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Artificial Intelligence in meaningful learning among non-university higher education students: a systematic review

Inteligencia Artificial en el aprendizaje significativo en estudiantes de educación superior no universitaria: una revisión sistemática

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Abstract

This article is a systematic review of the influence of Artificial Intelligence on the meaningful learning of non-university higher education students. There is a need to train competent and adaptable professionals, which requires the acquisition of pedagogical approaches that transcend the passive transmission of information. The implementation of AI in education ensures that meaningful learning is achieved in a fair and sustainable manner. This research seeks to analyze the characteristics of Artificial Intelligence, its advantages and disadvantages, and the results of the training strategies applied to non-university higher education students. A systematic literature review was conducted in the main databases, Dialnet, Latindex, LatinRev, PhilPapers, Redalyc, Scielo, Scopus, ResearchGate, following the PRISMA methodology. Starting from 90 documents, and after the filtering phases, taking into account AND inclusion criteria and NOT Boolean exclusion criteria, a total of 30 documents were analyzed in depth. The results indicate that these strategies mostly impact the learning of non-university higher education students, influencing their professional competence and the use of technologies in their training process. The overall objective is to evaluate the impact of AI implementation on the meaningful learning of non-university higher education students.

Keywords: Artificial intelligence, meaningful learning, higher education.

Resumen

El presente artículo se trató de una revisión sistemática, sobre la influencia de la Inteligencia artificial en el aprendizaje significativo de los estudiantes de educación superior no universitaria, existe la necesidad de formar profesionales competentes y adaptables, lo cual exige la adquisición de enfoques pedagógicos que trasciendan, la transmisión pasiva de la información. La implementación de la IA en la educación, asegura que el aprendizaje significativo se alcance de manera justa y sostenible. Esta investigación busca analizar las características de la Inteligencia artificial, sus ventajas y desventajas y los resultados de las estrategias formativas aplicadas en los estudiantes de educación superior no universitaria. Se realizó una revisión sistemática de la literatura en las principales bases de datos, Dialnet, Latindex, LatinRev, PhilPapers, Redalyc, Scielo, Scopus, ResearchGate, siguiendo la metodología PRISMA. Partiendo de 90 documentos, y tras las fases de filtrado, tomando en cuenta criterios de inclusión AND y criterios de exclusión boleano NOT, se analizó en profundidad un total de 30 documentos. Los resultados indican que mayoritariamente estas estrategias inciden en el aprendizaje de los estudiantes de educación superior no universitaria, influyendo en su competencia profesional y el uso de las tecnologías en su proceso formativo.

Palabras clave: Inteligencia artificial, aprendizaje significativo, educación superior.

Introduction

Artificial Intelligence (AI) is emerging as a tool with the potential to transform teaching and learning on an international scale. Its integration into educational platforms promotes meaningful learning that extends beyond rote memorization. Although in Peru, AI adoption in education remains in its early stages,

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a promising future is foreseen despite obstacles such as infrastructure limitations and a lack of teacher training (Agüero, 2024).

Addressing social responsibility in human-AI interaction is essential, which entails developing digital skills, understanding AI's capabilities and limitations, and fostering ethical use. Collaboration among AI developers, educators, and civil society is crucial for establishing regulatory and ethical frameworks that ensure equitable and sustainable AI implementation in educational settings (Presidencia del Consejo de Ministros, 2024). Meaningful learning, grounded in constructivist theories such as those proposed by Ausubel and Novak, seeks to enable students to integrate new information with prior knowledge, thereby developing a deep and lasting understanding that allows them to apply what they have learned across diverse contexts (Halanoca, 2024). The implementation of AI in non-university higher education emerges as a pathway to train competent and adaptable professionals, moving beyond passive information transmission (Muñoz, 2024; Mera, 2023).

