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The importance of digital skills in university education: a systematic review

La importancia de las competencias digitales en la formación universitaria: una revisión sistemática

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Abstract

Higher education in Peru and Latin America is facing significant changes due to digitization and new trends in today's market. Digital skills play a strategic role in student training; therefore, contemporary educational environments seek to strengthen both teaching processes and future job placement. This article uses the PRISMA 2020 guide and analyzes the contribution of digital tools in universities. Studies published between 2020 and 2025 are considered, taking into account access gaps, as well as teacher and curriculum updates. The review identifies areas that need to be strengthened, especially curriculum updates, in order to achieve high-quality and prosperous higher education for the country.

Keywords: higher education, vocational training, labor market.

Resumen

La educación superior en Perú y Latinoamérica afronta cambios debido a la digitalización y nuevas tendencias del mercado actual. Las competencias digitales tienen un rol estratégico para los estudiantes en su formación, por ello los nuevos entornos buscan fortalecer la enseñanza y la inserción laboral. El presente artículo usa la guía PRISMA 2020 y analiza la contribución de las herramientas digitales en las universidades. Se consideran estudios publicados entre el 2020 y 2025 considerando brechas de acceso, actualización docente y curricular. La revisión identifica que puntos se requieren reforzar, como la actualización curricular para obtener una formación superior de calidad y prospera para el país.

Palabras clave: enseñanza superior, formación profesional, mercado de trabajo.

Introduction

Global context

Digital transformation has fundamentally redefined the mission of higher education, positioning the development of students' digital competencies as a strategic priority rather than a complementary educational objective. Universities increasingly recognize that digital competencies extend beyond the effective use of technological tools; they constitute essential capabilities for enhancing employability, fostering lifelong learning, and enabling meaningful participation in contemporary society (UNESCO, 2024).

Rapid advances in digital technologies, artificial intelligence, and the persistence of digital inequalities continue to reshape higher education worldwide, creating challenges that universities must address in response to evolving labor market demands (ONU, 2023). Consequently, university education can no longer focus exclusively on disciplinary knowledge. Instead, it must incorporate comprehensive approaches to digital literacy that prepare graduates for increasingly complex professional environments. Wang and López-Carrillo (2025) argue that digital competencies should be embedded across the curriculum as transferable capabilities that support adaptability in rapidly changing workplaces. Likewise, Chang et al. (2024) contend that many university curricula have failed to keep pace with technological innovation, leaving graduates insufficiently prepared for occupations that require advanced digital proficiency. As a result, higher education institutions bear a central responsibility for integrating digital competence development into their educational mission while reinforcing their role as drivers of innovation, economic growth, and social progress.

Latin American context

Across Latin America, persistent disparities between university curricula and technological advancement continue to hinder educational development. These challenges are further compounded by longstanding socioeconomic inequalities that restrict equitable access to high-quality higher education (Salazar & Méndez, 2023).

Pineda and Reinoso (2024) emphasize that universities throughout the region should adopt critically informed curriculum designs that prioritize contemporary digital competencies as core learning outcomes. At the same time, Varela et al. (2025) caution against approaches that equate digital transformation solely with the adoption of information technologies, arguing that meaningful digital education must also encourage critical reflection on the broader social, ethical, and occupational implications of technological change.

Peruvian context

Between 2020 and 2025, Peru implemented multiple initiatives aimed at promoting digital transformation in higher education through government policies and institutional partnerships. Despite these efforts, many initiatives have yet to produce sustained improvements in the digital competencies required to enhance graduates' employability (Ramos & Calderón, 2023).

According to Cárdenas and Velarde (2024), one of the principal limitations lies in the fragmented design of digital education programs, which are frequently delivered as isolated courses with limited alignment to labor market needs. These shortcomings are exacerbated by inadequate technological infrastructure in remote areas, further widening educational disparities and restricting learning opportunities. Although universities have expanded basic instruction in areas such as data analysis and programming, Ruiz and Sandoval (2025) argue that higher education institutions must adopt a more proactive role by cultivating digital competencies that enable graduates to address complex social and professional challenges.

