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From the Digital Ecosystem to Critical Artificial Intelligence

Del Ecosistema Digital a la Inteligencia Artificial Crítica

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ABSTRACT

Digital transformation in Latin American higher education, driven by the rapid expansion of artificial intelligence (AI), constitutes a complex phenomenon that reshapes not only technological environments but also pedagogical practices, institutional structures, and the ethical frameworks that underpin university life. In this context, a critical perspective is essential to examine how these technologies influence the reproduction of inequalities and the redefinition of knowledge. This study aims to critically analyze the discourses, practices, and policies related to university digitalization and the integration of AI in higher education institutions across Latin America, from an ethical, contextualized, and situated perspective. The research follows an interpretive approach with socio-pedagogical and sociocultural orientation, grounded in an extensive documentary review, a comparative analysis of institutional cases, and the use of secondary sources. Although no direct fieldwork was conducted, replicable methodological instruments were designed as proactive contributions for future research. The main findings reveal structural tensions between modernization narratives and the real conditions of many public universities. It is evident that digitalization progresses more strongly in administrative areas than in pedagogical ones, and that AI is often adopted without solid ethical frameworks or meaningful faculty involvement. The study concludes that digital transformation in universities will only be socially and pedagogically meaningful if guided by principles of equity, technological sovereignty, and cognitive justice, recognizing Latin America's cultural and epistemic diversity as a starting point rather than a barrier.

Keywords: Artificial Intelligence; Digital Transformation; Higher Education; Educational Justice; Critical Epistemologies.

RESUMEN

La transformación digital en la educación superior latinoamericana, impulsada por la acelerada expansión de la inteligencia artificial (IA), constituye un fenómeno complejo que modifica no solo los entornos tecnológicos, sino también las prácticas pedagógicas, las estructuras institucionales y los marcos éticos que sustentan el quehacer universitario. En este contexto, se hace imprescindible una mirada crítica que examine cómo estas tecnologías inciden en la reproducción de desigualdades y en la redefinición del conocimiento. Este estudio tiene como objetivo analizar críticamente los discursos, prácticas y políticas vinculadas a la digitalización universitaria y a la incorporación de la IA en instituciones de educación superior en América Latina, desde una perspectiva ética, contextualizada y situada. La investigación se enmarca en un enfoque

interpretativo con orientación sociopedagógica y sociocultural, sustentado en una revisión documental exhaustiva, el análisis comparado de casos institucionales y el uso de fuentes secundarias. Aunque no se realizó trabajo de campo directo, se diseñaron instrumentos metodológicos replicables como aportes propositivos para futuras investigaciones. Entre los hallazgos principales, se evidencian tensiones estructurales entre los discursos de modernización tecnológica y las condiciones reales de muchas universidades públicas. Se constata que la digitalización avanza con mayor fuerza en el ámbito administrativo que en el pedagógico, mientras que la adopción de tecnologías de IA carece, en la mayoría de los casos, de marcos éticos sólidos y participación docente significativa. Se concluye que la transformación digital universitaria solo será social y pedagógicamente significativa si se articula a principios de equidad, soberanía tecnológica y justicia cognitiva, reconociendo la diversidad cultural y epistémica de América Latina como punto de partida y no como obstáculo.

Palabras clave: Inteligencia Artificial; Transformación Digital; Educación Superior; Justicia Educativa; Epistemologías Críticas.

INTRODUCTION

Higher education in Latin America is undergoing a decisive phase in its structural reconfiguration, driven by the rapid processes of digital transformation and the emergence of artificial intelligence (AI). Beyond the mere incorporation of technological tools, university digitization implies a profound transformation in the ways knowledge is produced, circulated, and appropriated. Castells⁽¹⁾ argues that the network society redefines knowledge structures according to market and efficiency logics. For his part, Cristóbal⁽²⁾ emphasizes the need for cultural frameworks that guide innovation beyond technological determinism. At the same time, Selwyn⁽³⁾ warns that technology in education is not neutral, but rather a reflection of power relations and social asymmetries.

From a Latin American perspective, thinkers such as Boaventura de Sousa Santos⁽⁴⁾, Walsh⁽⁵⁾, and Zemelman⁽⁶⁾ provide critical frameworks for understanding this transformation from subaltern contexts. They propose an “epistemology of the South,” the intersection between knowledge, power, and interculturality, and a liberating educational rationality in the face of the risks of homogenization of digital thought. Along these lines, Dussel⁽⁷⁾ has conceptualized “digital coloniality” as a new form of cognitive control, while Martín⁽⁸⁾ exposes the tensions between technological mediations and the development of critical subjectivities.

According to recent data from the Economic Commission for Latin America and the Caribbean (ECLAC)⁽¹⁷⁾ and the United Nations Educational, Scientific, and Cultural Organization (UNESCO)⁽¹⁶⁾, more than 60 % of public universities in the region still lack clear institutional policies on digital transformation. Only 25 % have implemented AI-related initiatives in academic processes. This situation raises substantive questions about the criteria, approaches, and ethical frameworks that guide these processes. In this regard, the 2030 Agenda calls for strengthening digital equity, respect for cultural diversity, and algorithmic transparency as pillars of responsible educational transformation.