This investigation analyzes the integration of AI in higher education to achieve meaningful learning. The impact and applications of AI in higher education are radically transforming how students and faculty interact with knowledge. Tools such as adaptive learning systems, virtual tutoring, and task automation are being integrated to foster autonomy, meaningful learning, and student responsibility (Ocaña-Fernández et al., 2024). Four of the most relevant uses of AI include: Co-construction of knowledge, where AI facilitates collaborative knowledge creation (Vera, 2023).

AI also functions as a tutor or mentor, offering personalized student support. Adaptive learning platforms adjust to individual student needs, providing predictive potential regarding performance, while personalization and assessment allow educators to tailor content, pacing, and evaluations to each student's specific requirements (Vera et al., 2023; Numa et al., 2024; Bellomo, 2023; Peña et al., 2022; Aparicio, 2023; Portela & Armijos, 2025; Blanco, 2024; Suarez, 2023).

Artificial Intelligence constitutes a key educational tool, optimizing pedagogical methodologies and enriching the learning experience. Its application enables educators to personalize instruction and assessment, in addition to facilitating educational management through the analysis of large datasets. Through AI integration, educational environments become more interactive and adaptive, not only preparing students for the future but also strengthening skills such as communication, creativity, and critical thinking (Parra-Sánchez, 2023).

The development of AI in education draws on advances in natural language processing, machine learning, and computer vision. These technologies enable the creation of systems capable of analyzing educational data, recognizing learning patterns, offering intelligent tutoring, and providing adaptive feedback. Within this evolution, notable developments include learning platforms that adjust content to each student and analytical tools that support pedagogical decision-making, thereby optimizing the educational process (Tapara et al., 2025).

Nevertheless, AI implementation faces challenges in higher education. Common problems include a lack of student motivation, outdated teaching methods, academic overload, resource scarcity, financial difficulties, mental health issues, diverse skill levels, a disconnect between theory and practice, deficiencies in assessment culture, a lack of academic support, poor reading habits, and communication difficulties. These obstacles must be addressed to maximize AI's positive impact on education (Vera et al., 2023; Salmerón et al., 2023; Cordón, 2023; Granda et al., 2024; Piedra et al., 2024; Parrales et al., 2024; Niño, 2022).

The use of Artificial Intelligence in meaningful learning within higher education faces challenges related to equity of access, student data protection, and its effective integration into teaching. Furthermore, research gaps persist, such as the long-term impact of AI on student motivation and engagement, the efficient combination of human interaction with technology, and the establishment of clear ethical frameworks (Clemente et al., 2024). Despite these challenges, AI has made significant strides in personalizing and democratizing learning. Among its benefits are: virtual tutoring and immediate feedback, providing personalized support and instant error correction; automation of assessment, freeing educators

from repetitive tasks and allowing them to focus on developing advanced skills; and democratized access to educational materials, breaking down geographic and socioeconomic barriers for students in remote areas or with special needs (Menacho, 2024; Ruiz & Yépez, 2024; Zavala et al., 2023; Menéndez et al., 2024; Vera, 2023; Salmeran et al., 2023; Magallanes et al, 2023; Chávez & Erazo, 2024).

This systematic review critically analyzes the existing literature to offer a comprehensive view of how AI can enhance higher education. By examining both advances and challenges, as well as knowledge gaps, it seeks to contribute to the ethical and effective implementation of AI, thereby transforming learning and strengthening the training of future professionals.

Methodology

A systematic review of scientific articles was conducted, drawing from various databases including Dialnet, Latindex, LatinRev, PhilPapers, Redalyc, Scielo, Scopus, ResearchGate, and the UCV repository, employing a descriptive and exploratory analysis approach.

First, Google Scholar was reviewed to search for scientific articles across different databases using the keywords: "*Inteligencia Artificial," "Aprendizaje significativo,"* and *"educación superior."* Initially applying the AND inclusion criterion yielded 6,850 articles from 2021 to 2025.