General objective

To analyze the influence of digital competencies on higher education during the 2020–2025 period.

Specific objectives

- To examine the barriers that constrain the development of digital competencies in higher education.
- To analyze the principal thematic approaches to digital competencies in higher education in light of current labor market requirements.

Rationale and significance

This review is grounded in the need to strengthen digital competencies within higher education as a means of improving graduate employability while aligning university curricula with the demands of an increasingly digital economy. From a societal perspective, the study contributes to identifying barriers that limit equitable access to digital education and highlights strategies capable of narrowing existing digital divides.

Academically, the review supports curriculum renewal aimed at consolidating digital education and preparing professionals for technology-intensive labor markets, consistent with the recommendations of Andersson and Müller (2023). It also reinforces the argument advanced by Bravo et al. (2025) that the accelerating pace of technological innovation requires continuous curriculum revision to prevent educational obsolescence.

Digital transformation has substantially altered professional profiles by creating new competency requirements while exposing persistent misalignment between technological developments and universities' capacity to modernize their academic programs. Structural inequalities, insufficient faculty professional development, and the continued reliance on traditional curricula collectively constrain the advancement of digital education.

Although Peru has introduced policies and initiatives intended to accelerate digital transformation, digital education remains unevenly implemented and continues to face structural and curricular limitations. These deficiencies ultimately undermine graduates' employability while reinforcing educational digital inequalities throughout the country.

Methodology

This study examined digital competencies in higher education by considering the complementary perspectives of both students and faculty, consistent with the qualitative research framework proposed by Denzin and Lincoln (2018). A qualitative methodological approach was adopted, relying on a systematic review of the scholarly literature addressing digital competencies in higher education. The review was conducted in accordance with the PRISMA 2020 Statement (Page et al., 2021).

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Search design

- **Database consulted:** SciELO.
- **Timeframe**: articles published between 2020 and 2025.
- **Languages**: Spanish, Portuguese, and English.
- **Document type**: Scientific articles.

Boolean formula applied:

"Competencias digitales" AND "formación universitaria" OR "empleabilidad" OR "educación superior".

This search strategy retrieved a substantial body of relevant publications for the study.

PRISMA tabulation process

Following the PRISMA 2020 guidelines, the selection and tabulation process was structured as follows:

- Records identified: **273**
- Records after duplicate removal: **271**
- Records excluded during screening (title and abstract): **185**
- Full-text articles assessed for eligibility: **86**
- Articles excluded after full-text review (due to educational level other than higher education, insufficient thematic focus, or non-applicable evidence): **56**
- Articles included in the final review: ***n* =** 30

Reference management was conducted using the **Zotero** platform, while **Microsoft Excel** supported the analysis of criteria and data tabulation.

Inclusion criteria

- Studies situated within the higher education context (universities, undergraduate and graduate programs, university faculty and/or students).
- Explicit focus on digital competencies and their formative impact.
- Articles published between 2020 and 2025, containing empirical data, theoretical framework validation, or interventions related to curricular design and university education.

Exclusion criteria

- Research centered exclusively on primary or secondary education, or on non-university settings.
- Studies that did not address university education or digital competencies.
- Texts lacking evidence applicable to university education or without a clear connection to digital competencies; however, those offering transferable methodological foundations were considered.