Based on a comparative analysis of institutional reports, regional studies, and public policy frameworks in Latin American universities, it is clear that the discourse on technological modernization contrasts with fragmented institutional practices that are poorly articulated with ethical and pedagogical frameworks. The report by the Universidad Técnica Particular de Loja reveals the urgent need to build ethical standards in the use of digital technologies, especially in automated academic assessment and monitoring processes. In turn, research by Martínez⁽¹⁰⁾, López⁽⁹⁾, and Pérez⁽¹¹⁾ highlights how the absence of comprehensive strategies and teacher participation in technological decision-making has generated resistance, mistrust, and low pedagogical appropriation of AI. This evidence confirms the importance of a critical and contextualized approach that not only diagnoses technological gaps but also analyzes their structural roots and proposes ethical, sustainable, and culturally relevant alternatives.

In this context, the incorporation of AI in Latin American higher education presents significant opportunities—such as the automation of administrative and academic tasks—but also far-reaching ethical, pedagogical, and epistemic challenges. Regional studies such as those by López⁽⁹⁾, Martínez⁽¹⁰⁾, Pérez⁽¹¹⁾, and the report by the Universidad Técnica Particular de Loja have documented impacts on teacher-student relationships, trust in automated systems, and the urgent need to establish ethical protocols. From a critical international perspective, authors such as Watters⁽¹²⁾, Selwyn⁽¹³⁾, and García⁽¹⁴⁾ warn that, without pedagogical mediation, AI can reinforce dynamics of standardization and surveillance that undermine the professional autonomy of educators.

Likewise, the political and epistemic dimensions of this transformation must be considered from a public university ethics perspective. Giroux⁽¹⁵⁾ argues that universities must resist their instrumentalization and

preserve their role as critical spaces for democratic deliberation, cognitive justice, and the social production of knowledge.

Therefore, this study is part of a critical, ethical, and situated perspective that proposes a university digital transformation oriented toward the common good. Rather than adapting technologies, it is about disputing meanings, imagining possible futures, and defending the right to an emancipatory digital education based on equity, participation, and respect for diversity.

General objective of the study: To critically analyze institutional discourses, practices, and policies on digital transformation and the incorporation of artificial intelligence in Latin American universities, in order to identify their scope, limitations, and possibilities for a more just, ethical, and contextualized higher education.

From this perspective, this study constitutes a first analytical approach to the processes of digital transformation and the use of artificial intelligence in Latin American universities, understood not as exclusively technical phenomena, but as expressions of ongoing cultural, political, and pedagogical disputes. We assume that university digitization cannot be evaluated solely in terms of technological coverage or institutional innovation, but rather based on its real capacity to expand rights, strengthen critical thinking, and promote contextualized, inclusive, and ethically grounded higher education. This research, therefore, is situated at the intersection between the structural challenges of the Latin American education system and the need to reconfigure the frameworks of meaning from which we think about the link between technology, knowledge, and educational justice.

METHOD

Approach and design of the study

This study takes a qualitative, interpretive approach with a socio-pedagogical and sociocultural perspective. It starts from the premise that educational phenomena—especially those linked to digital transformation—must be understood in terms of their contextual, symbolic, and historical complexity. Such understanding requires attention to the structural, cultural, ethical, and epistemic dimensions that shape the processes of technological incorporation in Latin American universities.

Methodological strategy and case selection

The methodological design adopted corresponds to documentary research, based on the analysis of secondary sources from scientific literature, institutional reports, university regulations, and documents issued by multilateral organizations. For the comparative analysis, six Latin American public universities—located in Mexico, Colombia, Cuba, Ecuador, Brazil, and Chile—were selected based on criteria of geographical diversity, public availability of information, and declared degree of progress in digitization and artificial intelligence processes.

Document collection and analysis techniques

The documents reviewed include institutional strategic plans, academic regulations, pedagogical guidelines, digital transformation protocols, and official communications issued between 2020 and 2024. To organize the information and strengthen the comparative analysis, a system of emerging categories was constructed, developed through triangulation between theoretical references, document review, and the objectives of the study. This matrix enabled the structuring of discourse analysis, allowing for the identification of common patterns and significant divergences in institutional approaches to the appropriation of digital technologies and artificial intelligence systems. The analysis was guided by ethical, political, and pedagogical criteria, highlighting the degree of teacher participation, formative tensions, and the implications that these processes generate for the digital transformation of Latin American universities.

These materials were systematized using a matrix of emerging categories, constructed from theoretical and empirical references in the field. The matrix made it possible to compare institutional discourses, priorities, and strategies regarding the use of digital technologies and artificial intelligence systems, taking into account ethical, political, and pedagogical criteria.

Proactive methodological contributions

Although no direct fieldwork was carried out, as part of the theoretical-operational contribution of the study, three replicable methodological instruments were designed that can be used in future empirical research on digital transformation and artificial intelligence in higher education:

- A semi-structured interview guide aimed at exploring the perceptions, tensions, and experiences of university stakeholders—faculty, students, and administrators—regarding institutional digitization processes.
- A structured survey for teachers and students, incorporating dimensions such as technological familiarity, perceptions of AI use, barriers to access, and digitally mediated teaching experiences.

- A document analysis matrix, based on ethical, political, and pedagogical criteria, which allows for a critical evaluation of institutional digital transformation policies from a situated and critical perspective.

These instruments, systematized and presented in the annexes of the study, were not applied in this research phase, but constitute a methodological input aligned with the epistemic principles of this research. Their design aims to facilitate future contextualized empirical explorations that are sensitive to the diverse realities of Latin American universities, thereby contributing to the development of robust interpretive frameworks for analyzing the phenomenon.

