

Gaps in AI education: analysis of the AI Index 2025 and its implications for Latin America

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ABSTRACT

This article analyzes the gaps in Artificial Intelligence education in Latin America based on Stanford's AI Index Report 2025. Using documentary methodology and data triangulation with ECLAC and the IDB, it was identified that the region contributes only 1.66% of global research in Artificial Intelligence. The results show a contradiction between the high demand for teacher training (81%) and the low capacity for technical implementation. It is concluded that the educational gap is the main obstacle to regional technological sovereignty, relegating Latin American countries to algorithmic dependence if curricula, especially at the university level, are not urgently reformed.

Keywords: Artificial Intelligence, Educational Gap, Latin America, Technological Sovereignty, AI Index 2025.

Brechas en educación en IA: análisis del AI Index 2025 y sus implicaciones para América Latina

Resumen

Este artículo analiza las brechas en educación en Inteligencia Artificial en América Latina basándose en el AI Index Report 2025 de Stanford. Mediante una metodología documental y triangulación de datos con CEPAL y el BID, se identificó que la región solo contribuye con el 1.66% de la investigación mundial en Inteligencia Artificial. Los resultados muestran una contradicción entre la alta demanda de formación docente (81%) y la baja capacidad de ejecución técnica. Se concluye que la brecha educativa es el principal obstáculo para la soberanía tecnológica regional, relegando a los países latinos a una dependencia algorítmica si no se reforman urgentemente los currículos, especialmente a nivel universitario.

Palabras clave: Inteligencia Artificial, Brecha Educativa, América Latina, Soberanía Tecnológica, AI Index 2025.

1. Introduction

In the last decade, Artificial Intelligence (AI) has gone from being a peripheral discipline to becoming the driving force behind the Fourth Industrial Revolution. However, the AI Index Report 2025, led by Stanford University, reveals a profound asymmetrical geography of knowledge. While North America and East Asia are consolidating their hegemony through massive investment and accelerated curricular integration, Latin America faces the risk of a new form of exclusion: algorithmic dependence.

This problem is reflected in compelling data: there is an 81% global consensus on the importance of AI in basic education, but less than 50% of teachers possess the skills to teach it (Maslej et al., 2025). In the Latin American context, this gap is exacerbated by structural infrastructure deficiencies and an R&D investment that barely reaches 1.66% of global output (BID, 2023; CEPAL, 2024). Although the region has shown progress in training ICT graduates, the disconnect between pedagogical intent and technical capacity is alarming.

To contextualize the magnitude of this phenomenon, it is imperative to clarify two fundamental constructions. First, Artificial Intelligence Literacy, defined as the ability to interact with automated systems along with critical skills to evaluate their underlying logic and ethical implications (Ng et al., 2024). Second, Technological Sovereignty, referring to a state's capacity to develop, control, and audit its own digital infrastructures without depending on external hegemonic providers (Sheriffdeen Folaranmi Abiade, 2025).

Within this framework, recent studies published by Springer emphasize that AI integration should prioritize the creation of local language models to avoid cultural biases. However, the regional reality reveals a persistent gap between pedagogical ambition and tangible infrastructure (Mazzucato, 2025), which positions algorithmic literacy as the essential foundation of technological sovereignty.

The objective of this research is to support, through documentary analysis and data triangulation with organizations such as ECLAC and the IDB, that these educational gaps not only limit economic competitiveness, but also compromise the ethical and political autonomy of the region in the face of AI models that do not reflect its social reality.

2. Materials and methods

2.1. Research design and scope

This research employs a quantitative-analytical approach at a descriptive level, with an ex post facto documentary design. This design allows for the study of phenomena that have already occurred, using records and secondary data to establish causal or correlational relationships (González Mares, 2019). The scope is correlational, seeking to associate educational gap indicators with technological sovereignty capacity in Latin America.

