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New literacies in the age of AI: Ethics, teaching, and writing (English Version)

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Digital Literacy and Teacher Training in Artificial Intelligence

Alfabetización Digital y Formación Docente en Inteligencia Artificial

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ABSTRACT

This study analyzes digital literacy and teacher training in artificial intelligence in higher education in Latin America and the Caribbean, with an emphasis on the Dominican Republic. It identifies gaps between the demands of the digital educational ecosystem and teacher training, highlighting structural, curricular, and pedagogical limitations. Furthermore, it reviews the main international standards for digital competencies and their suitability for teacher training from a documentary and analytical perspective, emphasizing the need to align training programs with these frameworks and integrate artificial intelligence to meet current demands. The results show that university programs insufficiently incorporate technological content and that teacher training is largely limited to instrumental aspects. The study also recognizes the urgent need to include artificial intelligence as cross-cutting competency or subject in initial teacher training. It concludes that educational change must transcend the technical paradigm to advance toward critical digital literacy, training reflective teachers capable of implementing intelligent technologies in teaching in a pedagogical, ethical, and responsible manner.

Keywords: Artificial Intelligence; Digital Competence; Teacher Training.

RESUMEN

En este estudio se analiza la alfabetización digital y la formación docente en inteligencia artificial en la educación superior de América Latina y el Caribe, con énfasis en la República Dominicana. Se identifican brechas entre las demandas del ecosistema educativo digital y la formación docente, destacando limitaciones estructurales, curriculares y pedagógicas. Asimismo, se revisan los principales estándares internacionales de competencias digitales y su adecuación a la formación docente desde un enfoque documental y analítico, enfatizando la necesidad de alinear los programas formativos con estos marcos, integrando la inteligencia artificial para responder a las demandas actuales. Los resultados evidencian que los programas universitarios incorporan insuficientemente el contenido tecnológico, y que la formación docente se limita mayoritariamente a aspectos instrumentales. Asimismo, se reconoce la urgencia de incluir la inteligencia artificial como competencia transversal o asignatura de la formación docente inicial. Se concluye que el cambio educativo debe trascender el paradigma técnico para avanzar hacia una alfabetización digital crítica, formando docentes reflexivos capaces de implementar tecnologías inteligentes en la enseñanza de manera pedagógica, ética y responsable.

Palabras clave: Inteligencia Artificial; Competencia Digital, Formación de Docente.

INTRODUCTION

Today, digitization is an unprecedented phenomenon, with emerging technologies, including artificial intelligence (AI), rapidly defining social, economic, and educational spheres (Martínez, 2025). In this ecosystem, digital literacy is no longer a supporting skill but has become a key component of human development. However, there is a worrying disconnect between the pace of technological growth and educational institutions' ability to implement these technologies critically and effectively (Andion, 2021).

Digital illiteracy or ignorance is common; authors such as Toscano et al. (2025) argue that this problem constitutes a significant obstacle to educational quality because educators lack training or motivation. The Dominican context is no exception; it has particularities that hinder the comprehensive and educational development of society. This society is experiencing gradual growth in the digital age; however, there are inequalities in technological access, which contribute to the development of teacher training programs in Higher Education Institutions [HEIs] (Díaz-Moreta, 2025).

Consequently, the enigmatic body is found in the classrooms of HEIs, which are directly faced with the enormous challenge of educating competent trainers in digital tools, not only to use them, but also to conceptually and pragmatically grasp the inherent principles of Information and Communication Technologies (ICT), AI, Robotics, augmented reality (AR), virtual reality, among other emerging technologies, which encourages the creation of responsible digital citizenship (Estrada and Bennasar, 2021; Acevedo et al., 2022; Pérez and González, 2024).

It is worth noting a critical digital training gap in Dominican education in the 21st century, as teachers lack the skills and the appropriate environment to train schoolchildren who can enter the labor market demanded by this IT and technological boom. Writings such as those by Vizúete et al. (2025) establish that soft skills combined with emerging technologies are fundamental to the labor-market integration of students graduating from the pre-university system; therefore, teachers in training must be able to transmit this technological knowledge to promote cross-cutting, practical development in their students.