Finally, we recognize as a limitation of this study the impossibility of directly contrasting the documentary findings with the perceptions of key actors, which will be a necessary line of inquiry in the future. However, the robustness of the documentary corpus analyzed and the rigor of the comparative procedure strengthen the internal validity of the results.

RESULTS

This section summarizes the findings obtained from the critical analysis of scientific literature, doctoral theses, public academic interviews, institutional reports, and documents from multilateral organizations. The interpretive logic guiding this section responds to a sociocritical stance that prioritizes contextualization, epistemic ethics, and the pedagogical assessment of the digitization and adoption processes of artificial intelligence in Latin American higher education.

Digitization concentrated on administration, with weak pedagogical integration

An analysis of institutional documents reveals notable progress in the digitization of university administrative processes—enrollment, assessment, academic management, and attendance monitoring—but this contrasts with the limited effective incorporation of technologies in teaching and learning practices. This disparity suggests an instrumental logic that prioritizes organizational efficiency over pedagogical transformation. In several cases, institutional plans lack a clear strategy for teacher support or meaningful pedagogical integration of AI. This reinforces a technocratic view of digitization that marginalizes its educational dimension.

Absence of robust ethical frameworks for the use of AI

Most of the universities analyzed do not have explicit ethical protocols for the use of artificial intelligence in academic settings. While some regulations mention general principles such as “transparency” or “data security,” these concepts are not translated into verifiable practices. This institutional weakness exposes education systems to risks linked to algorithmic surveillance, the depersonalization of learning, and the reproduction of biases in evaluation processes. The lack of participatory deliberative spaces to decide on the use of AI reinforces the asymmetry between educational actors and technology developers.

Structural gaps in infrastructure, capacities, and access

The documents analyzed reveal significant inequality between urban and rural universities, as well as between public and private institutions, in terms of connectivity, technological equipment, and teacher training. This asymmetry translates into fragmented digitization, which tends to replicate existing patterns of structural exclusion. Some institutions report multiple uncoordinated platforms, sporadic or non-existent training, and resistance stemming from a lack of institutional support. Far from being a homogeneous process, digital transformation reflects the territorial and socioeconomic tensions inherent in the Latin American university system.

Limited faculty participation in technological decision-making

Despite the prominent role assigned to faculty in digitization plans, in practice, teachers play a secondary role in defining technology policies. Administrative teams or technology units often make decisions without significant consultation with academic communities. This phenomenon manifests itself in an underutilization of available resources, low pedagogical appropriation of tools, and an institutional climate of uncertainty or mistrust regarding the future role of teachers in the face of increasing automation.

Digital transformation as a structural phenomenon

Digital transformation in higher education should not be understood solely as a process of technological modernization, but as a structural mutation that reconfigures the conditions under which academic knowledge is produced, circulated, appropriated, and legitimized. This phenomenon is not limited to the acquisition of infrastructure or platforms, but profoundly alters pedagogical links, institutional structures, and the meanings that guide university work.

From the perspective of the authors of this study, digital transformation in Latin America requires a critical

view that transcends technological determinism. It is necessary to problematize the power structures that sustain it, the historical gaps that condition it, and the social orientation that should guide it. Along these lines, Castells⁽¹⁾ warns that the network society has subordinated the institutional logic of knowledge to market and efficiency dynamics, affecting the public purposes of education. For his part, Cobo⁽²⁾ points out that technological availability does not guarantee meaningful educational innovation, which depends on intentional processes of critical digital literacy, pedagogical reflection, and institutional coherence.

In line with this view, the authors of this paper argue that any technological incorporation in the university must guarantee more than connectivity; it must promote pedagogical meaning, cultural relevance, and structural equity. Otherwise, digitization risks becoming a merely instrumental process disconnected from real educational needs.

From this same perspective, Selwyn⁽³⁾ insists that educational technology is not neutral, but rather a field of cultural and political dispute. Institutional enthusiasm for digitization does not always translate into substantive improvements in learning, but in many cases, it reinforces practices of surveillance, control, and exclusion. Artificial intelligence, for example, can personalize educational experiences, but it can also be used to classify, punish, or render invisible students who do not meet established algorithmic parameters.

Authors such as Boaventura de Sousa Santos⁽⁴⁾ and Walsh⁽⁵⁾ warn that the digital transformation in Latin American universities must be thought of from a southern epistemology that prioritizes community knowledge, cognitive justice, and institutional autonomy. It is not a question of importing technocratic models from the global north, but of building our own proposals that are contextualized, participatory, and culturally relevant.

Salmon⁽⁶⁾ adds a key pedagogical dimension by proposing his five-stage model for online learning, which highlights the importance of interaction, tutoring, and progressive appropriation of the digital environment. However, the findings of this study show that in many universities in the region, these principles are not applied: digitization tends to focus on the transmission of content, without generating spaces for meaningful participation or critical thinking.

Along the same critical lines, Giroux⁽⁷⁾ warns of the danger of a pedagogy subordinated to market logic and instrumental efficiency. For this author, the university must be preserved as a public space for resistance and emancipation. When technology is imposed without ethical reflection or educational purpose, it risks emptying the educational experience of critical content and intellectual autonomy.

Watters⁽⁸⁾ and Weller⁽⁹⁾ have problematized the rise of technosolutionism, the narrative that posits that any educational crisis can be solved by adopting decontextualized technological solutions. This view obscures the material, social, and cultural conditions that determine the quality of access, participation, and appropriation of technologies in our universities.