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology was used to retain only those documents most relevant to the review questions. The Boolean NOT operator (-) was added to the search for *"no universitaria,"* resulting in 6,040 articles. From these, 90 Spanish-language articles were selected, with 10 duplicates found across different databases. To exclude results focused on other areas, a filter by article type was applied, yielding 60 results for exclusion. Ultimately, 30 articles meeting the selection criteria were chosen, distributed as follows: 13 from Dialnet, 5 from Scielo, 5 from ResearchGate, 2 from LatinRev, 1 from Scopus, 1 from Latindex, 1 from PhilPapers, 1 from the UCV Repository, and 1 from Gob. Pe.

The technique employed was documentary observation, and the instrument used was a content analysis form. This form allowed for the review of similarities, categories, and relevant analytical elements across the identified studies.

The process is detailed in Figure 1.

The 30 selected articles, according to their database origin, comprised 12 from Ecuador, 6 from Peru, 3 from Colombia, 4 from Mexico, 2 from Spain, 1 from the USA, 1 from Cuba, and 1 from Argentina.

Table 1. *List of articles included*

Order	Author(s)	Country	Year	Methodology	Findings
1	Estela Lisbeth Muñoz Andrade	Mexico	2024	Qualitative	Application of artificial intelligence in higher education.
2	Débora Elizabeth Mera Castillo	Ecuador	2023	Qualitative	The influence of artificial intelligence on learning personalization: Perspectives and challenges in education.
3	Patricia Elizabeth Vera Rubio, Gladys Patricia Bonilla González, Aída Cecilia	Ecuador	2023	Qualitative	Artificial intelligence in higher education: A

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	Quishpe Salcán, Hugo Marcelo Campos Yedra				transformative approach.
4	Nahín Numa-Sanjuán, Leonardo Yotuhel Diaz-Guecha, Mariana Elena Peñaloza-Tarazona	Colombia	2024	Qualitative	Importance of Artificial Intelligence in 21st-century education.
5	Santiago Tomás Bellomo	Argentina	2023	Qualitative	Artificial intelligence in higher education: an analytical assessment.
6	Wilson Patricio Peña Herrera Acurio Wilmer Clemente Cunuhay Cuchipe Daysi Judith Nata Castro Luis Enrique Moreira Zamora	Ecuador	2022	Qualitative	Implementation of Artificial Intelligence as an educational resource.
7	William Oswaldo Aparicio Gómez.	Mexico	2023	Qualitative	Artificial Intelligence and its impact on education: Transforming learning for the 21st century.
8	Yara María Portela Leiva Jorge Luis Armijos Carrión	Ecuador	2025	Qualitative	Artificial intelligence in academic tasks: Support for learning or technological dependency?
9	Yenifeh Blanco Torres, Lilibeth De Jesús Fragozo Álvarez, Marlon Enrique Gómez Lesport	USA	2024	Qualitative	Artificial intelligence: possibilities, limits and challenges in higher education.
10	Johana Suarez Gómez	Colombia	2023	Qualitative	The future of higher education: A view from artificial intelligence.
11	Fernando Vera Millalén	Spain	2023	Qualitative	Integration of Artificial Intelligence in higher education: Challenges and opportunities.