The purpose of this paper is to analyze digital literacy and teacher training in artificial intelligence, taking into account three complementary dimensions: digital literacy as a necessary skill for contemporary educational practice; the state of digital literacy and the development of artificial intelligence skills in Latin America and the Caribbean, with a focus on regional advances and challenges; and an analysis of teacher training programs in Latin America and the Caribbean, with an emphasis on the Dominican Republic, from a technological perspective in order to identify gaps, opportunities, and institutional strategies that strengthen teacher preparation for the demands of the digital educational ecosystem.

DEVELOPMENT

DIGITAL LITERACY AND TEACHER TRAINING IN ARTIFICIAL INTELLIGENCE

The advent of artificial intelligence [AI] has triggered social and economic change, reshaping the essential skills needed for active citizenship and employability (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2021). In this scenario, digital literacy has gone beyond its original definition as a simple technical skill to encompass critical data curation and algorithmic reasoning. Globally, society is rapidly moving toward a media ecology dominated by intelligent systems, which are shaping information consumption, knowledge production, and decision-making. However, this rapid progress has revealed a notable gap between the demands

of a digitalized society and the training provided by teacher education programs (Molina et al., 2024).

The access gap (lack of connectivity or devices) has been the primary concern in education throughout history. Although this inequality persists, especially in vulnerable contexts (Economic Commission for Latin America and the Caribbean [ECLAC], 2024), artificial intelligence has introduced a more complex dimension: the critical skills gap. AI can replicate and extend racial, socioeconomic, or gender biases already present in society, given that it operates on large volumes of data (Alonso, 2023). Likewise, this data provides knowledge at the speed of a click, enabling autonomous learning, which favors the teaching-learning process; it also promotes research and self-taught cognition when used ethically and responsibly (Solano et al., 2024).

Initial teacher training programs often show institutional inertia that contrasts with the speed of technological innovation. Currently, curricula tend to prioritize an instrumental perspective on technology, covering only introductory office automation courses or the use of general platforms and learning management systems (Calderón et al., 2025). This superficial perspective creates a disconnect between academic content and the circumstances of the post-AI classroom, where students already use generative AI tools for research, writing, and problem-solving.

To close this gap, it is necessary to review the paradigm of teacher training, both initial and continuing. AI should be considered not only as a tool for improving administrative efficiency or providing content, but also as a mechanism for equity when applied intentionally (UNESCO, 2021). This requires initial teacher training programs to incorporate teaching of: a) pedagogical prompt engineering, i.e., the ability to interact with artificial intelligence models to produce high-quality educational content; b) assessment of the authenticity of AI-generated work; and c) establishment of an ethical framework to guide how student data is used and how algorithmic transparency is ensured.

To address curriculum dissonance from a structural standpoint, it is essential to review the digital competency frameworks that underpin initial teacher education and continuing professional development. Some of the current frameworks were designed before generative AI expanded massively. Therefore, they do not address essential topics such as algorithmic citizenship, algorithmic ethics, or applied artificial intelligence (UNESCO, 2021). These frameworks must shift from a focus on software use to an approach that emphasizes adaptation, critical evaluation, and co-creation between humans and artificial intelligence during the teaching and learning process.