Based on the documentary analysis carried out, empirical evidence has been identified that reaffirms this critical approach. The National University of Colombia, for example, proposes a model of digital transformation based on institutional leadership, strategic management, and organizational culture.⁽¹⁰⁾ However, it has been found that this model prioritizes administrative aspects, leaving pedagogical and ethical dimensions in the background. Similarly, researchers at the Autonomous University of Baja California⁽¹¹⁾ show that policies promoted by multilateral organizations tend toward standardization and decontextualization rather than inclusion and educational justice.

Regarding the use of artificial intelligence, an Argentine thesis published on ResearchGate⁽¹²⁾ reveals that, although AI is perceived as a tool for personalizing learning, it also raises concerns about the replacement of human judgment, algorithmic surveillance, and the dehumanization of teaching. For his part, Sánchez Perdomo⁽¹³⁾ from Colombia, proposes integrating AI tools with the competency-based approach, but his model requires ethical and pedagogical validation to avoid uncritical technological dependence.

Another relevant contribution is the doctoral thesis from the University of Córdoba, Spain,⁽¹⁴⁾ which classifies digital transformation into seven dimensions. Although its proposal is broad, its applicability to the Latin American context is limited if it is not adapted to the challenges of inequality, institutional fragmentation, and low connectivity that characterize many universities in the region.

Based on this assessment, the authors of this study identify a worrying phenomenon: the implementation of educational platforms and technologies has often been promoted without a fundamental transformation of pedagogical models. Digitization is thus reduced to a migration of content, without renewing methodologies, strengthening the teacher-student relationship, or enhancing the active role of students as knowledge builders.

Added to this is the contradiction between institutional discourses on innovation and the everyday reality of teachers and students. Despite the rhetoric on digital modernization, many universities lack sustained teacher training policies, adequate infrastructure, or democratic participation mechanisms to decide on the use of technologies. This gap between the symbolic and the operational generates mistrust, attrition, and a failure to harness the transformative potential of technologies.

From an evaluative perspective, the benefits of digital transformation are not denied: it has expanded access, made learning times and places more flexible, and promoted internationalization and innovation

experiences. However, these advances have been uneven and, in many cases, superficial.

The authors argue that, for digital transformation in higher education to be socially meaningful, it must be guided by an ethical, pedagogical, and humanistic horizon. This implies resisting the logic of performance over thinking, coverage over quality, and control over autonomy.

In short, this axis confirms that digital transformation in universities is neither automatic nor neutral. It requires critical thinking, institutional will, inclusive policies, and a sustained commitment to social and epistemic justice. This guiding foundation underpins all further development of this work.

Artificial intelligence, pedagogy, and academic ethics

The incorporation of artificial intelligence (AI) in higher education has generated growing debate in Latin America and globally. This is not merely a technical innovation, but rather a structural transformation that challenges ethical, pedagogical, institutional, and epistemological dimensions of the educational process. From the critical perspective adopted in this study, AI represents an ambivalent tool: it can enrich learning environments, personalize teaching, and optimize processes, but it can also introduce forms of surveillance, standardization, and dehumanization if it is not thoughtfully integrated into the educational ecosystem.

Various authors^(25,26,27,28) agree that excessive technological promises and a lack of critical evaluation mark AI in education. In line with this, this study warns that many Latin American universities have begun to implement AI tools without solid ethical frameworks, sufficient teacher participation, or in-depth institutional analysis, which could lead to uncritical and functionalist technological dependence.

From a pedagogical perspective, Peñalvo⁽²⁹⁾ recognizes the potential of AI to personalize learning trajectories, provided that student autonomy and the principles of cognitive diversity are respected. However, this potential can only be achieved in contexts where there is adequate teacher training, a supportive institutional culture, and clear pedagogical policies, conditions that are still fragile in many Latin American universities, as evidenced by institutional studies in Ecuador and Argentina.⁽¹⁰⁾

On the ethical front, Watters⁽³⁰⁾ and Selwyn⁽³⁾ have warned of the risks associated with algorithmic surveillance and automated assessment. Educational trust, privacy, and pedagogical integrity can be compromised if AI systems are adopted without transparency, auditability, and equity criteria. In this sense, this study highlights the urgency of implementing institutional policies that guarantee democratic governance over the use of these technologies, avoiding algorithmic bias and the displacement of human judgment.

Doctoral studies, such as that by López Morales in Mexico,⁽⁹⁾ have shown that the uncritical use of AI can erode the teacher-student bond, weakening the affective and dialogical dimension of the educational process. The automation of teaching, although efficient, can reduce learning to mechanical operations, contravening the fundamental principles of Latin American critical pedagogy.

In response to this, some proposals are emerging as viable alternatives. Chávez Solís et al.⁽³⁰⁾ propose a participatory ethical framework for the implementation of AI in universities, based on the co-creation of policies with teaching and student stakeholders. Similarly, the methodological model proposed by Sánchez Perdomo⁽²²⁾—which articulates the development of competencies with AI tools—is an example of meaningful integration. However, its scalability requires additional empirical and regulatory validation.

One of the main challenges, a criterion upheld in this work by the authors, does not lie in access to these technologies but in the lack of robust regulatory frameworks and pedagogical guidelines to ensure their ethical, contextualized, and sovereign use. While some regions have made progress in regulations and strategies, their absence in many countries poses the risk of fragmented and uneven implementation.

