



Digital educational transformation in Ecuador: the strategic role of digital teaching competence in church-run institutions in Esmeraldas

Transformación digital educativa en Ecuador: el papel estratégico de la competencia digital docente en instituciones fiscomisionales de Esmeraldas, Ecuador

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ABSTRACT

Digital transformation in education is one of the key challenges facing contemporary education systems, driving significant transformations in teaching, learning, and organizational governance. Therefore, teachers' digital competence is a strategic element for ensuring the successful implementation of technologies in educational practice and creating an innovative, inclusive, and sustainable learning environment. However, in Ecuador, significant digital knowledge gaps persist regarding connectivity, technological resources, and teacher training, particularly in regions with more pronounced social disadvantage and greater territorial divisions (such as the province of Esmeraldas). This study seeks to investigate teachers' digital competence as a strategic catalyst in the digital transformation processes of mission-based institutions in Esmeraldas. To this end, a systematic literature review was conducted according to the PRISMA guidelines, using data available through the Scopus, Web of Science, ERIC, SciELO, and Dialnet databases. With this approach, our selection of documents facilitated the identification and analysis of research on teachers' digital competence and pedagogical innovations and educational inclusion, as well as digital leadership and educational transformation. The findings suggest that teachers' digital competence is a critical construct that underpins pedagogical innovation, improves educational inclusion, and contributes to institutional digital cultures that support lifelong learning. They also identified challenges related to technological infrastructure, teacher training, institutional leadership, and closing the digital divide. As one of the main contributions of evidence, we present the Educational Transformation Model Based on Teacher Digital Competence (MTE-CDD), where teaching vocation, digital competence, pedagogical innovation, educational inclusion, and institutional digital culture are the structural elements for achieving sustainable educational transformation in a context like Esmeraldas.

Keywords: educational leadership, organizational culture, institutional resilience, change management, territorial development.

RESUMEN

La transformación digital en la educación es uno de los desafíos clave que enfrentan los sistemas educativos contemporáneos, impulsando transformaciones significativas en la enseñanza, el aprendizaje y la gobernanza organizacional. Por lo tanto, la competencia digital del profesorado es un elemento estratégico para garantizar la implementación exitosa de tecnologías en la práctica educativa y la creación de un entorno de aprendizaje innovador, inclusivo y sostenible. Sin embargo, en Ecuador persisten importantes brechas de conocimiento digital en cuanto a conectividad, recursos tecnológicos y formación docente, particularmente en regiones con mayor desventaja social y mayores divisiones territoriales (como la provincia de Esmeraldas). Este estudio busca investigar la competencia digital del profesorado como catalizador estratégico en los procesos de transformación digital de las instituciones de base misionera en Esmeraldas. Para ello, se realizó una revisión sistemática de la literatura según las directrices PRISMA, utilizando datos disponibles en las bases de datos Scopus, Web of Science, ERIC, SciELO y Dialnet. Con este enfoque, nuestra selección de documentos facilitó la identificación y el análisis de investigaciones sobre la competencia digital del profesorado, las innovaciones pedagógicas y la inclusión educativa, así como el liderazgo digital y la transformación educativa. Los hallazgos sugieren que la competencia digital del profesorado es un constructo fundamental que sustenta la innovación pedagógica, mejora la inclusión educativa y contribuye a culturas digitales institucionales que fomentan el aprendizaje a lo largo de la vida. También se identificaron desafíos relacionados con la infraestructura tecnológica, la formación docente, el liderazgo institucional y la reducción de la brecha digital. Como una de las principales aportaciones de la evidencia, presentamos el Modelo de Transformación Educativa Basado en la Competencia Digital del Profesorado (MTE-CDD), donde la vocación docente, la competencia digital, la innovación pedagógica, la inclusión educativa y la cultura digital institucional constituyen los elementos estructurales para lograr una transformación educativa sostenible en un contexto como el de Esmeraldas.

Palabras clave: liderazgo educativo, cultura organizacional, resiliencia institucional, gestión del cambio, desarrollo territorial.

ARTICLE HISTORY

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ARTICLE INFORMATION

Main topic:

Digital transformation in Education settings

Main practical implications:

Strengthening teachers' digital competence promotes pedagogical innovation, educational inclusion, and the consolidation of sustainable institutional digital cultures, especially in vulnerable contexts such as the fiscomisional institutions of Esmeraldas.

INTRODUCTION

The development of digital tools has drastically changed how societies produce knowledge, interact, and create value. Education needs to adapt to a world where citizens live in constant connectivity, now have the means to maintain information in the form of databases and applications, and possess the skills necessary for civic participation in a knowledge society. To effect this transformation, it goes beyond simply integrating technology into the classroom; it involves rethinking pedagogies between teachers and students, student interactions, and teaching and learning methodologies (Hernández-Sellés & Massigoge-Galbis, 2024).

The so-called Education 4.0 is emerging to meet the needs of a digitized environment, fostering active methods, collaborative learning, personalized education, and the application of new educational technologies to strengthen the development of 21st-century skills. In this vision, schools are no longer just places for transmitting content, but rather living mechanisms for the development of learning and knowledge, and for innovation in an ecologically transformative environment (Herrera Azuero et al., 2025).

With the digitization of educational operations, curriculum planning, assessment, institutional communication, and learning management have been revolutionized. However, empirical work indicates that these processes are not only a function of the technological infrastructure, but also depend on the extent to which educational stakeholders are able to seamlessly integrate technologies into their pedagogical activities (Cantos Vera et al., 2025; Italia, 2025).