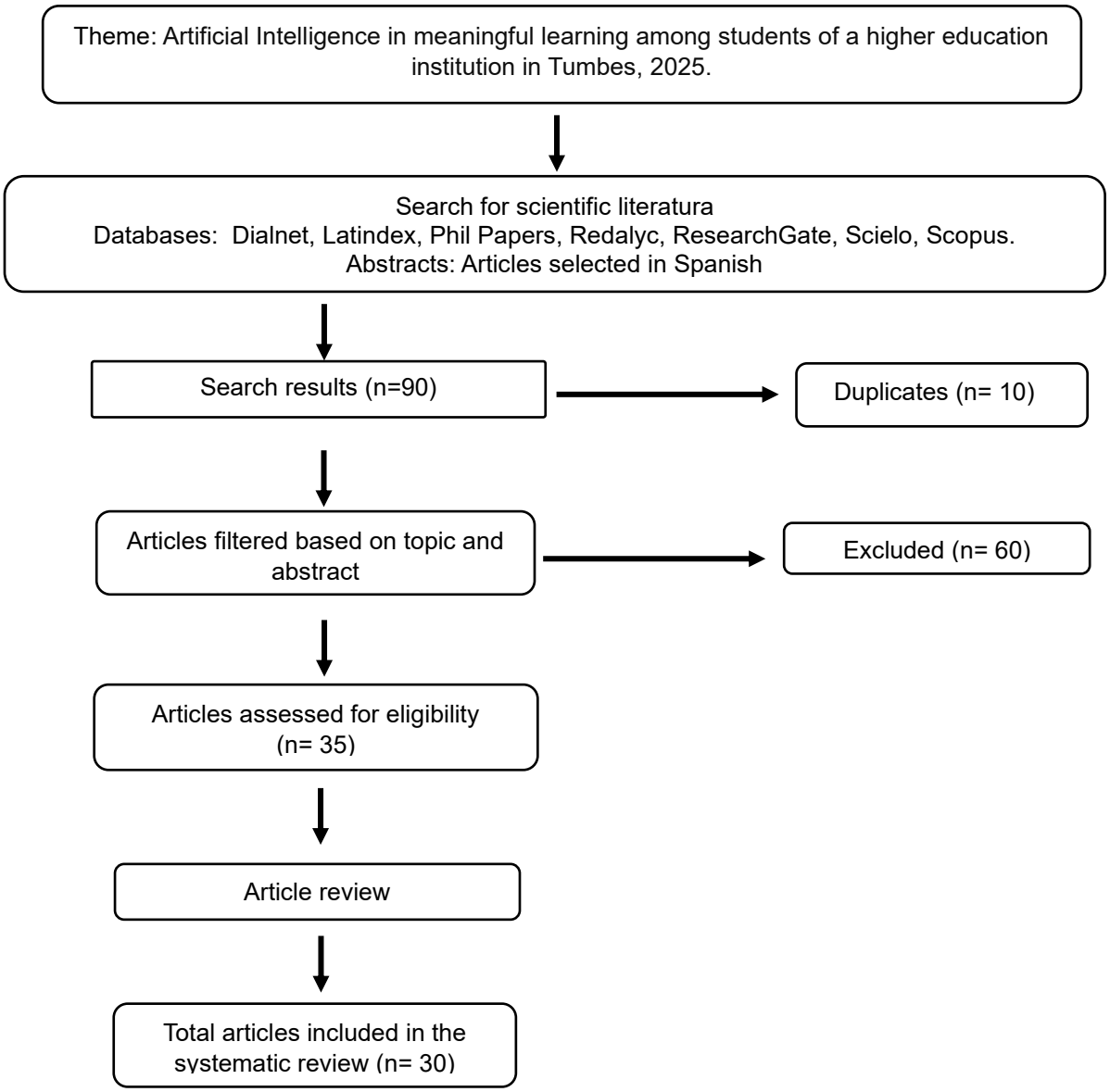
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12	Yinis Migdalia Salmerón Moreira, Heriberto Enrique Luna Álvarez, Wilvir Gary Murillo Encarnación, Alejandro Pacheco Gómez.	Ecuador	2023	Qualitative	The future of Artificial Intelligence for education in higher education institutions.
13	Oscar Cordón García	Spain	2023	Qualitative	Artificial Intelligence in Higher Education: Opportunities and Risks.
14	María Fernanda Granda Dávila, Irene Jeanneth Muncha Cofre, Fredy Vinicio Guamanquispe Rosero, Jenny Haydeé Jácome Noroña.	Ecuador	2024	Qualitative	Artificial Intelligence: Advantages and disadvantages of its use in the teaching-learning process.
15	Wilson Iván Piedra Castro Erika Silvana Burbano Buñay Jhonny Junior Tamayo Verdezoto Elvin Fray Moreira Alcivar.	Ecuador	2024	Qualitative	Artificial Intelligence and its impact on the methodological strategy of research-based learning.
16	Néstor Raúl Parrales García, Edwin Miguel Buque Parrales, Miguel Augusto Buque Cantos, María Raquel Moreno Ponce	Ecuador	2022	Qualitative	Integration of artificial intelligence in project formulation: Opportunities, challenges and future perspectives.
17	Nilton Rogger Niño Morante, Magaly Natalie Uceda Bazán, Fiorela Anaí Fernández Otoya, Maryuri García González.	Cuba	2024	Qualitative	Didactic strategies to promote meaningful learning aimed at university students.
18	Milagros Rocío Menacho Ángeles, Lily Marisol Pizarro Arancibia, Julio Ancelmo Osorio Menacho. Juana Alexandra Osorio Menacho, Brigitt Lily León Pizarro.	Peru	2024	Quantitative	Artificial intelligence as a tool in the autonomous learning of higher education students.