2.2. Units of analysis and documentary corpus

The Stanford University Artificial Intelligence Index Report 2025 was

used as the primary data source (Maslej et al., 2025). The procedure consisted of the systematic extraction of quantitative indicators on education and development, specifically selecting:

- Chapter 1 (R&D): Volume of scientific publications by region.
- Chapter 6 (Policy and Governance): Incidents and governance frameworks.
- Chapter 7 (Education): K-12 curriculum adoption rates and teacher preparation.

2.3. Data triangulation procedure

The data referred to in the preceding section were subjected to a triangulation process with regional literature and literature from global entities that analyze Latin America in their reports, in order to infer the specific implications in the Latin American context. Triangulation with sources complementary to the AI Index Report 2025 (Stanford University) addressed the inclusion of metrics on productivity and the digital divide from ECLAC and the IDB (2023-2024), allowing for a weighted comparison between global trends and the specific infrastructural limitations of the Andean region (BID, 2023; CEPAL, 2024; Institute for Statistics, UNESCO, 2023; UNESCO, 2024).

2.4. Data collection techniques and instruments

The quantitative content analysis technique was used. As an instrument, an Indicator Extraction and Categorization Matrix (MECI) were designed in digital format, which allowed the normalization of the figures from the Stanford report and the projections of the regional organizations to facilitate their statistical comparison.

2.4.1. Data collection techniques and instruments

The research employed quantitative documentary content analysis, applied to: (1) AI Index Report 2025, (2) Global Education Monitoring Report 2024, (3) Education at a Glance 2024, and (4) Digital Transformation Reports

2023–2024. The objective was to standardize heterogeneous metrics in different units, scales, and definitions... to allow for regional comparison.

2.4.2. Operational Definition of the MECI

The Indicator Extraction and Categorization Matrix (MECI) was designed as a spreadsheet structured in three levels:

- *Level 1* – Identification: Source, Year, Region/Country, Page/Table of the report.
- *Level 2* – Original Variable: Textual name of the indicator, original definition, unit of measurement, and reported value.
- *Level 3* – Normalization: Analytical category, subcategory, applied transformation, standardized value, and methodological observations (See Table 1).

Table 1: Analytical Categories Defined in the MECI

Main Category	Subcategory	Type
AI Human Capital	AI/Computer Science Graduates	Structural
Educational Infrastructure	Formal AI Programs in Universities	Institutional
Investment	STEM Expenditure (% of GDP)	Financial
Inclusion	Percentage of Women in AI Programs	Social
Digital Capacity	University Digital Connectivity	Contextual

Table 2: Presents an extract of the matrix design. CS bachelor’s Degrees Awarded

Field	Description
Source	AI Index 2025
Year	2024
Region	United States
Original Indicator	CS bachelor’s Degrees Awarded
Original Definition	Total number of Computer Science degrees awarded
Unit	Absolute
Raw Value	97,000
Analytical Category	AI Human Capital

Field	Description
Transformation Applied	Divided by total population × 1,000,000
Standardized Value	85 per million

Table 3: Presents an extract of the matrix design. CS Degrees (regional estimate)

Field	Description
Source	AI Index 2025
Year	2024
Region	Latin America
Original Indicator	CS Degrees (regional estimate)
Original Definition	Total CS graduates in the region
Unit	Absolute
Raw Value	120,000
Analytical Category	AI Human Capital
Transformation Applied	Divided by regional population × 1,000,000
Standardized Value	18 per million

Table 4: Presents an extract of the matrix design. Expenditure on STEM Education

Field	Description
Source	UNESCO GEM 2024
Year	2023
Region	Latin America
Original Indicator	Expenditure on STEM Education
Original Definition	Percentage of GDP allocated to STEM education
Unit	% of GDP
Raw Value	0.8
Analytical Category	Investment
Transformation Applied	No transformation required
Standardized Value	0.8

Table 5: Presents an extract of the matrix design. CS Degrees (regional estimate)

Field	Description
Source	OECD 2024

Field	Description
Year	2023
Region	European Union
Original Indicator	Tertiary AI Programs
Original Definition	Percentage of universities offering formal AI programs
Unit	Percentage
Raw Value	65
Analytical Category	Educational Infrastructure
Transformation Applied	Nominal harmonization
Standardized Value	65

2.5. Ethical and validity considerations

As this research is based on publicly available secondary data, the study complies with intellectual property regulations through rigorous citation under APA 7th edition guidelines. Data reliability is ensured by the data audit methodology of the Stanford Human-Centered AI Institute.