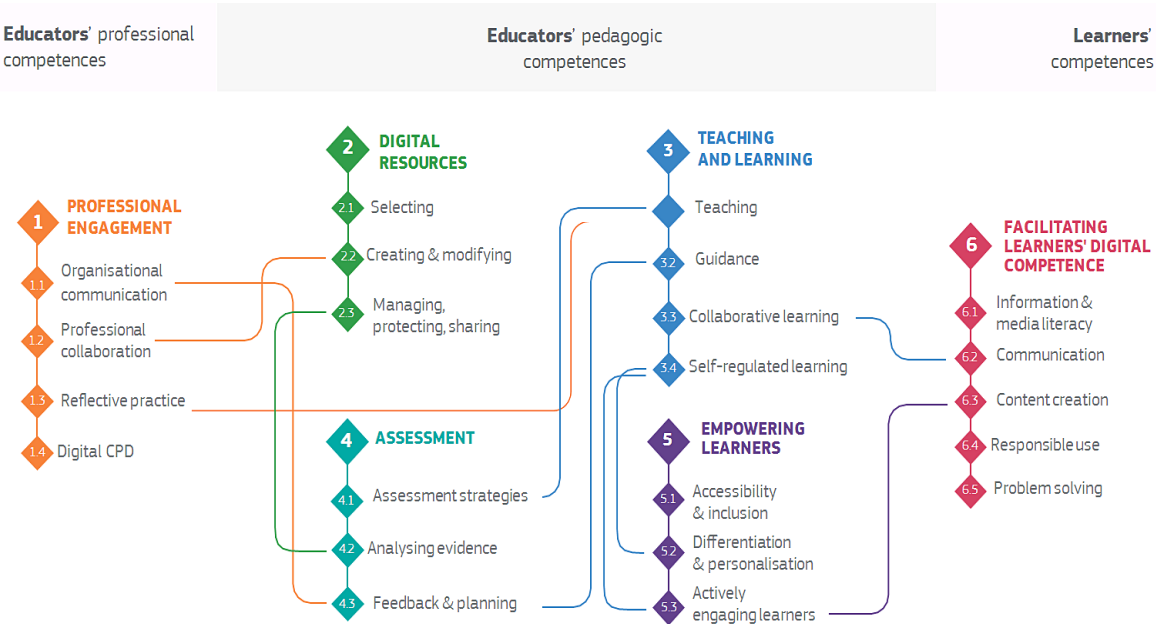
Teacher's digital literacy

Digital literacy is a process focused on acquiring knowledge and skills for the proper use of technological tools (Quispe & Visloa, 2022). It includes the ability to access, manage, understand, integrate, communicate, evaluate, and create information, as well as media literacy, information literacy, and ICT literacy, designed to help people develop a critical mindset regarding the use of digital and information technologies (UNESCO, 2025).

In the field of education, digital literacy for teachers currently includes four fundamental aspects: critical information management, data ethics and security, and the pedagogical and creative use of technology. As society becomes increasingly digitized, incorporating artificial intelligence in various areas, teacher training programs are not updating their content with the same depth or speed. Teacher training focuses on basic technical skills, but does not address

pedagogical and critical issues related to AI. Resistance to change, limited institutional support, and disparities in access to technology create a gap that particularly affects rural and vulnerable populations (Dilling et al., 2024; Pita-Briones et al., 2025). This gap means that teachers are not fully equipped to meet the educational demands of a digitalized society.

In this regard, digital teaching competencies are outlined in reference frameworks developed by European and international groups to enhance teachers’ technological skills in the digital age. These frameworks are guidelines that define the skills required to succeed in a specific position or field; they also guide professional development and performance evaluation. In this vein, the DigCompEdu framework offers a comprehensive reference for educators’ digital competencies across six key areas, as presented in figure 2.1: professional engagement, digital content creation, teaching and learning, assessment, learner autonomy, and digital competency development (UNESCO, 2019; Pita-Briones et al., 2025).



Note: This figure represents the six areas included in the DigCompEdu reference framework. Taken from *the European Framework for Digital Competence for Educators: DigCompEdu* (p. 8), by Redecker (2020).

Figure 2.1. DigCompEdu Digital Competence Reference Framework

These areas range from Professional Engagement (use of technology for collaboration and continuous development) and Digital Content Management (curation, production, and respect for copyright) to core applications in teaching and learning (designing enriching experiences). In addition, they extend to the dimensions of assessment (use of data to modify teaching), student empowerment (inclusion, personalization, and digital well-being), and conclude with the development of students’ digital competence (direct instruction of digital and critical skills), ensuring that teachers can approach technologies from a comprehensive and pedagogical perspective. According to Pita-Briones et al. (2025), in Latin America, only a small percentage of teachers adequately achieve these competencies, demonstrating the existing gap.