19	Geovanny Francisco Ruiz Muñoz, David Arturo Yépez González.	Ecuador	2024	Qualitative	Transforming education through Artificial Intelligence: A focus on Meaningful Learning.
20	Ernesto Paul Zavala Cárdenas, Diana Paola Salazar Guaraca, Edgar Henry Albán Yánez, Amalín Ladaysí Mayorga Albán.	Ecuador	2023	Qualitative	The role of Artificial Intelligence in the teaching-learning process of higher education.
22	Clemente Alcocer A. A., Cabello Cabrera, A., & Añorve García, E.22	Mexico	2024	Qualitative	Artificial intelligence in education: ethical challenges and perspectives toward a new teaching paradigm.
23	Kerly Katiuska Magallanes Ronquillo, Lila del Roció Plúas Pérez, Juan Francisco Aguas Veloz, Ricardo Luis Freire Solís.	Ecuador	2023	Qualitative	Artificial intelligence applied to educational innovation in the teaching and learning process.
24	Clemente Alcocer A. A., Cabello Cabrera, A., & Añorve García, E.	Peru	2021	Qualitative	Artificial intelligence in education: ethical challenges and perspectives toward a new teaching paradigm.
25	Betty Margarita Chávez Boza, Orlando Ramiro Erazo Moreta.	Mexico	2024	Qualitative	Generative Artificial Intelligence for learning programming fundamentals: A systematic literature review.
26	Presidencia del Consejo de Ministros.	Peru	2024	Qualitative	Recommendations for the ethical use of artificial intelligence.
27	Tapara Yupanqui, N. L., Bautista Apaza, E. V., Oblitas Bardales, S. E., Mamani Cachicatari, G., & Torres Acurio, J.	Peru	2025	Qualitative	Artificial intelligence and learning personalization: Inequalities and limitations in university education in the Peruvian highlands.

28	Mamani López, J. W.	Peru	2024	Qualitative	Higher education and personalized learning with AI: A systematic review.
29	Halonoca Puma, Doris	Peru	2024	Qualitative	Meaningful learning in higher education.
30	Parra-Sánchez, J. S.	Colombia	2023	Qualitative	Potential of artificial intelligence in higher education: A personalization approach.

Figure 1. *PRISMA flow diagram for article selection*



This systematic review presents a detailed analysis of the 30 selected articles. Specifically, 13 came from the Dialnet database, 5 from Scielo, 5 from ResearchGate, 2 from LatinRev, 1 from Scopus, 1 from PhilPapers, 1 from Latindex, 1 from the UCV Repository, and 1 from Gob. Pe. The selected articles originated from 12 in Ecuador, 6 from Peru, 3 from Colombia, 4 from Mexico, 2 from Spain, 1 from the USA, 1 from Cuba, and 1 from Argentina.

The analysis of the various studies highlights how AI drives the development of essential skills. The purpose of artificial intelligence in meaningful learning is to transform non-university higher education, optimizing teaching and the student experience (Mera, 2023).