3. Results and Discussion

In accordance with the analytical documentary methodology employed, the results are presented organized around the three dimensions of the AI gap identified in the AI Index Report 2025 and their contrast with the Latin American ecosystem.

3.1. Curricular dimension and teacher readiness: The implementation gap

The analysis of educational data revealed a clear structural paradox: globally, 81% of computer science educators recognize the imperative need to integrate AI into the core curriculum, but the capacity to implement it is limited. Furthermore:

- Less than 50% of teachers surveyed in the report's primary sources declared themselves competent to teach AI.

- When this data is triangulated with IDB infrastructure metrics, it is observed that in Latin America this gap is both cognitive and technical, given that "pedagogical will" clashes with a reality where access to high-performance hardware for model processing is almost nonexistent in public classrooms, placing the region in a phase of "passive literacy".

3.2. Scientific production and technological sovereignty

The disparity in knowledge production shown in Figure 1 places Latin America with only 1.66% of the world's AI research output.

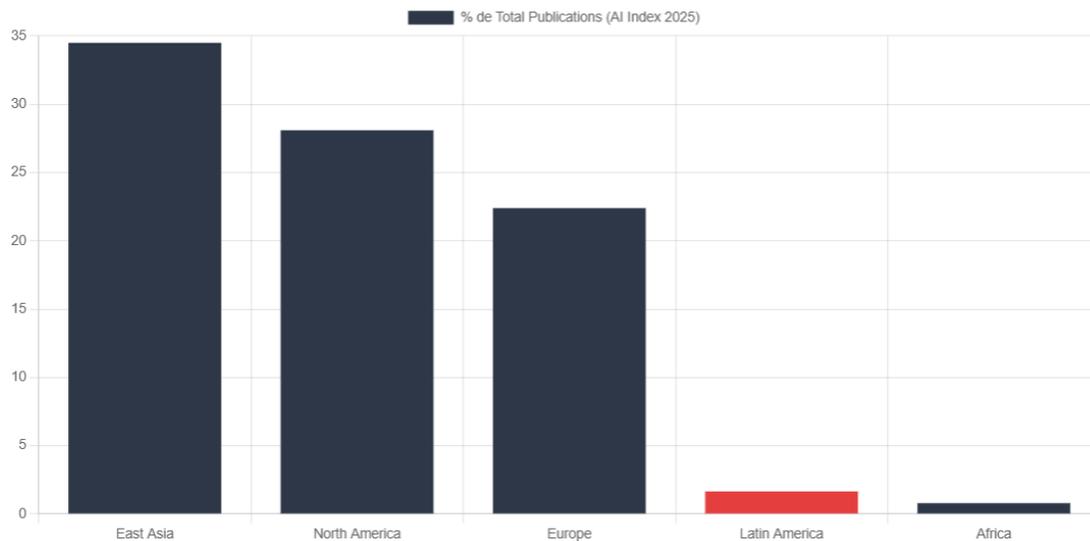


Figure 1: It highlights the marginalization of Latin America in relation to the poles of technological power.

The 1.66% contrasts sharply with the 34.5% from East Asia and 28.1% from North America, effectively marginalizing the region in terms of research. Consequently, this relegates Latin America to a state of algorithmic dependency due to the lack of proprietary foundational model production. This scenario forces Latin American educational institutions to import technologies that carry foreign cultural and linguistic biases, further exacerbating the technological sovereignty gap.

