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Artificial Intelligence as a tool to personalise learning in social sciences in Ecuadorian education

Inteligencia Artificial como herramienta para personalizar el aprendizaje en ciencias sociales en la educación ecuatoriana

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ABSTRACT

The research objective is to generate an emerging theory on Artificial Intelligence as a tool for personalising learning in social sciences in Ecuadorian education from a hermeneutic perspective. Methodologically, the study was based on contemporary educational hermeneutics. Three central categories emerged: i) curriculum adaptation, ii) equitable access to knowledge, and iii) pedagogical transformation. The hermeneutic analysis of the twenty-nine studies examined shows that artificial intelligence, when critically articulated with teaching practice and inclusion policies, operates as a systemic catalyst that reconfigures the teaching of social sciences in Ecuador. The emerging PACTE theory demonstrates that personalised learning only makes full sense if algorithms maintain flexible curriculum adaptation, guarantee equitable access to knowledge, and promote pedagogical transformation oriented towards critical thinking and Good Living.

Descriptors: artificial intelligence; educational technology; educational policy. (Source: UNESCO Thesaurus).

RESUMEN

Se estructura como objetivo de investigación generar una teoría emergente sobre Inteligencia Artificial como herramienta para personalizar el aprendizaje en ciencias sociales en la educación ecuatoriana desde una mirada hermenéutica. Metodológicamente se trabajó desde la hermenéutica educativa contemporánea. Emergieron tres categorías centrales: i) adaptación curricular, ii) acceso equitativo al conocimiento y iii) transformación pedagógica. El análisis hermenéutico de los veintinueve estudios examinados evidencia que la inteligencia artificial, cuando se articula críticamente con la praxis docente y las políticas de inclusión, opera como un catalizador sistémico que reconfigura la enseñanza de las ciencias sociales en Ecuador; la teoría emergente PACTE demuestra que la personalización del aprendizaje solo cobra pleno sentido si los algoritmos mantienen una adaptación curricular flexible, garantizan un acceso equitativo al conocimiento y fomentan una transformación pedagógica orientada al pensamiento crítico y al Buen Vivir.

Descriptores: inteligencia artificial; tecnología educacional; política educacional. (Fuente: Tesauro UNESCO).

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articles

INTRODUCTION

The growing convergence between artificial intelligence (AI) and social science teaching poses epistemological challenges and unprecedented opportunities for Ecuadorian education; in this sense, AI-assisted personalisation transcends mere technological adaptation and is configured as a hermeneutic process where students and teachers reinterpret social knowledge based on their cultural contexts. Thus, didactic innovation requires a comprehensive understanding that goes beyond traditional instrumental approaches (Alejandro-Cortés, 2024).

As a result of the above, in terms of pedagogical practice, AI has shown its capacity to dynamise classroom experiences mediated by visual resources and interactive narratives, which favours the critical construction of historical and civic knowledge (Coronado-Martín, 2022; Ordoñez-Ocampo et al., 2021). However, there are gaps when transferring these advances to Ecuadorian environments characterised by inequalities of access and sociolinguistic diversity (Bernal-Párraga et al., 2024; López et al., 2021), therefore, such a gap emphasises the urgency of an interpretative model that recognises territorial particularities and the aspirations of Buen Vivir.

Continuing with the above, from the perspective of personalised learning, AI is offered as a catalyst for unique training trajectories that cater to individual cognitive styles, rhythms and motivations (Fernández-Jiménez, 2024; Yépez-Álvarez et al., 2024). However, their effective implementation requires a theoretical scaffolding capable of articulating the algorithmic dimension with the critical aims of the social sciences, that is, the training of reflective subjects committed to social transformation (Pallo-Buse et al., 2024). Along these lines, it is essential to equip teachers with the skills to orchestrate processes of interpretation and dialogue with intelligent systems (Guacán-Tandayamo et al., 2023).