As a result, educational digital transformation should be described as a holistic effort that encompasses technological, innovative, leadership, and professional development for teachers. Modern teachers play a crucial role in today's educational environment. Historically understood as transmitters of knowledge, they are now seen as learning agents, designers of educational experiences, technological mediators, and promoters of life skills. This development responds to the demand that students be able to navigate complex and interconnected digital ecosystems (Macías-Gómez, 2025).

New pedagogical needs require teachers to cultivate skills to interact with, adapt, and use digital resources that foster meaningful, inclusive, and situated learning experiences. Similarly, they are also expected to promote critical thinking, digital literacy, creativity, and problem-solving using new technological tools (Ruiz Rojas et al., 2023).

In this context, teachers' digital competence has become a vital professional requirement for maintaining the relevance and quality of education. Other studies emphasize that digital competencies include pedagogical, communicative, ethical, collaborative, and innovative dimensions that, among other things, enable a transformation of educational practice and a response to the needs of 21st-century students (Orozco Buele et al., 2023; Luna-Rengel, 2025). In fact, developing these skills fosters greater pedagogical innovation, improved teacher performance, and support for institutional cultures of lifelong learning (Quijosaca Tene et al., 2025). In Ecuador, the pathways to digital transformation in education have been pursued unevenly due to digital infrastructure, connectivity, resource availability, and economic inequality across different regions. Although efforts have been made in recent decades to develop digital literacy and integrate new technologies into the educational frameworks of these countries (Loaiza Rodríguez et al., 2021; Hernández-Sellés & Massigoge-Galbis, 2024), considerable disparities persist in terms of equitable access to digital learning opportunities.

The digital divide is considered one of the greatest challenges facing Ecuadorian education. This problem is reflected not only in differences in equipment and internet access but also in differences in the application of technology to teaching and learning activities. Recent studies suggest that these problems can reinforce existing inequalities in education and hinder the development of key competencies required for inclusive participation in a digitally connected society (Chariguamán-Curipallo, 2025; Merino Casco, 2025; Sosa Zerna et al., 2025).

Esmeraldas is a relevant case study where we explore these dynamics because the area experiences many historical conditions of social and economic development, connectivity, and access to technological resources. The tensions between urban and rural areas create differentiated environments that lead to diverse conditions for implementing digital transformation policies, not only for students but also for teachers (Veloz Villarreal et al., 2025).

In this sense, private schools are central to providing educational services to different segments of society. These institutions combine a humanistic and formative mission with the need to address the challenges of modern education. However, they encounter obstacles related to resources, teacher training, and the successful assimilation of digital technologies in all their academic and administrative activities. As a result, understanding the importance of teachers' digital competence in these contexts is imperative to advance sustainable and inclusive educational adaptation procedures.

Digital educational transformation has become a priority in current education systems, but scientific evidence shows that the use of technology does not guarantee improvements in educational quality or effective educational innovation processes. The semi-private (fiscomisional) institutions within the province of Esmeraldas face problems such as digital

divides, territorial inequalities, and the need to improve teaching capacities to meet the demands of 21st-century education.

Given this situation, it is essential to analyze teachers' digital competence as a strategic factor for leading the sustainable and context-specific transformation of educational processes. Therefore, this research seeks to address the following question: How does teachers' digital competence affect the processes of digital educational transformation in semi-private (fiscomisional) institutions in the province of Esmeraldas?

This article seeks to evaluate the strategic role of digital teaching competence in the educational digital transformation process of the fiscomisional institutions in the province of Esmeraldas by evaluating recent scientific publications on digital competence, pedagogical reform, educational inclusion and digital transformation in learning contexts synthesized in a review of recent research.

THEORETICAL FOUNDATIONS

The Digital Transformation of Education

The digital transformation of education is a comprehensive process of transformation where educational technology is strategically integrated into the fabric of education, transforming the pedagogical, organizational, and cultural models of the education sector. It is no longer merely the digitization of resources or processes, but a transition; digital transformation is essentially a reconfiguration of teaching, learning, institutional administration, and knowledge creation practices to meet the needs of an increasingly connected and information-based society (Italy, 2025; Moncayo et al., 2026).

From a conceptual perspective, educational digital transformation is defined as the use of digital technology in a way that aligns with the institution's pedagogical objectives for flexible, inclusive, and student-centered learning environments. Therefore, in this sense, technology ceases to be an end in itself and acts as a tool that improves educational innovation and skills related to digital citizenship (Hernández-Sellés & Massigoge-Galbis, 2024).

The evolution of this phenomenon has varied in terms of its historical trajectories. Initially, technologies were used as a complement to support traditional teaching. Then came the advent of the internet, virtual spaces, and mobile devices, which helped make learning models more interactive and collaborative. Currently, the interaction of artificial intelligence, learning analytics, cloud computing, and open educational resources is creating a situation where educational processes are constantly being retransmitted (Herrera Azuero et al., 2025). At the international level, the most significant trends indicate a consolidation of digital educational ecosystems, an improvement in teaching and learning skills, personalized learning, hybrid education, and the creation of public policies to improve the quality of education and reduce the digital divide. Most international organizations emphasize that, in this context, digital transformation must be based on strengthening human talent, especially in the development of digital teaching skills, which has become one of the main determinants of the success of educational innovation in recent decades (Hernández-Sellés & Massigoge-Galbis, 2024).