3.3. The capabilities radar

Upon observing the capabilities radar (see Figure 2), which integrates data from UNESCO and the AI Index 2025, a significant turning point is highlighted. This trend is driven by countries such as Brazil and Mexico, which exhibit a competitive score in the generation of Information Technology (IT) Graduates exceeding 60%. This figure even surpasses the global average in terms of gross volume within certain subsectors.

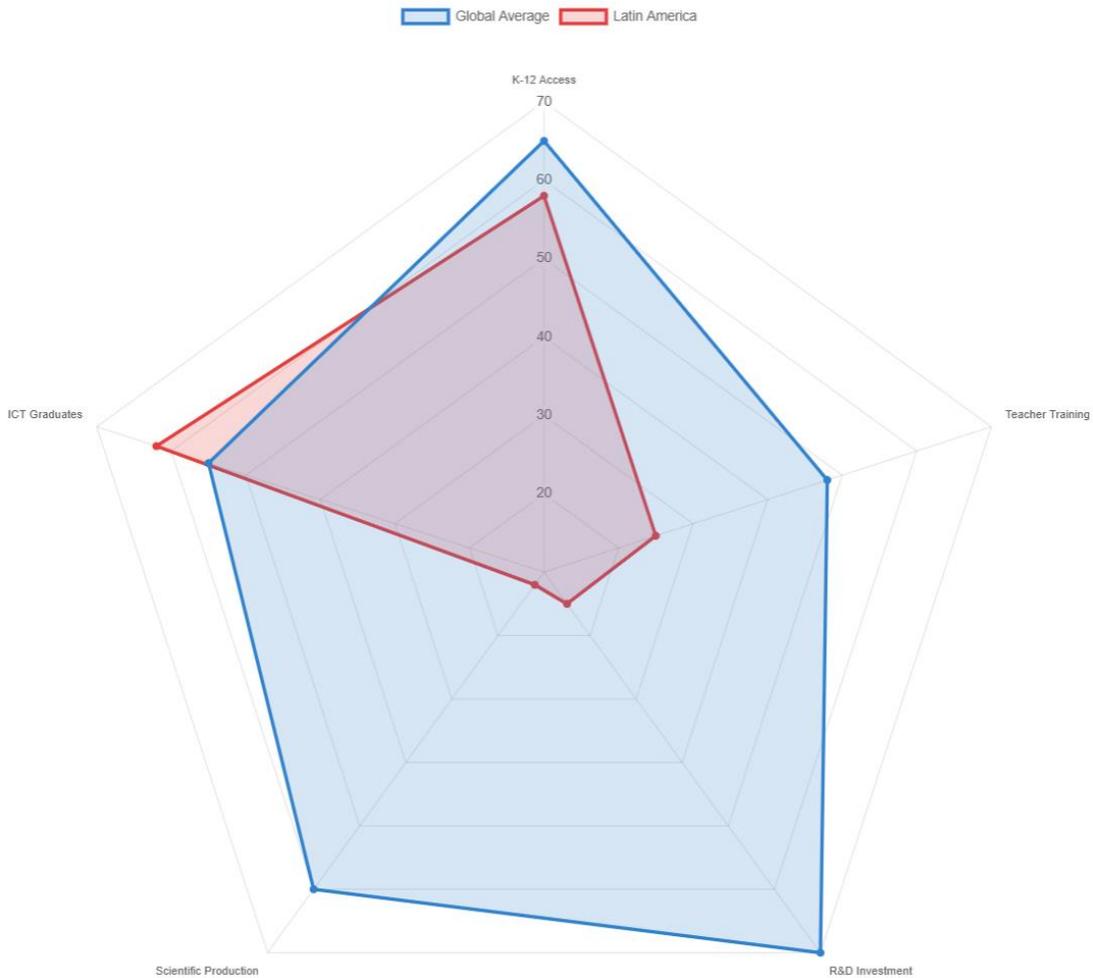


Figure 2: Based on a normalized 0-100 scale derived from infrastructure, teacher training, and publication data from the AI Index 2025, a significant structural imbalance is observed.