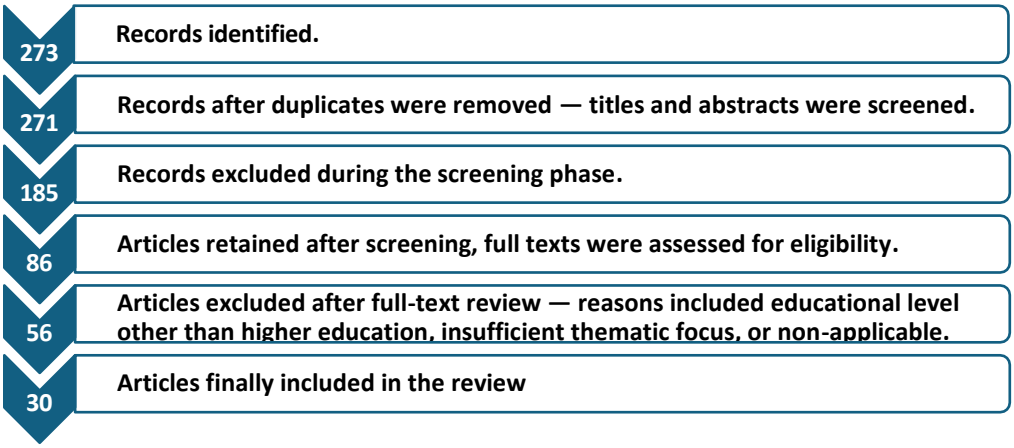


Figure 1 *PRISMA flow diagram – Own elaboration*

Results and discussion

No.	Author (APA 7)	Year	Country	Objective	Sample	Results
1	Alcala, G. K., Salguero, J. L. B., Salguero, A. G., Orosco, O. E., Orosco, E. G., & Vega, C. S.	2024	Bolivia	To analyze the relationship between digital competencies and academic performance.	University students.	Digital competencies exert a positive influence on academic performance.
2	Alcívar, M. V. Z., & Rivadeneira, M. P.	2022	Ecuador	To evaluate the digital competencies of faculty in online degree programs.	University faculty.	Medium-level proficiency was observed, along with a need for further training.
3	Altamirano Galván, S. G.	2021	Mexico	To strengthen digital literacy among faculty and students.	Higher education faculty and students.	Digital competencies were enhanced through formative strategies.
4	Alvarez-Chacón, Z.	2024	Cuba	To establish indicators for measuring digital literacy.	Experts and documentary sources.	Metrics adapted to Cuba's digital landscape were established.
5	Apaza Mayta, D. E.	2022	Bolivia	To analyze the digital competencies of faculty in a B-learning modality.	University faculty.	Digital competencies improve teaching performance in hybrid environments.
6	Aránguiz-Bravo, C.	2023	Spain	To identify digital competencies in undergraduate education.	Health sciences students.	Digitalization enhances healthcare delivery and student research capacity.
7	Cabero-Almenara, J., Barroso-Osuna, J., Llorente-Cejudo, C., & Palacios-Rodríguez, A.	2022	Mexico	To review the European Framework for the Digital Competence of Educators.	University faculty.	The effectiveness of the European model when adapted to the Latin American context was confirmed.
8	Cabrera Coronel, A. M., Centurión de Gómez, N. S., & Mora Rojas, C. O.	2022	Mexico	To analyze the virtualization of face-to-face classes.	University students.	Virtualization improved learning outcomes and adaptability.
9	Calle Álvarez, G. Y.	2022	Colombia	To analyze teaching strategies during the COVID-19 reality.	University professors.	Virtual education maintained continuity despite limitations.
10	Camacho-Navarro, A., & Salinas-García, R. J.	2022	Mexico	To conduct an in-depth evaluation for developing digital competencies.	Teacher-training students.	The strategy strengthened digital skills.