Table 1. Evolution of digital transformation in education

Period	Key Features	Educational approach
1980s	Introduction of computers in educational institutions	Computer literacy
1990s	Expansion of the internet and multimedia resources	Access to digital information
2000–2010	Virtual platforms and e-learning	Online learning
2010–2020	Mobile learning, social networks, and open resources	Collaborative learning
2020–Present	Artificial intelligence, learning analytics, and digital ecosystems	Comprehensive educational transformation

Source: Author's own elaboration based on Italia (2025), Hernández-Sellés and Massigoge-Galbis (2024), and Moncayo et al. (2026).

Digital Teaching Competence

Digital teaching competence has, in fact, been one of the main pillars for the transformation of education in recent times. The relevance of this work lies in the fact that innovation processes have not been determined solely by access to new technologies, but rather by teachers' ability to apply these technologies critically, creatively, and pedagogically (Orozco Buele et al., 2023).

A consensus among authors is to describe digital teaching competence as the knowledge, skills, attitudes, and values that allow an educator to use digital technologies in their work related to teaching, learning, assessment, communication, and professional development. Thus, in this sense, digital competence goes far beyond simply mastering tools; it is more about creating innovative and purposeful learning experiences (Luna-Rengel, 2025; Macías-Gómez, 2025).

More recent research points to multiple dimensions of this competence. The following aspects are particularly relevant: the technological dimension, which represents how digital resources are managed; the pedagogical dimension, which considers how technology-mediated learning experiences are designed; the communicative dimension, focused on

digital interaction; the ethical dimension, related to the responsible use of information; and the innovative dimension, associated with the creation of new educational strategies (Granda Agila et al., 2025).

Considering the growing emphasis on such competences, international organizations have established a series of frameworks that guide teacher training and evaluation in digital education.

Table 2. Comparison of international frameworks for teachers' digital competence

Frame	Organization	Main focus	Key Components
DigCompEdu	European Commission	Teacher professional development through digital technologies	Professional Engagement, Digital Resources, Teaching, Assessment, and Student Empowerment
UNESCO ICT-CFT	UNESCO	Integration of ICT for sustainable educational development	Educational Policies, Curriculum, Pedagogy, and Professional Development
INTEF	Spanish Ministry of Education	Digital competence applied to teaching practice	Information, Communication, Content Creation, Security, and Problem Solving
ISTE	International Society for Technology in Education	Transforming learning through digital leadership	Facilitator, Designer, Collaborator, Leader, and Lifelong Learner

Source: Author's own elaboration based on Orozco Buele et al. (2023), Luna-Rengel (2025), and Quijosaca Tene et al. (2025).

Innovation in Pedagogy and Digital Technologies

Pedagogical innovation is one of the most important benefits resulting from the successful use of digital technology in teaching and learning environments. In addition to technological applications, innovation includes shifting teaching methods toward more active, participatory, and student-centered learning (Herrera Azuero et al., 2025).

Active learning is one of the most relevant methodologies during this transformation. Students construct their learning using project-based learning, collaborative learning, and problem-solving methods, while the teacher acts as a facilitator and guide within the learning process (Quijosaca Tene et al., 2025). Gamification has emerged as an innovative strategy that incorporates game-like features designed to stimulate motivation, participation, and engagement among students. Promoting the use of challenges, rewards, and levels to shape and activate interactive dynamics that create more engaging and meaningful learning experiences (Herrera Azuero et al., 2025).

A related trend is hybrid learning, which integrates face-to-face and virtual learning experiences to offer students greater flexibility and personalization. This allows educational processes to adapt to different contexts and needs, emphasizing the continuity of learning beyond the physical confines of educational environments (Rios Contreras et al., 2025).

Finally, personalized education is consolidating as one of the main promises of digital transformation. Intelligent technologies and learning tracking systems are used to develop personalized training programs based on the individual pace, interests, and needs of the student, in order to strengthen inclusion and improve educational outcomes.

Inclusion and Digital Culture

Digital educational transformation can only succeed if it is part of a plan designed to reduce inequality and create opportunities for democratizing access to information and knowledge. From this perspective, educational inclusion and digital culture form a dual dimension of any educational technology innovation process, and they are inseparable: on the one hand, digital culture, and on the other, it can become a common characteristic. Ensuring equitable access to digital educational resources is an important prerequisite for guaranteeing access to diverse learning experiences for all students. For example, both research and practice show that the provision of connectivity, equipment, and training remains scarce and, therefore, disproportionately affects rural, vulnerable, and peripheral areas (Chariguamán-Curipallo, 2025; Sosa Zerna et al., 2025).

At the same time, digital citizenship is a key competency of responsible, ethical, and critical behavior in digital contexts. This dimension encompasses aspects associated with the protection of personal information, the responsible use of information, coexistence in virtual spaces, and participation in digital communities (Merino Casco, 2025).

Similarly, digital literacy has emerged as a key element of the inclusive societies strategy. It goes beyond simply being digitally literate, enabling the means to understand, evaluate, generate, create, and disseminate information using digital technologies. As a result, developing an institutional digital culture involves fostering a process of continuous training for teachers, students, and administrators (Sanipatin Potosi et al., 2025).