At the methodological level, most of the research reviewed uses qualitative designs, content analysis, and institutional case studies^(10,30) which demonstrates a relevant but still scattered theoretical basis. Greater regional coordination is needed to link technical knowledge with critical pedagogical approaches so that AI is integrated as an ally and not as a substitute for Latin American educational thinking.

From this critical perspective, it is pertinent to incorporate the analysis of virtual learning environments (VLEs) as part of the digital ecosystem transformed by AI. Over the last two decades, VLEs have been a key infrastructure for educational digitization, and their role was evident during the COVID-19 pandemic. However, the emergence of intelligent platforms raises a fundamental question: will VLEs be superseded or will they coexist with AI in a transformative synergy?

This study argues that AVEs should not be understood as obsolete environments, but rather as platforms in transition. AI can enrich them through content personalization, adaptive tutoring, and continuous assessment.^(31,32) However, without coherent integration strategies, there is a risk of fragmentation of the educational process, as evidenced by recent institutional reports.

Furthermore, in contexts of high inequality, where deficiencies in connectivity and teacher training persist, VLEs remain an accessible and organizing tool. Their replacement by intelligent systems would not only be unlikely but also pedagogically inappropriate. The key lies in the articulation between both environments, based on complementarity and inclusion.

In short, the Latin American university digital ecosystem must move toward the ethical integration of

artificial intelligence, without losing sight of the principles of educational justice, technological sovereignty, and critical training. Universities have a duty to build frameworks for participatory governance, solidarity-based financing, and regional alliances that ensure that AI does not deepen gaps, but rather contributes to a more just, humane, and transformative higher education.

Comparative analysis and proposal for institutional policies

Digital transformation: uneven progress and the need for coordinated regional action

The comparative analysis of six public universities in Latin America—located in Mexico, Colombia, Cuba, Ecuador, Brazil, and Chile—identified common patterns, significant divergences, and structural gaps in institutional strategies for digital transformation and the incorporation of artificial intelligence. While each institution has made particular progress, shared challenges remain that limit the consolidation of an ethical, inclusive, and situated digital education model.

In general terms, the institutional policies analyzed focus on technological upgrading and the digitization of administrative services, but show weak pedagogical integration and little ethical focus on the use of emerging technologies. Only two of the universities included in the study have specific documents regulating the use of AI in academic processes, and none have institutional protocols to ensure the participation of students and teachers in technological decision-making.

This disparity calls for a rethinking of current approaches from a systemic and cooperative perspective. The region urgently needs to articulate regional platforms for technological cooperation, common ethical frameworks, and differentiated policies capable of responding to institutional heterogeneity without replicating external models that are alien to the context. Digital transformation cannot be understood as a race for innovation, but rather as a collective process that guarantees cognitive justice, technological sovereignty, and educational equity.

Table 1. Critical comparison of institutional policies for digital transformation and the implementation of artificial intelligence in Latin American public universities

Country	University analyzed	Digital Transformation (DT)	Implementation of Artificial Intelligence (AI)	Document Accessibility
Mexico	Autonomous University of Baja California (UABC)	Presents a solid institutional strategic plan with clear objectives in infrastructure and digital governance.	It is launching pilot programs in virtual tutoring, with little associated pedagogical or ethical evaluation.	High level of access to documents, annual reports, and public interviews in institutional media.
Colombia	National University of Colombia	Has developed a comprehensive digital transformation model with an emphasis on administrative, and organizational transformation.	Initial exploration phase to integrate AI into evaluation processes, with no clear institutional guidelines or framework.	Partial documentation available; limited access to formal interviews and up-to-date reports.
Cuba	University of Havana	Addresses DT in scattered internal documents, without a unified policy or stable resources allocated.	No evidence of AI use in institutionalized academic or administrative processes.	Difficult access to updated official data; indirect references and informal interviews predominate.
Ecuador	Technical University of Loja (UTPL)	Develop a robust policy with a pedagogical, ethical, and contextualized approach in the Andean region.	Integrate AI into continuous assessment and performance analysis processes with significant teacher participation.	Broad access to official documents, academic publications, and public interviews.
Brazil	Federal University of Minas Gerais (UFMG)	Links its TD to national policies, with sustained technical and institutional guidance.	Develops AI projects in teaching and research, although no institutional ethical framework has yet been defined.	Good availability of official reports, although student participation in the discourse is limited.
Chile	University of Chile	Has an institutional digital policy linked to national strategies for inclusion and quality.	Develops pilot experiences in adaptive systems, although there is still no detailed pedagogical regulatory framework.	High accessibility to sources, open interviews, and digital platforms for institutional transparency.

The primary sources used to construct the comparative table and support the data for each university in the article are institutional documents, public policies, and publicly available academic literature. The details of the type of source and origin for each country/university included are provided below:

I. Mexico - National Autonomous University of Mexico (UNAM)

Primary source:

- UNAM Digital Transformation Strategy 2020-2024.

- Official website of the CUAED (Coordination of Open University, Educational Innovation, and Distance Education).
- Institutional publications on the use of AI in digital tutoring and assessment processes.

II. Colombia - National University of Colombia

Primary source:

- Institutional Strategic Plan for Digital Transformation 2021-2026.
- Documents published in the Higher Education Observatory.
- Academic articles and theses in the UNAL Repository on pilot projects with AI.

III. Cuba - University of Information Sciences (UCI)

Primary source:

- Reports from the Cuban Society Computerization Program.
- Publications from the Cuban Ministry of Higher Education (MES).
- Presentations from the 2022 International University Congress.