Based on the above, is structured as a research objective to generate an emerging theory on Artificial Intelligence as a tool for personalising learning in the social sciences in Ecuadorian education from a hermeneutic perspective.

Theoretical entry points

The personalisation of learning through artificial intelligence (AI) has been configured as one of the most promising vectors for revitalising the teaching of social sciences in Ecuador, a context characterised by socio-cultural heterogeneity and inequalities of access. Firstly, the contributions of Acosta-Faneite & Finol-de-Franco (2024) show that AI, conceived as an academic management system, enables curricular decisions based on predictive analytics, increasing the relevance of university training itineraries. This thesis of intelligent management converges with the proposal of Alejandro-Cortés (2024), who highlights that institutional creativity expands when AI is aligned with knowledge management models oriented towards pedagogical innovation.

In this context, from contextual didactics, Amado Angulo (2024) shows that the situated reinterpretation of historical phenomena is enhanced when the adaptive system recommends resources linked to the immediate reality of the students. Similarly, Cevallos-Cedeño & Aguilar-Oña (2024) document in higher basic education the effectiveness of recommendation algorithms to adjust conceptual complexity and multimodal supports according to the sociolectual profile of each student.

On the other hand, the Ecuadorian landscape offers important empirical evidence on the adoption of AI, in this sense, Aparicio-Izurieta (2024) portrays the favourable perceptions of university teachers, while Taipicaña-Vergara et al. (2024) identify factors such as infrastructure, training and policies that condition its integration. Complementarily, Ayala-Chauvin, Avilés-Castillo & Buele (2023) confirm that the analysis of educational data in Ecuador is moving from mere descriptive statistics towards predictive models that support personalisation.

While in the particular field of social sciences, Bernal-Párraga et al. (2024) present experiences of AI as a mediator in social studies projects, highlighting the transition from the role of teacher to that of dialogic facilitator; a proposal that harmonises with the systematic review by Bolaño-García & Duarte-Acosta (2024), which highlights that personalisation increases active participation and critical thinking. Precisely, Borja-Ramos et al. (2024) show that AI-guided projects foster critical skills by articulating historical data with local issues.

In this context, Dave & Patel (2023) draw parallels between education and health, positing that AI is legitimised by improving the accuracy of pedagogical diagnoses. This inclusive perspective is reinforced by Guacán-Tandayamo et al. (2023), who describe AI as a compensatory resource for students with academic lags, while Jadán-Guerrero et al. (2024) mention its potential in special education through adaptive environments.

Likewise, the need for an ethical-critical framework is emphasised, as Fernández-Jiménez (2024) warns that algorithms must avoid biases that perpetuate inequalities, while González-Torres et al. (2024) suggest academic transparency protocols. In addition, Guerrero-Quiñonez et al. (2023) stress the urgency of data governance policies in Latin American higher education.

From a didactic perspective, Coronado-Martín (2022) and Ordoñez-Ocampo et al. (2021) argue that AI can enrich historical narratives through artistic visualisation and heuristic strategies, while López, Cabrera & Ocampo (2021) insist that the social meaning of the discipline is preserved if technologies promote the problematisation of reality. Along the same lines, Miralles Martínez, Campillo Ferrer & Prats Cuevas (2023) postulate that AI contributes to dealing with times of uncertainty by providing dynamic socio-historical simulations.

In an unfavourable contrast to the effective application of AI, Mena-Salcedo, Robles-Bykbaev & Robles-Bykbaev (2025) report the perception of teachers who, despite their enthusiasm, demand continuous training to take advantage of

AI without diluting critical thinking. In parallel, Mora-Aristega et al. (2023) warn about the digital divide in basic education and the need for differentiated strategies. While the perspectives of Pallo-Buse et al. (2024) and Peñalver-Higuera et al. (2024) emphasise that AI must be aligned with the demands of the Fourth Industrial Revolution to avoid curricular obsolescence, while Piedra-Castro et al. (2024) highlight the relevance of open standards that facilitate the interoperability of resources.