The Ficomisional Institutions and Educational Transformation

Due to this hybrid model, ficomisional institutions occupy a special place at all levels of the Ecuadorian education system, some even operating simultaneously with state support or managing their own religious or community organizations.

Historically, these have been an increasingly important way to disseminate education and aid a diverse population. Their main characteristics are humanistic orientation, a focus on holistic education, and close partnerships with the communities in which they operate. However, like any other educational institution in the country, they face serious difficulties in adopting digital technologies and adapting to the needs of modern educational change.

The main structural barriers to change are budget constraints, insufficient technology, connectivity issues, and ongoing teacher training requirements. These limitations hinder the use of innovative strategies and restrict the use of opportunities provided by digital technologies to achieve higher-quality education (Loaiza Rodríguez et al., 2021). However, private schools also have a significant opportunity to foster innovation. Their institutional image, geographic location, and the commitment of their educational stakeholders are advantages that contribute to the development of digital cultures of inclusion, equity, and lifelong learning. Competence in digital teaching is identified as a strategic factor in this case, capable of integrating technology and pedagogical innovation, as well as the institutional transformation that seeks to lead to sustainable educational change in the province of Esmeraldas.

METHODS

Using a qualitative approach through a systematic literature review, this study was conducted to identify, analyze, and systematically interpret scientific evidence in a process of research and development regarding digital teaching competence and the process of digital educational transformation. Thus, an examination of the most recent academic perspectives on digital competencies, pedagogical innovation, educational inclusion, and institutional digital culture was carried out, with a clear focus on Latin America and Ecuador.

Systematic review is a commonly reported and established method for synthesizing scientific knowledge in order to discover and understand the current state of scientific knowledge, emerging knowledge, and develop an interpretive framework, which is widely used to interpret complex phenomena. This type of research is especially beneficial in education because, in educational research, it is advantageous to incorporate data from multiple cases, methods, and approaches to achieve an inclusive analysis of the strategic position of digital teaching competence in shaping educational transformation in both national and global educational transformation projects. This study was conducted in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, a well-cited reference for systematic reviews.

Search Strategy

From January to February 2026, a literature search was conducted using national and international scientific databases known for their academic quality and expertise in the educational and technological fields. The information sources were:

- Scopus
- Web of Science (WoS)
- ERIC (Education Resources Information Center)
- SciELO
- Dialnet

These databases were chosen to combine high-impact indexed literature with specific studies in education and publications relevant to Latin America and Ecuador. The search strategy was based on keywords relevant to digital educational transformation, digital teacher competence, pedagogical innovation, and educational institutions. To broaden the document search, Boolean operators AND and OR were used to synthesize key concepts and the corresponding languages in English and Spanish.

Main Search String

("educational digital transformation" OR "digital transformation in education" OR "educational digital transformation") AND ("teacher digital competence" OR "digital competence" OR "teacher digital competence") AND ("pedagogical innovation" OR "educational innovation" OR "pedagogical innovation") AND (Ecuador OR "Latin America")

Similarly, specific keywords related to the digital divide, educational inclusion, digital leadership, church-affiliated institutions, and institutional digital culture were used to broaden the scope of the review. The initial search identified a broad set of potentially relevant publications, which were subsequently refined and assessed for eligibility.

Inclusion and Exclusion Criteria

To ensure the quality and relevance of the analyzed studies, inclusion and exclusion criteria were established beforehand.

Table 3. Study Selection Criteria

Criteria	Inclusion	Exclusion
Publication period	Studies published between 2021 and 2026	Studies prior to 2021
Language	Spanish and English	Other languages
Document type	Scientific articles, systematic reviews, indexed book chapters, and technical documents from international organizations	Opinions, blogs, news articles, and documents without academic review
Subject area	Digital teaching competence, digital educational transformation, pedagogical innovation, educational inclusion, and digital leadership	Studies unrelated to education or digital skills
Academic quality	Publications indexed in Scopus, WoS, ERIC, SciELO, and Dialnet	Publications without verifiable academic backing
Context	Global, Latin American, and Ecuadorian studies	Studies unrelated to digital educational processes

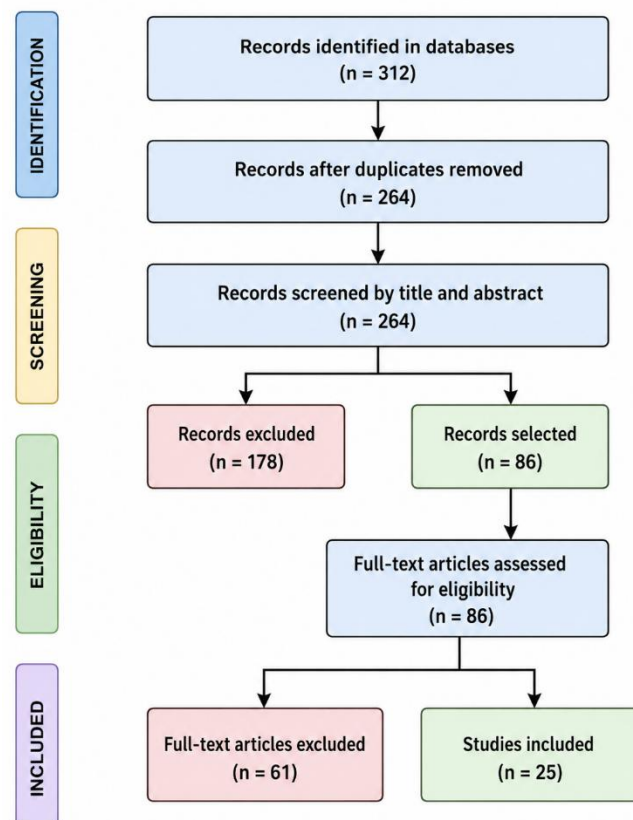
Source: Author's own elaboration.