11	Candia García, F.	2023	Mexico	To analyze digital competencies during the COVID-19 pandemic.	Faculty and students.	An expansion of the digital divide and a need for faculty updating were evidenced.
12	Cárdenas-Contreras, G. E.	2022	Venezuela	To promote post-pandemic digital literacy among faculty.	University professors.	Digital training is crucial for teaching practice.
13	Cardozo, S., Jara, Á., & Kwan Chung, C. K.	2021	Paraguay	To analyze postulates on virtual courses during the pandemic.	University students.	Students value the flexibility of digital education.
14	Casimiro Urcos, C. N., Tobalino López, D., Pareja Pérez, L. B., Vega Palomino, E. M., & Casimiro Urcos, W. H.	2023	Peru	To analyze the impact of the flipped classroom in higher education.	Students at public universities.	The flipped classroom enhances participation and learning.
15	Casimiro Urcos, C. N., Tobalino López, D., Reynosa Navarro, E., Casimiro Urcos, W. H., & Pacovilca Alejo, G. S.	2022	Peru	To analyze the relationship between digital competencies and teaching performance.	University faculty.	A positive correlation exists between both variables analyzed.
16	Castro-Palomino, L., & Alanya Coras, E.	2024	Bolivia	To analyze the use of digital tools among faculty.	Systematic review.	Tools strengthen teaching, though ongoing training is required.
17	Cervantes Mata, C. M.	2025	Mexico	To analyze digital profiles by knowledge area.	University professors.	Significant differences in digital competencies were identified across disciplines.
18	Coloma Rodríguez, O., Salazar Salazar, M., Ortega Cabrera, F. E., & Pérez Torres, A.	2024	Cuba	To propose a framework for teacher digital competence.	University professors.	The proposed competence framework favors educational innovation.
19	Contreras, P. J., Castillo-Narro, M., Huerta-Mercado, J., & Cuba-Fuentes, M. S.	2022	Peru	To analyze perceptions regarding teleconsultation teaching in medicine.	Faculty and students.	Teleconsultation was rated optimally, although certain technical aspects require improvement.
20	Martin Cuadrado, A. M. M., Pérez Sánchez, L., & Jordano de la Torre, M.	2020	Brazil	To analyze digital competencies according to the DigCompEdu framework.	University faculty.	Deficiencies in the evaluation of framework content were identified.
21	Dávila Morán, R. C.	2022	Peru	To analyze the use of virtual tools	University students.	Virtual tools enhance students' digital

				among students.		competencies.
22	Dávila Morán, R. C., & Agüero Corzo, E. del C.	2024	Cuba	To determine how collaborative learning develops digital competencies.	University students.	Collaborative work was confirmed to promote digital competencies.
23	Dávila Morán, R. C., Pasquel Cajas, A. F., Mamani Huanca, D. Y., Vargas Murillo, A. R., & López Gómez, H. E.	2022	Peru	To analyze the link between digital competencies and teaching performance.	University faculty.	Digital competencies positively impact teaching and faculty performance.
24	Delgado Togra, D. S., Martínez Chávez, T. M., & Tigrero Vaca, J. W.	2022	Mexico	To evaluate digital training of faculty in virtual environments.	University faculty.	The central role of digital training for faculty was highlighted.
25	Díaz Castillo, M. M., Oramas Sánchez, C., Herrera Ruiz, M. F., & Pérez Vargas, T. M.	2024	Cuba	To design actions for strengthening faculty digital transformation.	University faculty.	The proposed actions improve technological adaptation for educators.
26	Domínguez García, D. I., Torres Romero, F., & Rosario Cruz, R.	2022	Mexico	To analyze student stances on post-COVID online education.	University students.	Gradual adaptation and persistent technological gaps in the post-COVID environment were observed.
27	Gaona-Portal, M. del P., Bazán-Linares, M. V., Luna-Acuña, M. L., & Peralta-Roncal, L. E.	2024	Ecuador	To analyze studies on digital competencies in higher education.	45 reviewed articles.	Digital competencies are essential for modern learning in higher education.
28	García, C. R. P., Rodríguez Aburto, C. A., Poma García, J. L., & Sevilla Sánchez, R. Y.	2023	Bolivia	To analyze digital competencies in academic tutoring.	University faculty.	Virtual tutoring strengthens educational accompaniment in higher education.
29	Giler-Medina, P.	2023	Ecuador	To analyze the influence of digital competencies on visual learning.	Students.	Digital tools facilitate visual and conceptual understanding.
30	Kanobel, M. C., Galli, M. G., & Chan, D. M.	2023	Argentina	To analyze the level of digital competencies among university faculty.	University faculty.	Digital gaps among teaching professionals were identified.

The review reveals that digital competencies constitute a central axis in contemporary higher education. Analysis of studies published between 2020 and 2025 demonstrates that technology use drives educational development and contributes to improved teaching processes in universities (Apaza, 2022).

The articles reviewed indicate that the COVID-19 pandemic accelerated the development of digital

competencies (Cárdenas-Contreras, 2022). Universities implemented virtual classes within a compressed timeframe, yielding differentiated outcomes depending on the level of institutional technological support. This shift brought to light several gaps, including limited infrastructure, insufficient faculty training, and inadequate internet access (Cabrera et al., 2022).