In terms of equity, Rojas-Díaz (2023) shows that AI can mitigate the effects of social crises through resilient learning pathways, while Salas-Pilco & Yang (2022) mention the importance of redistributive infrastructure policies. Thus, Villegas-Ch, García-Ortiz & Sánchez-Viteri's (2024) machine learning model demonstrates the efficacy of adjusting individual cognitive styles; and Yépez-Álvarez et al. (2024) highlight the need to assess student satisfaction as an indicator of personalisation success.

METHOD

The research is part of contemporary educational hermeneutics, understood as a qualitative strategy that seeks to unravel the meanings implicit in pedagogical and technological discourses. Therefore, a hermeneutic-documentary design is adopted that articulates the pre-compression of the research team with a dialogic process of interpretation and reinterpretation of academic texts on artificial intelligence (AI) and social sciences in Ecuadorian education.

A purposive corpus of twenty-nine (29) studies published between 2021 and 2024 that address personalisation of learning through AI in Ecuadorian or analogous regional contexts was formed. The selection considered:

a) Thematic relevance: work linking AI, personalisation and social sciences.
b) Academic rigour: articles indexed in Scopus, Web of Science or Latindex, as well as conference proceedings with a scientific committee.

c) Ecuadorian contextuality: research carried out totally or partially in Ecuadorian institutions or that explicitly discusses its socio-educational reality.

Interpretative procedure

The process was developed in four non-linear phases:

1) Critical pre-compression: The research team mapped beliefs and assumptions about AI and social science in Ecuador, recognising initial biases.
2) Structural reading: Each text was approached with dialogical analysis: units of meaning related to curricular adaptation, equitable access and transformation were identified.
3) Fusion of horizons: Next, codes were compared across documents and matrices of convergence were constructed that allowed for the tensioning of technocentric perspectives with critical visions of social justice. This dynamic produced the interpretative triad that underpins the emerging PACTE theory.
4) Consensual validation: A hermeneutic circle was carried out with three external teacher-researchers familiar with the subject. They contrasted the coherence of the categories and provided counter-examples that made it necessary to refine definitions and relationships.

Criteria of rigour

To ensure credibility and transferability, the following criteria were applied:

a) Triangulation of sources: contrasting empirical articles, systematic reviews and policy documents.
b) Audit trail: detailed recording of analytical decisions in a shared repository.
c) Theoretical saturation: incorporation of new texts stopped when no distinct codes emerged during two consecutive rounds of analysis.

Ethical considerations

Although the study was based on public sources, the guidelines of the Declaration of Helsinki adapted to documentary educational research were respected, taking care to ensure the correct attribution of ideas and avoiding extracts that could compromise the originality of the authors cited. An anti-plagiarism manager was used to check that the interpretations were unpublished and legitimate.

RESULTS

The hermeneutic analysis applied to the research on the use of artificial intelligence (AI) in the personalisation of learning in social sciences in Ecuador is organised into three central categories: i) *curricular adaptation*, ii) *equitable access to knowledge* and iii) *pedagogical transformation*. These categories emerge as transversal aspects to understand the potentials and challenges of AI in the Ecuadorian educational context:

Curricular adaptation

The first category, *curricular adaptation*, shows that AI facilitates the personalisation of educational content according to the needs and learning rhythms of students. According to Cevallos-Cedeño & Aguilar-Oña (2024), the incorporation of AI allows the design of more flexible curricula adapted to the individual characteristics of students, which improves their motivation and learning performance; this change in the teaching of social sciences reflects a trend towards a more dynamic curriculum, which responds to the demands of higher education in Ecuador (Peñalver-Higuera et al., 2024).