The use of these criteria meant that only studies providing evidence relevant to the research purpose and offering different perspectives on the phenomenon under study could be included.

PRISMA Process

Documents were selected based on the four phases of PRISMA: identification, screening, eligibility, and inclusion. First, records were retrieved from the selected databases. Then, duplicate documents were removed, and an initial screening of titles and abstracts was conducted to identify their potential thematic relevance. During the eligibility phase, a thorough reading of the full texts was carried out to ensure adherence to the inclusion criteria. Finally, studies that provided evidence of a direct relationship with digital teaching competence, digital educational transformation, and the challenges of innovation and inclusion in educational contexts were selected.

Figure 1. PRISMA diagram for article selection



Source: Prepared by the authors following the PRISMA methodology.

The documentary basis for the analysis and construction of the research results was formed with the 25 studies ultimately included.

Data Analysis

The data sources were analyzed using thematic analysis and narrative synthesis techniques commonly used to conduct qualitative systematic review research. Thematic analysis helped to discover recurring patterns, emerging concepts, and significant relationships in the included studies, while narrative synthesis allowed for the integration and interpretation of findings from different contexts and research approaches. The studies were then classified into analysis categories, which were generated inductively from the predominant themes in the literature. This process facilitated the structuring of the scientific evidence and a comprehensive understanding of the phenomenon under investigation. The resulting categories were:

- Educational digital transformation.
- Teacher digital competence.
- Pedagogical innovation and digital technologies.
- Educational inclusion and the digital divide.
- Leadership and institutional digital culture.
- Challenges and opportunities for mission-based institutions.

By combining these categories, we support the construction of a systematic interpretation of the role of digital teaching competence as a strategic factor for educational transformation, and thus lay the foundation for the development of the conceptual model that would be used in this study.

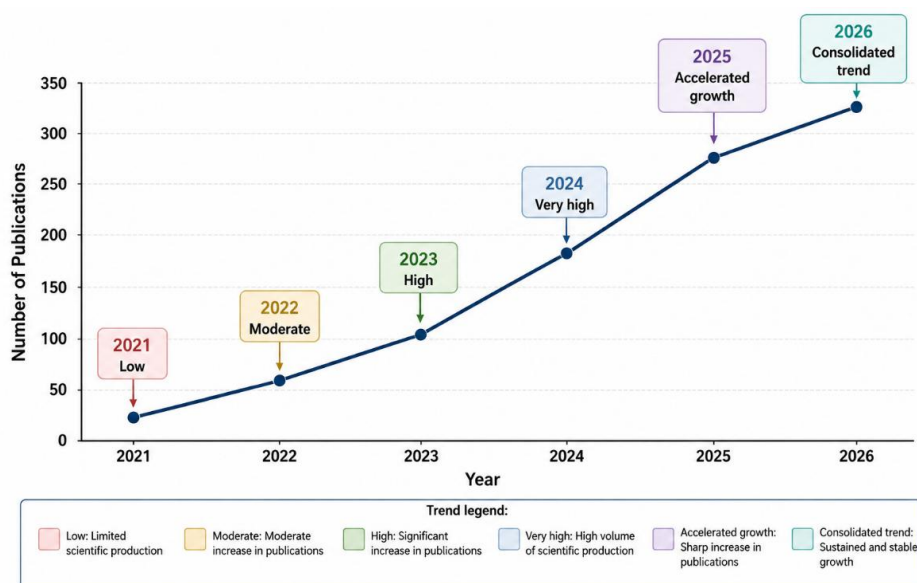
RESULTS AND DISCUSSION

Global Trends in Research on Teacher Digital Competence

Analysis of research results revealed a positive trend in scientific interest in digital teaching competence in recent years. This upward trend was particularly pronounced after the COVID-19 pandemic, a period during which educational institutions worldwide had to evolve toward virtual and hybrid teaching methods. As a result, teachers' digital skills shifted from a complementary ability to a strategic asset for promoting the continuity and quality of educational activities. As evidenced in published works, recent literature reflects a move away from models focused solely on technology, toward broader paradigms that capture pedagogical, organizational, and socio-cultural dimensions.

Research such as that by Hernández-Sellés and Massigoge-Galbis (2024), Luna-Rengel (2025), and Quindemil Torrijo et al. (2024) emphasize that teachers' digital competence is linked to innovation, inclusivity, digital leadership, and institutional change in education. Furthermore, scientific output indicates a growing interest in researching digital competencies in specific contexts, especially in Latin American nations, where disparities in access and territorial inequalities in education are considered significant shortcomings of education systems.

Figure 2. Scientific output on teachers' digital competence by year



Source: Author's own elaboration based on the studies included in the systematic review.