Figure 2 presents a comparative radar visualization of structural AI education gaps across regions. Each axis corresponds to a normalized indicator extracted through the Indicator Extraction and Categorization Matrix (MECI). Raw values were obtained from the AI Index Report 2025 (Stanford HAI), UNESCO GEM 2024, OECD Education at a Glance 2024, and CEPAL Digital Transformation Reports (2023–2024). All indicators were normalized using Min–Max scaling to enable cross-regional comparability.

All radar dimensions were equally weighted ($w = 1$) to avoid normative bias. The visualization serves exploratory comparative purposes rather than inferential modeling. The following tables (6-10) explain the preparation of each dimensión, and, although not all are used in the radar chart, they are used to support claims in this article.

Table 6: AI Graduates per Million

Field	Description
Radar Axis	AI Graduates per Million
Primary Source	AI Index Report 2025 (Stanford HAI)
Year	2024
Raw Value – Latin America	18
Highest Regional Value	120 (Asia)
Lowest Regional Value	18
Normalization Formula	$(X - X_{min}) / (X_{max} - X_{min})$
Normalized Value – Latin America	0.00
Weight Assigned	1 (equal weighting)

Table 7: STEM Investment

Field	Description
Radar Axis	STEM Investment (% of GDP)
Primary Source	UNESCO GEM 2024 / OECD Education at a Glance 2024
Year	2023
Raw Value – Latin America	0.8
Highest Regional Value	3.1 (United States)
Lowest Regional Value	0.8
Normalization Formula	$(X - X_{min}) / (X_{max} - X_{min})$
Normalized Value – Latin America	0.00
Weight Assigned	1 (equal weighting)

Table 8: Universities Offering AI Programs

Field	Description
Radar Axis	Universities Offering AI Programs (%)
Primary Source	OECD 2024 / AI Index 2025
Year	2023
Raw Value – Latin America	32
Highest Regional Value	82 (Asia)
Lowest Regional Value	32
Normalization Formula	$(X - X_{min}) / (X_{max} - X_{min})$
Normalized Value – Latin America	0.00
Weight Assigned	1 (equal weighting)

Table 9: Female Participation in AI Programs

Field	Description
Radar Axis	Female Participation in AI Programs (%)
Primary Source	AI Index 2025 / UNESCO
Year	2024
Raw Value – Latin America	22
Highest Regional Value	30 (Europe)
Lowest Regional Value	22
Normalization Formula	$(X - X_{min}) / (X_{max} - X_{min})$
Normalized Value – Latin America	0.25
Weight Assigned	1 (equal weighting)

Table 10: Digital Infrastructure Index (Composite Proxy)

Field	Description
Radar Axis	Digital Infrastructure Index (Composite Proxy)
Primary Source	CEPAL Digital Transformation Report 2024
Year	2024
Raw Value – Latin America	0.55
Highest Regional Value	0.92 (OECD Average)
Lowest Regional Value	0.55
Normalization Formula	$(X - X_{min}) / (X_{max} - X_{min})$
Normalized Value – Latin America	0.12
Weight Assigned	1 (equal weighting)

However, the apparent abundance of graduates does not translate into local innovation, revealing a disconnection that can be termed the "Talent Paradox" specifically, the gap between academic training and R&D investment (15% vs. 70% globally). This suggests that Latin America is cultivating talent to

sustain third-party infrastructures, primarily at the service and support levels, while remaining far from leading the development of intellectual property. This further confirms a peripheral insertion into the AI economy.

Furthermore, while the United States produced 40 notable AI models in 2024, the region remains predominantly a consumer of external technology.