Its impact is evident in learning personalization, the use of virtual tutoring, process automation, and data analysis. These applications enable a more dynamic and efficient approach, although they also face challenges such as the technological access gap, resistance from some educators, and ethical dilemmas concerning data management (Muñoz, 2024; Vera et al., 2023; Ruiz & Yepez, 2024).

For effective integration, adopting an interdisciplinary approach that ensures continuous training for both educators and students is crucial. The convergence of AI and education opens new opportunities in programming instruction, academic management, and the use of adaptive platforms. Artificial intelligence provides educators with creative and innovative digital tools to foster direct interaction with students and optimize their academic performance (Numa et al., 2024).

AI is utilized in knowledge construction, automating administrative and research tasks, and enhancing feedback and assessment processes (Piedra et al., 2024).

Nevertheless, promoting responsible AI use is essential, avoiding excessive dependence while strengthening critical thinking and creativity in learning processes.

The use of artificial intelligence in meaningful learning offers various advantages in non-university higher education. Key benefits include learning personalization, improved teaching quality, and reduced teacher workload. Through instant feedback and task automation, AI optimizes educational quality and allows content to be tailored to each student's needs. Additionally, it fosters the development of new technological competencies in both students and faculty (Vera, 2023).

However, it also faces significant challenges. Some disadvantages include the risk of over-reliance on technology, potential reduction in social interaction, and ethical concerns regarding data privacy. Furthermore, its implementation requires adequate infrastructure and ongoing teacher training, which can pose a challenge in some educational settings. When approached strategically and responsibly, AI can transform education and enhance learning meaningfully (Salmerón et al., 2023; Menéndez et al., 2024).

Among the disadvantages, it can be determined that AI remains an artificial, programmed element; therefore, it cannot fully address social interaction, especially affective dimensions (Granda et al., 2024).

Important challenges include technological limitations, the need for teacher training, and complex ethical and social issues (Piedra et al., 2024; Menacho, 2024).

AI has significantly impacted training, enabling knowledge management and the creation of environments for productive, social, and entrepreneurial projects. While projects are crucial for organizational improvement, their prioritization often lacks clear recommendations regarding scope, time, and limited resources. In the digital age, artificial intelligence emerges as a revolutionary tool in both business and educational spheres (Parrales et al., 2024).

AI should not be conceived as a substitute for traditional education, nor as an indication that teacher presence is no longer required; rather, it serves as a strategic complement. Its integration demands an ethical, critical, and contextualized vision that preserves humanistic values and fosters complex thinking. Equity in access, especially in vulnerable regions like Tumbes, must be a priority in any educational innovation policy.

Conclusions

- Artificial intelligence introduces new pedagogical tools and redefines the relationships among teachers, students, and knowledge. This shift necessitates a profound revision of the traditional

educational approach, steering it toward more dynamic, collaborative, and student-centered models.

- Artificial intelligence should be employed as a complementary resource that enhances learning, personalizes instruction, and prepares students for complex digital environments. Its implementation must align with clear, ethical, and humanistic educational objectives, avoiding its use as a mere technological substitute.
- The incorporation of artificial intelligence demands active, contextualized, and student-centered methodologies that promote knowledge construction from prior learning. In higher education, this strengthens deep and meaningful learning by articulating theory, practice, and context.
- Artificial intelligence offers opportunities to automate processes, optimize resources, and improve decision-making in educational management. Its strategic use can contribute to institutional efficiency and a more agile response to 21st-century challenges.
- Continuous training of teaching staff in digital, ethical, and methodological competencies is necessary to guarantee effective and responsible implementation of artificial intelligence. Resistance to change can be mitigated through participatory and contextualized training processes.
- The digital divide, teacher resistance, and ethical dilemmas regarding privacy and data use must be addressed through inclusive policies and clear regulations. Equity in access to and use of artificial intelligence is key to preventing new forms of educational exclusion.
- To avoid technological dependence, it is essential to develop critical thinking, creativity, and autonomy in students. AI should be a tool that enhances, rather than replaces, human capacities in the educational process.

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