The examination of scientific output indicates that academic interest in teachers' digital competence has shown steady and gradual growth between 2021 and 2026. The findings suggest that as educational digitization processes advance worldwide, there is also a growing need to investigate the role teachers play in the effective integration of technologies within learning environments. This trend indicates that teachers' digital competence no longer exists as a supplementary skill, but rather as a strategic component of educational research agendas. The increasing scientific output stems from the growing understanding that the digital transformation of educational institutions requires professional teaching skills in the areas of designing, implementing, and evaluating learning experiences mediated by digital technologies. Furthermore, the increase in publications in recent years can be attributed to the changes brought about by the growth of virtual learning environments and hybrid teaching models, and the need to develop digital competencies in response to contemporary educational challenges. This development gives rise to new research concerns in pedagogical innovation, educational inclusion, digital leadership, and professional teaching development.

Most Relevant Dimensions of Teachers' Digital Competence

One of the most reliable findings identified in the reviewed literature is the multifaceted nature of teachers' digital competence. Studies indicate that this competence is not only about using equipment from an instrumental perspective, as well as the skills associated with the technology the teacher uses, but also includes pedagogical, communicative, ethical, and innovative skills that are the foundation for transforming educational practice. This review revealed that the most commonly cited dimensions are technological and pedagogical; communicative; ethical; and innovative. These dimensions are mutually reinforcing and inform a professional profile that can address the challenges facing education today.

Table 4. Dimensions Identified in the Literature on Teachers' Digital Competence

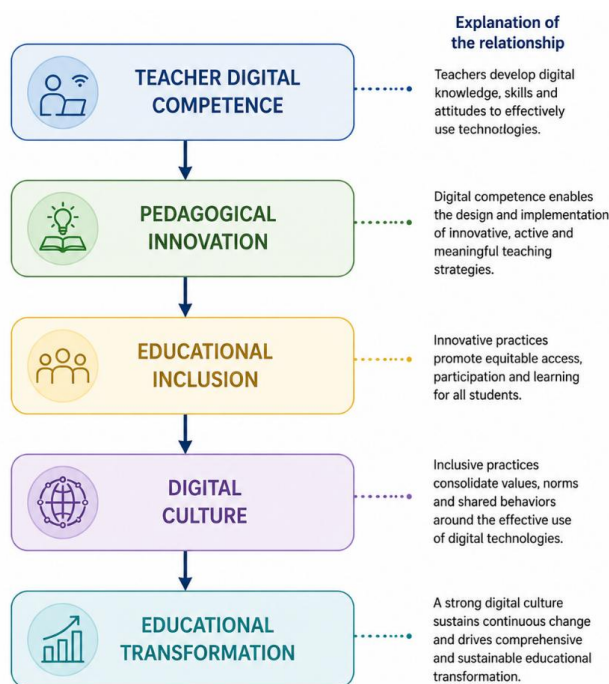
Dimension	Description	Key benefits identified
Technological	Proficiency in digital tools and resources	Facilitates technological integration in the classroom
Pedagogical	Design of ICT-mediated learning experiences	Promotes educational innovation
Communicative	Interaction and collaboration in digital environments	Strengthens learning communities
Ethical	Responsible, safe, and critical use of technology	Promotes digital citizenship
Innovative	Creation of new strategies and methodologies	Drives educational transformation

Source: Own elaboration based on Orozco Buele et al. (2023), Luna-Rengel (2025), Granda Agila et al. (2025) and Quijosaca Tene et al. (2025).

The results imply that the balanced development of these dimensions is an essential condition for teachers to be actively involved in educational digital transformation.

Relationship between digital competence and educational innovation

Figure 3. Conceptual map of relationships identified in the literature



The development of teacher digital competence triggers a progressive process that drives innovation, inclusion and institutional change toward sustainable educational transformation.

Source: Prepared by the authors based on Hernández-Sellés and Massigoge-Galbis (2024), Herrera Azuero et al. (2025), Luna-Rengel (2025), and Orozco Buele et al. (2025).

Challenges in Latin America

Despite the progress we have acknowledged in digital transformation efforts in education, the reviewed documents highlighted several barriers hindering the consolidation of these processes in Latin America. These obstacles manifest themselves in structural, cultural, and organizational forms. Among the most recurring challenges are limitations in technological infrastructure, shortcomings in teacher training, a lack of digital leadership, budget constraints, and, in some educational contexts, resistance to change.

Table 5. Main barriers to digital educational transformation in Latin America

Barriers	Main manifestations	Educational Impact
Infrastructure	Limited connectivity and device scarcity	Reduces opportunities for digital access
Teacher training	Insufficient technological and pedagogical training	Limits educational innovation
Digital leadership	Poor institutional strategic planning	Hinders the sustainability of change
Funding	Limited resources for technological innovation	Delays modernization processes
Resistance to change	Preference for traditional methodologies	Reduces the adoption of new practices

Source: Authors' elaboration based on Chariguamán-Curipallo (2025), Merino Casco (2025), Rodríguez Revelo and Villegas-Ricaute (2025), Sosa Zerna et al. (2025), and Veloz Villarreal et al. (2025).

The findings indicate that digital transformation in education requires comprehensive interventions that combine technological investment, human capacity development, and institutional leadership.

Implications for Church-Based Schools in Esmeraldas

Due to the contextual analysis and literature review, specific opportunities and challenges for church-based schools in the province of Esmeraldas become evident and are particularly relevant. The convergence of digital divides, territorial inequalities, and teacher training requirements creates an intricate yet promising environment for promoting innovative processes adapted to the area's characteristics. Based on this evidence, these institutions demonstrate their community identity, social commitment, and capacity for coordination with local stakeholders as some of the critical aspects that could act as catalysts for sustainable educational transformation processes.