Table 2.1. Reference Framework for Digital Competencies according to UNESCO

Area	Knowledge acquisition	Deepening of knowledge	Knowledge creation
Understanding the role of ICT in education	Knowledge of policies	Policy implementation	Policy innovation
Curriculum and assessment	Basic knowledge	Application of knowledge	Knowledge society skills
Pedagogy	ICT-enhanced teaching	Complex problem solving	Self-management
Application of digital skills	Application	Infusion	Transformation
Organization and administration	Standard classroom	Collaborative groups	Learning organizations
Professional learning for teachers	Digital literacy	Networking	Teachers as innovators
Note: This table shows information on the areas included in the digital competency reference framework. Taken from <i>the ICT Competency Framework for Teachers</i> (p. 8), by UNESCO (2019).			

Nowadays, it is not enough for teachers to be skilled in the technical or instrumental use of digital tools. The educational requirements for the 21st century demand a more critical and deeper understanding of technology, in which digital skills must be combined with ethics, reflective capacity, and creativity on the part of teachers (UNESCO, 2019; Pita-Briones et al., 2025). In this context, the DigCompEdu Reference Framework and UNESCO’s proposals are a starting point, not an end goal.

This is because rapid technological transformations, especially those related to artificial intelligence, require continuous renewal of pedagogical knowledge and methods.

It is not enough to incorporate technologies into education; it is also necessary to understand how algorithms, data, and intelligent systems affect or benefit educational equity, the learning process, and pedagogical decisions. In this scenario, essential skills such as AI-mediated learning, people-centered thinking, and AI-assisted pedagogy emerge, promoting a more responsible and context-adapted education.

Thus, today’s educators must move from functional digital competence to transformative digital competence.

This requires a good command of the technological foundations and an understanding of the social and ethical consequences of using intelligent systems in education. As Pita-Briones et al. (2025) point out, in Latin America, there is a notable lack of teacher preparation to address these challenges, which requires adapting training programs and continuing professional development policies that include artificial intelligence literacy as a key element in teacher training. In this regard, table 2.2 presents UNESCO’s competency framework for teacher training in AI.

This global UNESCO tool was developed based on the principles of protecting teachers’ rights, strengthening human capacity for action, and promoting educational sustainability. Its purpose is to guide the design of national and international competency frameworks, teacher training programs, and assessment parameters that enable educators to integrate artificial intelligence into their teaching practices in an ethical, critical, and sustainable manner (UNESCO, 2025).

This proposed set of dimensions is a significant expansion of the concept of digital teaching competency, encompassing specific skills for an educational environment increasingly shaped by artificial intelligence.

Table 2.2. AI Competency Framework for Teachers		
Dimension	Description	Levels of progression
Human-centered thinking	Focus on social responsibility, accountability, and human behavior.	Acquire, deepen, create
AI ethics	Applying principles of transparency, privacy, fairness, and bias prevention in the educational use of AI.	
Fundamentals and applications of AI	Basic and advanced understanding of how AI works for its contextualized pedagogical application.	
Pedagogy of AI	Design and implementation of active and personalized teaching strategies supported by intelligent technologies.	
AI for professional learning	Use of AI for self-training, continuous assessment, and participation in collaborative teaching communities.	
<i>Note:</i> This table shows information on the areas included in the AI competency framework for teachers. Taken from <i>the AI Competency Framework for Teachers</i> , by Miao & Cukurova, UNESCO (2024).		

The dimension of human-centered thinking requires, first and foremost, that teachers consistently place the individual, rather than technology, at the center of the entire educational process. This involves promoting social responsibility, accountability, and an understanding of human behavior in contexts mediated by artificial intelligence. From this perspective, the ethics of artificial intelligence require educators to understand and implement principles such as transparency, privacy, equity, and the prevention of bias when using intelligent tools.

This becomes crucial in an era when algorithms can reproduce inequalities or manipulate sensitive information about teachers and students.

The fundamentals and applications dimension of AI, on the other hand, aims to help teachers understand how intelligent systems work, from their conceptual basis to their practical application.

AI pedagogy involves creating teaching strategies that are active, adaptive, and personalized, supported by intelligent technologies that analyze learning data and provide feedback tailored to each student’s needs. Finally, the AI for professional learning dimension encourages the use of these technologies so that teachers can train themselves, continually evaluate their performance, and participate in collaborative communities of practice, thereby contributing to sustained professional development.

Taken together, these dimensions suggest an evolutionary model that involves teachers’ use, understanding, evaluation, and critical application of artificial intelligence, thereby ensuring that the incorporation of AI in education aligns with human principles and a transformative pedagogical purpose.