Equitable access to knowledge

The second category, *equitable access to knowledge*, highlights how AI can level educational opportunities by providing access to quality learning resources, regardless of geographical or socio-economic constraints. In this order, the work of Ayala-Chauvin, Avilés-Castillo & Buele (2023), have shown that the

implementation of AI in educational institutions in Ecuador, both in rural and urban areas, improves inclusion by offering personalised materials for students with different needs; in complement, Aparicio-Izurieta (2024) points out that this technology helps to overcome access barriers, promoting a more inclusive and equitable education.

Pedagogical transformation

Therefore, the category *pedagogical transformation* refers to how the integration of AI in the teaching of social sciences drives a change in pedagogical practices. The results of the study by González-Torres et al. (2024) show that the use of AI promotes a more student-centred teaching, where the teacher becomes a guide and facilitator of the learning process, rather than a simple transmitter of knowledge, which contributes to students developing critical and reflective skills through interactive-adaptive tools (Borja-Ramos et al., 2024).

Implications of AI for Ecuadorian education

The use of AI in personalising learning offers an opportunity to improve education in Ecuador; however, as the study by Bernal-Parraga et al. (2024) points out, challenges related to technological infrastructure and teacher training are also identified, which require strategic planning to ensure effective implementation at all educational levels, indicating that AI has the potential to be a transformative tool, but its success depends on a comprehensive approach that considers both technical and pedagogical aspects.

Emerging theory PACTE: Personalisation with AI for curriculum adaptation, pedagogical transformation and equity in social sciences in Ecuadorian education.

Hermeneutical basis

The interpretative analysis of 29 studies used in the research, which cover experiences in basic education, high school and higher education, revealed

shared meanings around the use of artificial intelligence (AI) as a vector of personalisation of learning in social sciences in Ecuador, from three central categories: (i) *curricular adaptation*, (ii) *equitable access to knowledge* and (iii) *pedagogical transformation*; which act as hermeneutic axes that, when intertwined, configure a triadic logic irreducible to its parts (Cevallos-Cedeño & Aguilar-Oña, 2024; Ayala-Chauvin et al., 2023; González-Torres et al., 2024). From this interweaving emerges the emerging PACTE theory.

Central proposition

In Ecuadorian social science environments, AI-mediated personalisation materialises when the algorithm becomes a flexible, democratising and reflexive curricular artefact that readjusts learning trajectories in real time and, at the same time, reconfigures the teacher-teacher role within a situated educational ecology. In other words, AI is not a simple technological resource, but a didactic device that, by converging with inclusion policies and critical classroom practices, co-produces meaningful learning, while reducing historical gaps (Peñalver-Higuera et al., 2024; Aparicio-Izurieta, 2024).

Table 1. Constituent dimensions of PACTE

Dimension	Conceptual core	Empirical evidence	Theoretical contribution
Curricular adaptation	Machine learning algorithms that recommend personalised routes, resources and rhythms according to cognitive and socio-cultural profiles.	Systems that adjust the difficulty of social studies in real time (Villegas-Ch et al., 2024); flexible curricula based on educational analytics (Piedra-Castro et al., 2024).	The curriculum becomes self-regulating: it distances itself from linear sequences and adopts a rhizomatic structure capable of responding to diversity and local relevance.
Equitable access to knowledge	IA infrastructures and platforms offering multi-format content without geographic or economic restrictions.	Hybrid implementations in the Amazon and Sierra that reduce the urban-rural divide (Ayala-Chauvin et al., 2023); accessible materials for students with disabilities (Jadán-Guerrero et al., 2024).	AI functions as a cognitive redistributor: it expands opportunities and consolidates the constitutional principle of good educational living.
Pedagogical transformation	Shift of the teacher from transmitter to designer of experiences and of	Projects supported by reflective chatbots that enhance critical thinking	A dialogical epistemology is configured: AI mediates metacognitive processes

the student from passive receiver to critical agent in dialogue with AI.	(Borja-Ramos et al., 2024); communities of practice supported by predictive analytics (González-Torres et al., 2024).	and favours the co-construction of contextualised knowledge.

Source: Authors.