Table 6. Contextual Analysis of Opportunities and Challenges for the Church-Owned Schools of Esmeraldas

Aspects	Opportunities	Challenges
Digital teaching competence	Ongoing professional development	Skills gaps
Pedagogical innovation	Implementation of active learning methodologies	Technological limitations
Educational inclusion	Support for vulnerable groups	Inequal access to digital technology
Institutional digital culture	Strengthening learning communities	Lack of digital planning
Educational leadership	Transformation-oriented management	Need for strategic vision
Community engagement	Family and community involvement	Socioeconomic limitations

Source: Prepared by the authors based on Loaiza Rodríguez et al. (2021), Hernández-Sellés and Massigoge-Galbis (2024), Orozco Buele et al. (2025), Rodríguez Revelo and Villegas-Ricaute (2025), and Veloz Villarreal et al. (2025).

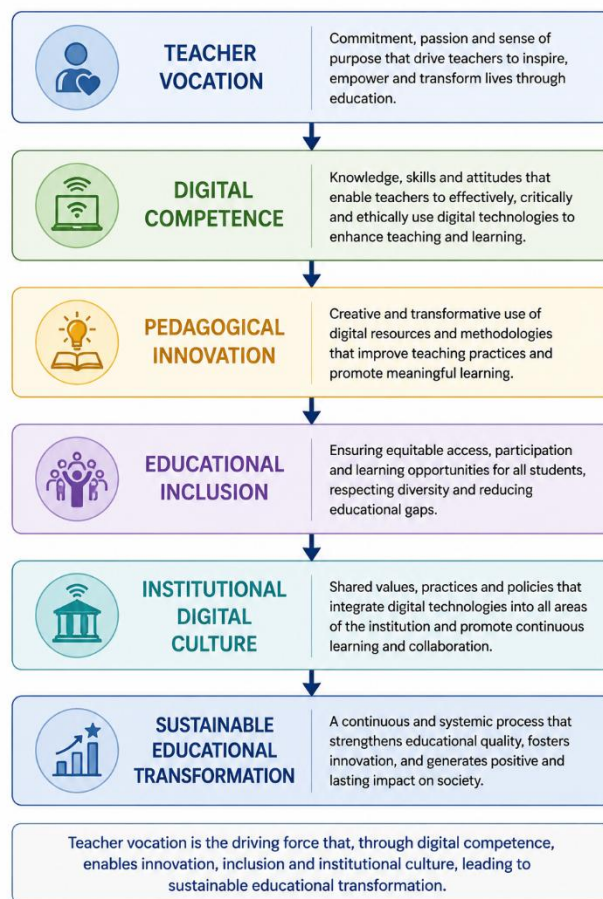
The findings provide further evidence that digital teaching competence is a strategic enabler for strengthening quality, promoting inclusivity, and incorporating context-specific digital processes. Therefore, training in digital skills is essential for the semi-private schools of Esmeraldas to address the educational challenges of the 21st century.

Proposal of a Conceptual Model

A common finding regarding digital educational transformation obtained as a result of the systematic review is that there is no single explanation for digital educational transformation as being isolated from technological access or the use of digital media within educational systems. The reviewed scientific evidence suggests that the human factor, particularly the teacher, is the key element that allows technology to transform the process of pedagogical innovation, educational inclusion, and institutional development. Based on this premise, we propose an Educational Transformation Model Based on Competence in Digital Teaching (ETM-DTC), a conceptual framework that combines the main components found in the literature and generalizes them to the characteristics of Ecuadorian semi-private schools.

According to this model, sustainable educational transformation stems from the development of digital competencies through a progressive process. This process, driven by teachers' dedication, fosters digital competencies that promote pedagogical innovation, strengthen educational inclusion, consolidate a digital culture within the institution, and ultimately create sustainable processes related to educational transformation.

The model suggests a systematized vision of educational digital transformation, in which each element represents a specific stage that needs to be developed to progress to other levels. Thus, institutional change does not occur naturally, but rather through an incremental process of human, pedagogical, and organizational strengthening.

Figure 4. Educational Transformation Model Based on Digital Teaching Competence (MTE-CDD)

Source: Prepared by the authors based on Hernández-Sellés and Massigoge-Galbis (2024), Orozco Buele et al. (2023, 2025), Luna-Rengel (2025), Herrera Azuero et al. (2025), and Rodríguez Revelo and Villegas-Ricaute (2025).

Dimensions of the model

The first dimension relates to teaching vocation (the ethical, professional, and human commitment of educators to the needs and adaptation of society to social and technological change). The literature has demonstrated that the desire for continuous learning is one of the main factors for the successful adoption of educational innovations.

The second dimension is teachers' digital competence, which has been defined as central to the model. Knowledge of technology, pedagogical skills, communication, ethics, and the ability to use technology creatively to improve educational processes are intertwined in this dimension. Pedagogical innovation, or its third dimension, is illustrated in terms of active teaching practices, cooperative learning, gamification, blended learning, and student-centered learning. The fact that digital competence has real educational relevance when transformed into imaginative pedagogical approaches is well-established evidence.

The fourth dimension relates to educational inclusion, which is defined as enabling learning opportunities for all students regardless of their social, economic, cultural, or geographic background. A legitimate digital transformation cannot occur until it contributes to mitigating disparities and increasing access to knowledge.