IV. Ecuador - Technical University of Loja (UTPL)

Primary source:

- UTPL 2022 Digital Transformation Implementation Report.
- Institutional publications on the use of AI and adaptive tools.
- Academic policy documents and virtual education models.

V. Brazil - Federal University of Rio Grande do Sul (UFRGS)

Primary source:

- Institutional Development Plan and Digital Transformation Plan (2020-2025).
- Publications from the Distance Education Center.
- Theses and articles on AI experiences in university teaching.

VI. Chile - University of Chile

Primary source:

- UChile Digital Strategy 2021-2025.
- Publications from the Teaching and Learning Center.
- Studies by the Observatory of Higher Education and the Digital Society.

In addition to these institutional sources, bibliographic references cited in the article ^(9,10,22,30) were used, as well as regional reports from ECLAC, UNESCO, and the IDB (Inter-American Development Bank), which allow for the contextualization and interpretation of the policies and practices observed.

Based on the comparative analysis, the authors identify a profound heterogeneity in institutional approaches, scope, and priorities regarding digital transformation and the adoption of artificial intelligence (AI) in Latin American public universities. While some institutions, such as the UTPL in Ecuador or the University of Chile, have advanced and coordinated strategies, others—such as the University of Havana—show regulatory gaps, poor systematization, and structural limitations that compromise their response capacity. This inequality reflects not only budgetary or technical differences, but also epistemic and political divergences regarding the role of the university in the contemporary digital landscape.

A key finding is that, even though most of the universities analyzed have made progress in digitizing administrative services, only a few have managed to integrate the pedagogical and ethical dimensions into their institutional policies. In this regard, a worrying trend can be observed: digital transformation is often seen as a technical or functional objective, disconnected from pedagogical debate, the participation of the university community, and critical reflection on the social and epistemological impacts of AI use. The lack of specific ethical protocols and participatory mechanisms reinforces the risk of an uncritical and top-down adoption of technologies that can reproduce forms of control, exclusion, or standardization in educational practice.

Consequently, the authors argue that an urgent strategic reorientation is needed in Latin American public universities, based on principles of cognitive justice, technological sovereignty, and pedagogical responsibility. This reorientation must articulate common regulatory frameworks, lines of regional cooperation, ongoing teacher training, and participatory design of digital policies. The digital transformation of universities cannot be conceived as a simple indicator of modernity, but rather as a structuring process of the Latin American educational project, in which ethics, equity, and contextualization must occupy a central place. Only in this way will it be possible to advance toward a model of a critical, democratic digital university committed to the diverse reality of our peoples.

Proposal for institutional policies for inclusive digital transformation

Based on the evidence gathered, strategic guidelines and recommendations are formulated to guide the design and implementation of robust institutional policies that are coherent and aligned with the sociocultural realities of Latin America.

STRATEGIC GUIDELINES WITH MEASURABLE OR ACHIEVABLE ACTIONS

1. Technological sovereignty and university autonomy

Objective: Reduce dependence on external platforms.

Measurable actions:

- Design and implement at least one open-source institutional educational management platform in each public university in the region.
- Develop an institutional technology dependency index (IDTI) that measures the use of external software and services versus in-house solutions on an annual basis.

2. Digital equity as a guiding principle

Objective: Reduce technological gaps between urban and rural contexts.

Measurable actions:

- Implement scholarship policies for internet access and devices for 30 % of students in digitally vulnerable conditions.
- Measure annually the level of effective connectivity (bandwidth and access time) of students and teachers in rural regions and compare its evolution.

3. Critical digital literacy

Objective: Increase reflective digital competence among educational actors.

Measurable actions:

- Establish institutional training pathways with at least three levels of certification (basic, intermediate, advanced) in critical digital literacy for 100 % of the teaching staff within three years.
- Apply pre- and post-training assessments that measure the development of ethical, pedagogical, and technical skills.

4. Participatory digital governance

Objective: Democratize decisions on digital policies.

Measurable actions:

- Establish a Digital Advisory Council at each university with representation from students, faculty, administration, and management.
- Approve institutional regulations that require any large-scale decision on technological implementation to be submitted for public consultation.

5. Ethical evaluation of artificial intelligence

Objective: To ensure the responsible and contextualized use of AI.

Measurable actions:

- Create digital ethics committees in at least 70 % of national universities, with annual public reports evaluating emerging technologies.
- Develop and apply an ethical impact matrix to evaluate all new digital tools before their institutional adoption.

DIFFERENTIATED RECOMMENDATIONS FOR KEY ACTORS

1. For governments

a. Fund national plans for digital transformation in universities

- Key actors: Ministries of Education, Finance, and Science and Technology; cooperation agencies; public universities.
- Specific actions:
 - Create structured funds with criteria based on territorial gaps and institutional vulnerability.
 - Include educational digitization as a priority component in higher education budgets.
 - Encourage continuous teacher training as a mandatory condition for access to funding.

b. Create national regulatory frameworks on AI in education

- Key actors: Congresses, data protection agencies, ministries of justice and education, universities.
- Specific actions:

- Promote laws that regulate the use of educational algorithms and guarantee algorithmic justice.
- Define transparency standards for AI platforms used in universities.
- Establish minimum ethical requirements for technology agreements between universities and private companies.

c. Promote public consortia for educational innovation

- Key actors: State universities, R&D centers, ministries, and multilateral organizations.
- Specific actions:
 - Fund university technology development laboratories with a socio-pedagogical approach.
 - Create inter-institutional open innovation systems for the production of regional educational software.
 - Promote interoperability between Latin American public platforms.