State of digital literacy and AI skills development in Latin America and the Caribbean

Digital literacy and the development of artificial intelligence skills have become essential elements for educational and social transformation in Latin America. Although some countries have made progress, the area is still grappling with significant gaps that prevent everyone from having a fair opportunity to learn and participate in the global digital market (UNESCO, 2019; Pita-Briones et al., 2025).

A recent study found that Chile and Colombia are leaders in university digital skills, but Ecuador lags behind five other countries (Martínez, 2023). According to Softtek’s 2024 report,

Argentina leads the region with a digital literacy rate of 66 %, while Brazil is close to 46 % and Mexico trails at approximately 37 %. Digital literacy is not just about using technology; it is about knowing how to find, check, and do. It is a key skill that helps people get involved and empowers them in society (OEI, 2024).

In the Latin American context, the incorporation of artificial intelligence into education systems is progressing unevenly. A report by Herrera et al. (2025), prepared by the Economic Commission for Latin America and the Caribbean [ECLAC], indicates that the region accounts for about 14 % of global visits to AI solutions, despite concentrating only 11 % of Internet users worldwide (Herrera et al., 2025). However, the distribution is heterogeneous: countries such as Chile, Brazil, and Uruguay are in the “pioneer” category, with more than 60 points on the 2024 Latin American Artificial Intelligence Index (ILIA). On this index, Chile scored 74,3 points in human talent specialized in AI, Uruguay 62,1, and Costa Rica 46,9. In Brazil, there was also a 282 % increase in enrollment in AI generation courses over the last year, placing it second in the region in this indicator (Herrera et al., 2025; Ti Inside, 2025).

For decades, the Dominican Republic has faced countless challenges in digital literacy, especially in the business and education sectors. In this regard, Robles et al. (2025) have identified notable deficiencies in advanced digital skills, particularly in technical and operational professions.

The education system also faces difficulties, and Gallur and Diaz (2023) note that although students and teachers recognize the importance of digital skills, 95,6 % of students believe teachers need more robust training despite advances in digital infrastructure, such as the increase in the number of Internet users, Serrano and Llorente (2023) state that teachers tend to perceive their digital skills as intermediate, especially in the fields of science and technology.

In the current Dominican context, advances in digital literacy and AI integration show both achievements and persistent challenges. A United Nations Development Program (UNDP) study reports that 68,9 % of Dominican citizens use artificial intelligence more than once a week.

Table 2.3. Indicators of digital literacy and artificial intelligence in the Dominican Republic		
Indicator	Result	Source
Students who consider teachers’ digital training to be insufficient	95,6	Gallur & Diaz (2023)
Citizens who use AI at least once a week	68,9	United Nations Development Program [UNDP] (2025)
Teachers with intermediate perception of digital skills	63,4	Serrano & Llorente (2023)
Devices delivered to students with faults	76,6	UNESCO, UNDP & EDUCA (2023)
Rural schools without connectivity	36,7	UNESCO, UNDP & Business Action for Education [EDUCE], (2023).
Goal of the “Soy Digital” program (people to be trained)	100 000	Dominican Telecommunications Institute [INDOTEL] & Ministry of Education of the Dominican Republic [MINERD], (2025).
Note: Prepared internally based on the cited sources.		

This shows significant adaptation to emerging technologies and an optimistic attitude toward their educational and employment potential (UNDP, 2025). In addition, the Dominican Telecommunications Institute (INDOTEL) and the Ministry of Education (MINERD) launched

the “Soy Digital” initiative to teach 100 000 parents and guardians the basics of digital skills. However, the school system faces some major obstacles: a study by UNESCO, UNDP, and Educa (2023) found that 76,6 % of the devices given to children did not work, and that 36,7 % of schools lacked connectivity, compared to 18,1 % in urban areas.

These data reflect an ambivalent situation: on the one hand, a progressive expansion of public policies and citizen adoption of emerging technologies; on the other, a significant gap in advanced skills, equitable access, and the sustainability of digital literacy programs. Consequently, it is necessary to strengthen national teacher-training policies and to create digital ecosystems that promote the critical, ethical, and pedagogical integration of artificial intelligence.

