifuentes-Medina (2020), the integration of ICTs into teaching processes improves access to knowledge and promotes more autonomous and collaborative learning, reinforcing the importance of developing digital skills in higher education. Furthermore, the use of digital technologies contributes to improved academic performance by facilitating access to educational resources and the development of specific technical skills (Cueva Chávez, 2024).

The impact of information and communication technologies (ICTs) on teaching and learning processes has been extensively documented (Veytia Bucheli, Gómez-Galán, Cáceres Mesa, & López Catalán, 2022). The use of digital tools allows for the creation of interactive learning environments in which students take an active role in their educational process. In this way, ICTs not only facilitate the reception of information but also promote interaction with content, peers, and teachers, fostering more participatory and meaningful learning. Furthermore, digital tools contribute to ensuring more equitable access to educational resources, an aspect that is especially relevant in distance learning or emergency contexts, such as that generated by the COVID-19 pandemic (Guevara Fernández, 2024).

The relationship between students' digital skills and their academic performance has been widely documented in the scientific literature. According to García-Prieto, López-Aguilar, and Delgado-García (2022), students with higher levels of digital skills are more likely to achieve better academic results, especially when they are proficient in using online learning platforms. Furthermore, the independent use of digital tools not only improves academic performance but also promotes a more active role for students in their own learning process (Núñez Rojas, Matas Terrón, Ríos Ariza, and Llatas Altamirano, 2024).

Despite positive expectations regarding the use of information and communication technologies (ICTs), the implementation of digital competencies faces several challenges in higher education. One of the main problems is the lack of teacher training in the pedagogical use of these technologies, which limits the development of sufficient digital competencies for their effective integration into educational practice. This situation is reflected in the still limited use of ICTs in many higher education

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institutions. Furthermore, these difficulties are related to limitations in technological infrastructure, which does not always guarantee equitable access to or the appropriate use of digital resources by students (Rodríguez, Trujillo, and Sánchez, 2019).

The digital divide is one of the main problems in implementing digital skills in higher education. According to Vovchasta, Kan, Hlavatska, Sovach, and Makukhina (2024), inequalities in access to information and communication technologies (ICTs) and in training for their use generate significant differences in students' academic performance, especially among those from disadvantaged socioeconomic backgrounds. This gap not only affects students but also teachers, who in many cases lack the necessary training to effectively integrate digital technologies into teaching processes (González et al., 2021).

The COVID-19 pandemic forced the accelerated implementation of information and communication technologies (ICTs) in higher education, generating various effects, both positive and negative. According to Martínez Moreno et al. (2023), distance learning was adopted immediately; however, many university students lacked the necessary digital skills for its proper adaptation. In this context, a significant gap emerged in students' technological preparedness for the efficient use of these tools, which resulted in a negative impact on the academic performance of many university students (González-Benito et al., 2021).

On the other hand, information and communication technologies (ICTs) have driven new pedagogical approaches that are transforming higher education. Strategies such as gamification, project-based learning, and the use of collaborative platforms are effective methodologies for improving the motivation and engagement of university students (Figueroa-Oquendo, 2024; Sosa-Gutiérrez et al., 2024). These methodologies not only contribute to the development of digital skills but also strengthen students' intrinsic motivation, with positive effects on their participation and academic performance.

Continuing professional development for teachers in the use of information and communication technologies (ICTs) is a key element in ensuring educational quality in the digital age. According to García et al. (2020), teachers not only require training in the use of technological tools, but also in the application of digital pedagogical methodologies. In this sense, continuing professional development allows teachers to effectively integrate ICTs into their teaching practices and offer students better preparation to meet the demands of the digital environment (Padrón Álvarez et al., 2023).

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Institutional policies play a fundamental role in the integration of information and communication technologies (ICTs) in higher education. According to Vovchasta et al. (2024), universities must implement policies that promote the incorporation of ICTs into the academic curriculum and ensure the availability of the necessary resources for their proper implementation. In this context, the creation of accessible digital environments, the strengthening of technological infrastructure, and the implementation of training programs aimed at the entire educational community are essential.

The study of digital competencies in higher education highlights the need to strengthen their development among students and faculty. Their integration depends on key factors such as technological infrastructure, teacher training, and the socioeconomic context. Likewise, it is essential to promote the use of ICTs to improve academic performance and pedagogical innovation. Technological and educational barriers that limit equitable access must also be addressed. In this regard, universities should promote a comprehensive and inclusive approach that guarantees equal opportunities (Núñez Rojas et al., 2024; Delgado et al., 2019).

Conclusions

The study of digital competencies in higher education teaching and learning processes allows us to understand their importance in academic performance and how students respond to digital environments. Based on a review of recent research, it is concluded that digital competencies are a central element, as they contribute to improving learning, increasing motivation, and fostering student participation. When information and communication technologies (ICTs) are effectively integrated into educational processes, they promote more collaborative and autonomous learning, which positively impacts the student experience.

Theories of autonomous learning and self-determination help us understand that satisfying the needs for autonomy, competence, and relatedness provides a solid foundation for developing digital skills. Furthermore, students' perceptions of their ability to use ICT directly influence their motivation and academic performance. Therefore, it is important to provide the necessary resources and pedagogical support to strengthen these skills.

In addition, theories of self-regulated learning, causal attribution, and achievement goals have demonstrated that autonomous learning in digital environments significantly influences academic performance. These perspectives allow for a clearer

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understanding of the relationship between ICT use and academic achievement, providing relevant elements for strengthening pedagogical strategies.

Furthermore, the results of this research highlight the need to strengthen institutional resources and pedagogical support to improve the development of digital skills. They also underscore the importance of optimizing the relationship between ICT use and academic performance, as well as implementing pedagogical strategies that enhance learning in digital environments.

In conclusion, universities must assume a more comprehensive role in developing digital skills among both teaching and non-teaching staff. This implies implementing innovative methodologies such as gamification and project-based learning, as well as promoting inclusive and accessible learning environments that guarantee equal opportunities for all students, regardless of their socioeconomic background or level of technological skills.

Future lines of research

Based on the results obtained, aspects of interest were identified that could not be addressed in depth due to the scope of the study and that constitute relevant lines for future research.

Conduct applied research to analyze the implementation of educational approaches for teaching ICT in different universities, in order to demonstrate the development of digital skills and their relationship with academic performance, student participation and adaptation to digital learning environments.

Develop longitudinal studies that allow the analysis of the evolution of digital skills throughout the university course, in order to compare this process with the employability of graduates and their insertion into digital work environments, as well as with the integration of ICT in their professional training.

To carry out research analyzing the contribution of active and innovative methodologies, such as project-based learning, cooperative learning and the use of digital platforms, in the development of digital skills, intrinsic motivation and self-regulation of learning, promoting academic performance in digital environments.

To delve deeper into the role of institutional and teaching support in the integration of ICT in higher education, analyzing how continuous training in the pedagogical use of digital technologies can strengthen student engagement and the development of key digital skills for academic and professional success.

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To explore the impact of the digital divide on access to and development of digital skills in students from different socioeconomic backgrounds, in order to identify inclusive strategies that guarantee equity in access to ICTs and allow the design of educational policies aimed at a more inclusive digital education.

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