2. For universities

a. Design institutional digital transformation plans

- Key actors: Management teams, teachers, students, ICT and academic units.
- Specific actions:
 - Conduct participatory assessments of digital culture, infrastructure, and training needs.
 - Define strategic roadmaps with specific timeframes, indicators, and budgets.
 - Create internal observatories on digital equity and AI use.

b. Establish ethical and pedagogical standards for the use of AI

- Key actors: Academic councils, ethics committees, pedagogical departments.
- Specific actions:
 - Approve internal guidelines on AI that include aspects of bias, transparency, and human evaluation.
 - Create institutional protocols on student and teacher data protection.
 - Form digital ethics committees with interdisciplinary participation.

c. Foster digital teaching learning communities

- Key actors: Faculty, teacher training units, inter-university networks.
- Specific actions:
 - Promote study circles and teaching practices on successful technological experiences.
 - Recognize educational innovation based on ethical and pedagogical criteria with incentives.
 - Document, share, and scale up good pedagogical practices with technology.

3. For regional and international organizations

a. Support regional platforms for technological cooperation

- Key actors: UNESCO, OEI, ECLAC, MERCOSUR, leading universities.
- Specific actions:
 - Fund common repositories of open educational resources in Spanish and Portuguese.
 - Create a Latin American educational cloud with free services for public universities.
 - Support expert exchanges and interregional knowledge transfer.

b. Promote common frameworks for digital quality assessment

- Key actors: Accreditation bodies, university networks, education observatories.
- Specific actions:
 - Design shared minimum standards for platforms, materials, and virtual environments.
 - Implement solidarity-based technology audits among universities in the region.
 - Establish digital quality indicators with a focus on rights, diversity, and sustainability.

c. Promote regional observatories on digital inclusion and ethics.

- Key actors: Think tanks, educational NGOs, universities, multilateral agencies.
- Specific actions:
 - Coordinate the production of annual reports on gaps, algorithmic biases, and regional progress.
 - Promote collaborative research on AI in education and equity.
 - Facilitate the creation of a Latin American charter on educational sovereignty and digital transformation.

PRIORITY ACTIONS FOR AN INCLUSIVE AND CRITICAL DIGITAL TRANSFORMATION

Based on the analysis carried out, priority actions are proposed, divided into three time frames. Each one responds to a logic of feasibility and sustainability, seeking to articulate the means, ends, and actors involved for their effective implementation.

I. Short term (1-2 years): Lay the minimum institutional foundations

- Conduct participatory institutional assessments of digital divides
 - *Objective:* Identify inequalities in access, training, infrastructure, and perception of technology use.
 - *Actors:* ICT departments, planning units, innovation centers.
 - *Measurement:* Availability of public reports with indicators disaggregated by faculty and vulnerable population.
- Train teaching staff in the pedagogical, ethical, and contextualized use of technologies
 - *Objective:* Strengthen critical digital skills in the areas of teaching, assessment, management, and digital citizenship.
 - *Actors:* Academic vice-rectors, teacher training centers.
 - *Measurement:* Number of certified programs implemented; assessment of impact on actual practices.
- Establish institutional ethical protocols for the use of artificial intelligence
 - *Objective:* To regulate the use of automated systems in assessment, management, and academic tutoring.
 - *Actors:* Ethics committees, legal departments, university councils.
 - *Measurement:* Approval and implementation of guidelines, and their periodic review by academic communities.

II. Medium term (3-5 years): Consolidate institutional capacities and knowledge networks

- Develop proprietary educational management platforms with intelligent functions
 - *Objective:* Strengthen technological sovereignty and adapt digital environments to local realities.
 - *Actors:* ICT departments, university-public enterprise partnerships, regional consortia.
 - *Measurement:* Number of active interoperable platforms; levels of customization and algorithmic transparency.
- Consolidate national and inter-university research networks in critical digital education
 - *Objective:* Generate situated, interdisciplinary, and proactive knowledge on educational innovation and technology.
 - *Actors:* Research groups, public agencies, academic associations.
 - *Measurement:* Indexed scientific output, inter-institutional meetings, externally funded projects.
- Promote legal frameworks on data protection, transparency, and algorithmic justice
 - *Objective:* Prevent the exploitation of sensitive educational information and ensure fairness in automated decision-making.
 - *Actors:* Governments, universities, ombudsmen.
 - *Measurement:* Approved regulations, sanctions applied, digital audits conducted.

III. Long term (5-10 years): Transform the university model from an ethical and emancipatory perspective

- Build a critical, inclusive, and contextualized digital university
 - *Objective:* Overcome the instrumental model of digitization by articulating technology, pedagogy, and social justice.
 - *Actors:* University community, regional networks, international organizations.
 - *Measurement:* Inclusion of criteria for cognitive justice, diversity, and equity in institutional strategic plans.
- Establish regional standards for critical digital literacy
 - *Objective:* To guarantee digital training that empowers individuals, beyond technical operability.

- *Actors*: Mercosur Educativo, UNESCO, educational networks.
- *Measurement*: Publication of common curriculum frameworks, national implementation, comparable indicators.
- Align technological innovation policies with democratic and cultural principles
 - *Objective*: Subordinate technology to emancipatory educational ends, avoiding its use as a tool for control or exclusion.
 - *Actors*: States, universities, civil society.
 - *Measurement*: Social participation in policy design, independent monitoring, results in inclusion and cultural relevance.