Analysis of teacher training programs in the Dominican Republic: From a technological perspective

An important factor in the technological analysis of teacher training programs in the Dominican Republic is the inclusion of technology-related courses in university curricula. In this regard, Table 5 shows how five (5) higher education institutions, whose names are withheld for ethical reasons, have incorporated content related to computer science, digital skills, and educational technology. This analysis is based on the total number of credits required to obtain a teaching degree, the number of technology-related courses, and their equivalence in academic load.

Table 2.4. Curriculum of Dominican universities that include technology-related subjects			
Universities	Total number of credits	Specific technology subjects	Credits in educational technology
University A	165	- Educational Technology I - Educational Technology II - Technology Integration Laboratory	9 (5,5 %)
University B	172	- Technology Applied to Education - Educational Informatics	6 (3,5 %)
University C	128	- Educational Technology - Digital Materials Design - Integration of ICT in the Classroom	8 (6,3 %)
University D	150	- Educational Technology - Computer Science for Educators	6 (4,0 %)
University E	140	- Fundamentals of Educational Technology - Instructional Design and Technology - Assessment with ICT	10 (7,1 %)

The data collected show that although all institutions incorporate technology courses into their study programs, there are significant discrepancies in the approaches and depth with which they are taught. On the one hand, there are notable fluctuations in the number of credits assigned to this area: between 6 (3,5 %) at University B and 10 (7,1 %) at University E. On the other hand, the names of the courses reveal different educational perspectives, ranging from more technical approaches, such as “Educational Informatics,” to more comprehensive approaches, such as “Assessment with ICT” or “Technology Integration Laboratory.”

This curriculum study enables the identification of areas for improvement and strengths in the digital training of future teachers. Some universities, such as A, C, and E, provide a well-defined structure with three specific courses. Others, however, offer a more traditional model with only two subjects.

The variety of classes and different credit percentages shows that, although there is consensus on the importance of educational technology, it has not yet been standardized in teacher training programs in the Dominican Republic.

In line with this, authors of the stature of Tapia et al. (2020) advocate the incorporation of ICT as an essential discipline in training programs, since the same study conducted between 2012 and 2018 showed that the increase in technology subjects in the Republic of Chile according to the teacher training program and disciplinary teacher training (by area) was 12 % in the former and 29 % in the latter. Similarly, in the paper by Cabello et al. (2020), also conducted in Chile, the findings show that more teacher training plans do not integrate ICT (35,1 %) than those that do (22,7 %); Therefore, both authors agree that there should be government education policies to improve training programs that encourage graduates to develop technological skills in line with the digitalization of this era.

Ultimately, teacher training goes beyond preparing teachers in the instrumental use of digital platforms. The real challenge is to train educators with the sensitivity and criteria necessary to accompany their students in a reality where AI is constantly redefining the limits of knowledge. This preparation involves, above all, developing an ethical compass to guide both their teaching practice and the civic education of new generations in these essential skills.

CONCLUSIONS

The analytical journey undertaken reveals a central paradox in contemporary teacher training, leading us to conclude that, while artificial intelligence is redefining educational ecosystems at unprecedented speed, training models remain anchored in instrumental logics that are notoriously insufficient. The theoretical foundation suggests that overcoming this dissonance requires transcending mere technical training to embrace a radically humanizing approach, where technology is understood as a space for cultural negotiation and civic practice.

In the age of artificial intelligence, teacher training must go beyond the development of traditional digital skills and include essential components such as data management, critical thinking, creativity, and the ability to supervise and support educational processes with intelligent tools. This training must be continuous, contextualized, and focused on overcoming resistance to change to ensure the successful integration of AI in education.

A pending challenge is to delve deeper into the experiential dimension of teachers, those intimate narratives of resistance, adaptation, and creative reappropriation that arise in their technological immersion, particularly in contexts of diversity and education. This limitation points to a fertile path for future qualitative research. The conclusion is that true transformation lies not in focusing on producing teachers who operate digital tools, but in training educators with the critical lucidity to question their underlying logic and the pedagogical sensitivity to use them in the construction of more inclusive and democratic classrooms.

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