While these gaps affected the learning process, they also spurred policies aimed at strengthening digital competencies for virtual instruction. Regarding these shortcomings, studies emphasize the limited integration of digital competencies into university curricula (Cabero-Almenara et al., 2022). Traditional higher education has been predominantly discipline-oriented, and the rise of virtuality facilitated a transition toward collaborative methodologies and pedagogical approaches that incorporate technology. This transformation was reinforced by digital literacy, which encompasses both technical aspects and applied knowledge.

An unequal distribution of resources across institutions was also identified. In Peru and Latin America more broadly, limited infrastructure and lack of connectivity represented significant obstacles (Contreras et al., 2022). Nevertheless, positive experiences were also reported in universities that promoted innovation strategies, training programs, and interinstitutional partnerships (Casimiro et al., 2022), which contributed to mitigating gaps and fostering a digital culture.

Three main axes emerge from the analysis: digital literacy, faculty development, and adaptation to the labor market. Studies conclude that digital competencies are not confined to teaching but are oriented toward comprehensive professional training (Aránguiz-Bravo, 2023). Graduates must be capable of managing information, communicating in digital environments, and adapting to workspaces where technology continually transforms professional roles.

Regarding the teaching dimension, digital competence is conceptualized as a body of knowledge and skills oriented toward the pedagogical use of information technologies (Cervantes, 2025). The incorporation of digital competencies in higher education has been advanced through methodologies such as flipped classroom, gamification, and collaborative learning (Casimiro et al., 2023), all of which strengthen critical thinking and enhance employability. The European framework for teacher digital competence, DigCompEdu, also stands out as a guide for training processes grounded in international standards.

The studies evidence a positive influence of digital competencies on student performance (Alcalá et al., 2024). Virtual environments promote participation and creativity; therefore, the development of digital competencies should be understood as an ongoing process.

The labor market has driven digital training in universities, demanding graduates capable of integrating technologies, managing data, and communicating across digital platforms (Candia, 2023). This compels institutions to update their curricula by incorporating digital competencies and content related to Industry 5.0. Universities thus fulfill a strategic role in professional digital preparation. However, a gap persists between university training and the competencies demanded by the market (Castro-Palomino & Alanya, 2024). Traditional curricula prioritize technical and conceptual content, displacing digital literacy and innovation, which results in graduates who struggle to adapt to digital work environments. Strengthening the connection between higher education and digital transformation is therefore necessary.

Studies also show that digital competencies develop progressively (Altamirano, 2021). Higher education must promote continuous updating to facilitate labor market insertion. Likewise, digital literacy is recognized as complementary to digital competence (Alcívar & Rivadeneira, 2022), emphasizing critical information analysis, ethical content production, and responsible digital citizenship. This connects to the need to reduce misinformation and strengthen digital ethics.

In synthesis, digital competencies are consolidating as a strategic component in university education and graduate employability. While studies reveal progress in their integration, structural and pedagogical gaps that limit their development persist. Overcoming these challenges requires strengthening educational innovation, faculty training, and linkages with the labor sector in order to produce digitally competent professionals prepared to face the demands of contemporary society.

Conclusions

The present study confirms that digital competencies positively influence higher education and graduate employability. The COVID-19 pandemic prompted technology adoption and facilitated collaborative learning; however, in the Peruvian context, educational gaps and challenges persist that must be addressed through public policies aimed at their reduction.

The labor market demands professionals with technical knowledge who possess digital skills and are capable of solving complex problems. In this regard, universities must update their curricula and align them with current demands. Digital competencies constitute a fundamental link between university education and labor market requirements.

Nevertheless, the process of educational modernization is hindered by structural and pedagogical deficiencies, including inadequate infrastructure and limited faculty training. Furthermore, full digitalization is complicated by the coexistence of traditional curricular models with contemporary educational approaches.

The study identifies partial advances in the integration of digital skills in higher education, particularly in the use of strategies such as collaborative learning and the flipped classroom. However, a solid and consistent articulation between university education and the development of digital competencies has yet to be evidenced, which represents a key challenge for the consolidation of higher education oriented toward the current digital context.

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