This proposal constitutes a dynamic framework for action that must be contextualized in each country and university, respecting local realities but guided by universal principles of justice, inclusion, and educational sovereignty. As a replicable methodological proposal, the annexes present some of the analytical tools used: the Interview Guide, the Structured Survey, the Criteria for Document Analysis, and the Systematization of Emerging Categories. Although not directly applied in this study, these tools provide a solid basis for future empirical research in this area.

DISCUSSION

The digital transformation in Latin American higher education cannot be understood as a technical, neutral, or inevitable process. It requires a situated reading that articulates structural, political, pedagogical, and epistemic dimensions. Based on the analysis carried out, five interpretive axes are proposed that allow for a critical understanding of the advances, limitations, and tensions that shape university digitization in the region.

Predominance of administrative digitization over pedagogical transformation

The findings show that the universities analyzed have prioritized the automation of administrative processes—such as enrollment, document management, and academic monitoring—over pedagogical innovation and the transformation of teaching practices. This technocratic bias reproduces a logic of instrumental efficiency, rather than strengthening the educational bond and critical development of students.^(13,34) Authors such as Benavides⁽¹⁵⁾, Trillas⁽¹⁶⁾, and Lion⁽¹⁷⁾ warn that this approach can deepen structural gaps and limit the democratizing potential of digital technologies in contexts marked by inequality.

Fragmentation and inconsistency in institutional policies

Comparative analysis reveals a notable dispersion in digital transformation policies. The absence of integrated regulatory frameworks, systematic evaluation mechanisms, and a long-term strategic vision has led to isolated initiatives that are dependent on circumstantial leadership or external resources. This fragmentation prevents the construction of sustainable digital ecosystems that are ethical and consistent with pedagogical and institutional realities.^(16,17)

Low teacher and student participation in technology governance

One of the most worrying findings is the systematic exclusion of teachers and students from the selection, design, and evaluation processes of technological tools and digital infrastructures. This lack of participatory governance not only affects the legitimacy of the decisions taken but also reduces the critical appropriation of technologies by their key actors.^(13,38) The disconnect between technical decisions and everyday educational practices accentuates resistance, superficial uses, or unreflective dependencies.

Limited training in critical digital literacy

Most of the institutions studied show weaknesses in teacher training programs focused on digital skills with an ethical, reflective, and contextualized approach. Training often focuses on operational aspects (use of platforms, basic tools) and does not incorporate ethical, epistemic, or sociocultural dimensions of technology use.^(10,13,40) This shortcoming limits teachers' ability to integrate technology as a transformative pedagogical resource and reinforces an instrumental and uncritical view of the digital environment.

Tensions between algorithmic efficiency and educational justice

The growing incorporation of artificial intelligence in educational processes raises profound dilemmas about equity, autonomy, and cognitive justice. While AI can personalize learning and automate processes, it can also lead to exclusion, surveillance, and standardization if applied without solid ethical frameworks and contextual adaptations.^(35,36,41) In Latin America, where structural inequalities and digital divides persist, importing algorithmic models without critical mediation represents a form of “digital coloniality”,⁽⁷⁾ that jeopardizes the epistemic and pedagogical sovereignty of our universities.

Evaluative synthesis and epistemological projection

This set of findings confirms that digital transformation cannot be addressed solely from a technical or economic perspective. It involves disputes over meaning, power configurations, and visions of the future regarding the role of the university in society. From the critical perspective that guides this study, key lessons are identified:

- Digital transformation must be understood as a cultural and political project, not just as technological modernization.
- AI in education must be guided by a formative, ethical, and humanistic logic, not as a punitive or control mechanism.
- The active participation of teachers and students in technological decision-making processes is a necessary condition for their pedagogical legitimacy.
- The development of coherent and sustainable institutional policies requires regional coordination, public commitment, and a firm commitment to digital justice.

In this context, the role of Latin American universities goes beyond the adoption of tools: they must lead the creation of ethical, pedagogical, and regulatory frameworks that guarantee emancipatory digitalization that is situated and at the service of the common good.^(42,43)

CONCLUSIONS

This study confirmed that the digital transformation in Latin American higher education is advancing in an uneven and fragmented manner, with notable differences between institutional contexts, state structures, and levels of technological development. While there are notable initiatives, tensions between technological modernization and educational justice prevail.

Through a comparative analysis of institutional documents, public policies, specialized literature, and case studies, it was found that university digitization continues to focus on administrative and management aspects, with little pedagogical coordination and low participation of educational actors in decision-making. Artificial intelligence, meanwhile, is being incorporated in an incipient manner, without ethical frameworks or clear regulations to ensure equitable, transparent, and humanistic use.

In line with these findings, concrete strategic guidelines were proposed to guide digital transformation based on the principles of technological sovereignty, digital equity, critical literacy, and participatory governance. Differentiated recommendations were also outlined for governments, universities, and regional organizations, adapted to the structural and cultural challenges of the region.

Priority actions were identified and prioritized in three time frames (short, medium, and long term) to promote a phased, evaluable, and sustainable process. These actions were accompanied by a replicable methodological proposal that includes qualitative instruments (interview guide, structured survey, document matrix) for future research.

In summary, it is concluded that a genuinely inclusive and emancipatory digital transformation requires overcoming the instrumentalist approach and committing to a critical, technologically sovereign, and pedagogically situated university. Only through dialogue between innovation, ethics, and epistemic justice will it be possible to reimagine the role of higher education in building a more equitable and democratic regional future.

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