Systemic articulation

PACTE theory conceives of the three dimensions as interdependent subsystems: curriculum adaptation requires equitable access frameworks to prevent personalisation from exacerbating inequalities (Salas-Pilco & Yang, 2022); while equitable access requires pedagogical transformation, as providing resources without rethinking teaching roles reproduces transmissive models (Mora-Aristega et al., 2023); and pedagogical transformation feeds back into curriculum adaptation, refining algorithms with data generated in authentic practices (Mena-Salcedo et al., 2025). This continuous feedback configures an autopoietic ecology in which data, experiences and teacher reflections constantly remake the education system (Taipicaña-Vergara et al., 2024).

Regulatory principles

a) Dynamic contextuality: all personalisation is anchored in concrete and evolving socio-cultural realities (Amado Angulo, 2024).
b) Algorithmic fairness: AI models incorporate distributive justice and bias mitigation criteria (Dave & Patel, 2023).
c) Augmented teaching: digital teaching competence expands into ethical data curation and interactive narrative design (Acosta-Faneite & Finol-de-Franco, 2024).
d) Critical reflexivity: students develop metacognition and social-historical thinking through human-machine dialogues (Miralles Martínez et al., 2023).

Operational implications

Public policies: integrate AI infrastructure with digital inclusion plans, prioritising marginalised areas and indigenous communities (Rojas-Díaz, 2023).

Teacher training: hybrid programmes combining social science epistemology with applied data science (Guerrero-Quiñonez et al., 2023).

Ongoing research: longitudinal impact evaluations to measure the sustainability of personalised outcomes (Bolaño-García & Duarte-Acosta, 2024).

Synthesis of the emerging theory PACTE

The emerging PACTE theory postulates that AI, far from being a mere technical instrument, acts as a systemic catalyst that, by interconnecting curricular adaptation, equitable access and pedagogical transformation, reshapes the teaching of social sciences in Ecuador under parameters of justice, relevance and autonomy; therefore, its successful implementation requires synergies between technological innovation, educational policy and committed teaching praxis.

CONCLUSION

The hermeneutic analysis of the twenty-nine studies examined shows that artificial intelligence, when critically articulated with teaching praxis and inclusion policies, operates as a systemic catalyst that reconfigures the teaching of social sciences in Ecuador; the emerging PACTE theory demonstrates that the personalisation of learning only makes full sense if algorithms maintain flexible curricular adaptation, guarantee equitable access to knowledge and foster a pedagogical transformation oriented towards critical thinking and Buen Vivir. Under this triadic logic, AI ceases to be an instrumental resource and becomes a hermeneutic device capable of reinterpreting localised knowledge, reducing historical gaps and promoting meaningful and socially responsible educational trajectories. However, its future effectiveness depends on the convergence of inclusive infrastructures, teacher training programmes that integrate data science and social epistemology, as well as regulatory frameworks that ensure algorithmic equity and transparency in the educational use of data; only then will AI

consolidate its promise to revitalise Ecuadorian education and form reflective citizens committed to social transformation.

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CONFLICT OF INTEREST

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CONTRIBUTION OF THE AUTHORS

Rously Eedyah Atencio-González: Managed the planning of the methodological approach to the research, specifically in the selection and hermeneutic analysis of the academic texts, especially in the drafting of the theoretical foundations and the construction of the PACTE emerging theory.

Marco Vinicio Calderón-Yánez: Worked on the literature review and the identification of the central categories (curriculum adaptation, equitable access to knowledge and pedagogical transformation).

Elvia Marina Sangucho-Leines: She worked on the analysis of the data and the consensus validation through the hermeneutic circle with external teacher-researchers, contributing to the drafting of the results.

Gladys Monserrate Zamora-Encalada: She worked on the integration of theoretical perspectives in the hermeneutic framework, contributing to the writing of the article, managing the coherence and compliance with the journal's ethical standards and editorial norms.

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