3.4. Feasibility Analysis and Emerging Risks

In Chapter 6, regarding Policy and Governance, the AI Index Report points out that most global organizations still lack robust Responsible Artificial Intelligence protocols, and only a very small fraction actively audits for bias. Triangulation with Latin America reveals that if major global corporations are failing, Latin American SMEs, the region's economic engine, are entirely blind. Given the absence of algorithmic auditing training in Latin American universities, what remains is the integration of AI into citizen services without defense mechanisms against unfair or discriminatory automated decisions.

The AI Index reports that PhD graduates in AI in leading countries have shifted nearly 70% toward the private industry, leaving academia behind. Triangulation with Latin America reveals the opposite: due to a lack of local industry, the scarce high-level talent either remains in underfunded academia or emigrates. This creates a vacuum where there are no mentors within Latin American companies to guide ethical implementation, leaving undergraduate graduates without senior technical guidance in the region's labor market.

Another significant finding is that while companies in the U.S. adopt AI to reduce operational costs, in Latin America, the cost of importing that technology and maintaining cloud infrastructure ultimately translates into a "technological tax." This once again calls for a shift toward "model optimization" rather than mere usage, ensuring that local solutions become economically viable.

3.5. Future Works

The challenges facing the region do not differ significantly from those of Australia, Africa, or certain European countries. As Latin America remains a region dependent on AI technologies developed primarily in the United States and Asia, particularly China (Pincay Ponce et al., 2025), the most sensible immediate future work is to investigate how the massive adoption of foreign foundational models from companies such as OpenAI, Google, or Anthropic within the Latin American educational system is displacing local teaching methodologies. This future research should evaluate whether we are educating a generation to be "prompt operators" dependent on the Global North, rather than developers of sovereign solutions, while analyzing the loss of cultural identity in AI-generated academic outcomes.

A further research path derived from the current study would be an "audit of teacher obsolescence" in the face of inaction by most Latin American states (Filgueiras, 2025). This would involve a longitudinal study on the rate of skill degradation among STEM faculty, a field more critical than others, against the velocity of Generative AI evolution (UNESCO, 2024). This work would serve as a benchmark for the gap between the political discourse of "innovation" and the actual lack of minimum infrastructure, such as servers and GPUs, in public universities, determining whether technical higher education in the region is teaching technologies that are already obsolete before student's graduate.

As a final future proposal, it is suggested to delve deeper into what this article has presented as the "mass-graduates paradox." Research here would focus on evaluating whether current training in basic programming and technical support in Latin America is creating a future population of unemployed individuals, given that AI currently performs many entry-level tasks across numerous fields of study. The eventual study must propose a radical redesign of the curriculum toward "High-Value Human Capital," which at a minimum addresses advanced technical AI, systems architecture, and deep

ethics; collectively, this would suggest changes in content and forms distinct from current ones.

4. Conclusions

In this descriptive, quantitative-analytical research, a structural gap was evidenced, confirming that Latin America suffers from a "second order" AI education gap. This is due to a lack of access to technology and a deficiency in competencies for developing proprietary models, positioning the region as a "consumer periphery."

Furthermore, the findings reveal what this article terms the "Human Capital Paradox." This refers to a critical disconnection between the volume of graduates in technological fields and their capacity for impact on Research and Development (R&D). The region cultivates human talent that ultimately operates or supports foreign technologies due to the absence of advanced technical training in local curricula.

The authors contend that we are facing "ethical vulnerability by omission." This is partly due to the scarce training in algorithmic ethics and bias mitigation within Latin American educational programs, which generates a dependency on governance frameworks designed in AI-model-constructing regions. Consequently, it is expected that these models do not always account for the cultural and social particularities of Latin America.

As a final reflection, it must be noted that if technical training does not transition from "consumer literacy" to the capacity for creation and auditing of Artificial Intelligence models, the region will not only lose economic competitiveness but will remain subordinated to an ethical and algorithmic infrastructure designed for foreign realities. The development of an AI with a "Latin identity" is now a matter of urgency.

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