The fifth dimension is institutional digital culture, which involves integrating digital values, behaviors, culture, and institutions that are oriented toward sustainably integrating technology into institutional life. At this point, innovation shifts from being an individual endeavor to a shared characteristic of the organization. Last but not least, the sixth dimension manifests itself in a sustainable educational transformation based on the institutional capacity to respond sustainably to external changes, to improve the quality of educational inputs, to sustain innovation, and to ensure social inclusion.

Relationships between dimensions

The relationships proposed in the model are sequential and interdependent. Therefore, a teaching vocation fosters a willingness to learn and pursue professional development; this predisposition encourages the development of digital skills, resulting in opportunities to innovate in pedagogical methods. Thus, pedagogical innovation develops the conditions for learning through more adaptable, participatory, and diverse student-centered strategies to broaden the scope of educational inclusion. Collectively, and as part of the educational community, by sharing and disseminating these practices, such practice helps to produce an institutional digital culture that reinforces the sustainability of change. Sustainability in education, then, is

not an isolated result of transformation, but rather a continuous interaction between human, pedagogical, technological, and organizational factors, and an issue in which one is an inseparable part of the solution to change.

Application of the model to practice

Operationally, the model can be applied as a tool for institutional diagnoses, planning, and evaluation. It can be used to highlight strengths and weaknesses in each dimension and help develop change-oriented strategies that are adapted to the specific conditions of an institution. Similarly, the model can inform teacher training programs, pedagogical innovation projects, institutional digital transformation policies, and educational management processes in ways that enhance 21st-century skills.

Opportunity for Use in Esmeraldas

Benefits

Implementing the model in the semi-private (fiscomisional) schools of the province of Esmeraldas will likely benefit several of them. Some of these benefits include: improved digital instruction skills and knowledge, learning gains, increased student participation, reduced learning gaps, and a strengthened culture of innovation within the institution. It would also help increase the institutions' preparedness for new situations, cultivating more resilient, participatory, and flexible educational spaces for the needs of the digital environment.

Feasibility

The model is feasible because it does not require systematic transformations or radical technological changes to begin implementation. Its main focus is the gradual development of pedagogical and institutional capacity, leveraging existing resources and ongoing training processes. Furthermore, semi-private schools are well-suited for educational transformation projects due to their strong school identity, proximity to communities, and a culture of organizational values rooted in a sense of social commitment and holistic education. Expected Impact

Implementing this model will facilitate the further implementation of sustainable educational transformation approaches in the semi-private schools of Esmeraldas. Potential effects include deeper integration of technology into the pedagogical system, greater educational inclusion, development of digital skills in teachers and students, and the establishment of institutional cultures aligned with a culture of continuous innovation. The model can become another benchmark for similar educational institutions, providing evidence to support the development of public policies and digital transformation strategies that reflect the long-term territorial conditions in Ecuador. Thus, teachers' digital competence is no longer treated as a technological skill, but as the fundamental driver of sustainable educational transformation.

DISCUSSION

Teacher Digital Competence as a Force for Educational Transformation

The results validate that teacher digital competence is now a priority in driving educational transformation in modern times as one of the most powerful mechanisms. Available sources have agreed that the successful use of digital technologies for effective integration has less to do with access to technological resources and more to do with teachers' ability to work together pedagogically, critically, and creatively with digital content in their teaching.

Luna-Rengel (2025) therefore proposes that digital competencies are an important determinant for supporting pedagogical innovation and improving learning processes, while Orozco Buele et al. (2023) argues that these competencies currently constitute a key element of professional teaching practice in Latin America. Both perspectives agree that teachers are the transformative element of digital educational ecosystems. At the same time, Hernández-Sellés and Massigoge-Galbis (2024) emphasize that teacher training is the central dimension of any policy related to the transformation of digital education. In this view, technological training is meaningful when it connects with strengthening pedagogical skills that enable innovation in teaching and learning processes. However, some authors suggest that this view needs to be broadened by emphasizing that digital competence must go beyond the instrumental and include a broader definition of competence.

Granda Agila et al. (2025) highlight communicative competence in digital environments, while Macías-Gómez (2025) argues that skills such as adaptability to change, creativity, and lifelong learning are vital. This discourse argues that teachers' digital competence is more than a discrete skill, but rather a holistic set of capabilities that enrich educational leadership and institutional innovation. The results highlighted in this study support this view and allow us to affirm that digital teaching competence acts as a driving force for educational change: it moves people away from traditional teaching methods and toward more flexible, collaborative, and inclusive pedagogical practices. A new generation of teaching professionals needs to be equipped with skills that will allow them to meet the new demands of 21st-century education as they evolve as educators.

Beyond technological infrastructure

And one of the most recurring debates in the literature on digital educational transformation revolves around the importance of technological infrastructure. Over the years, policies in education focused on the acquisition of necessary equipment, connectivity, and digital platforms, with the expectation that these things alone would make significant progress in educational practices. However, this narrow perspective has been challenged by recent research. The studies we reviewed affirm that having devices and connectivity is a key condition, but by no means sufficient for educational transformation.

Hernández-Sellés and Massigoge-Galbis (2024) argue that many technological interventions struggle with the integration of technology in teaching and leadership initiatives and are not successful without being accompanied by teacher training and institutional leadership. Similarly, Cantos Vera et al. (2025) argue that addressing the digital divide requires large-scale, multi-layered interventions that intertwine technology, training and teaching strategies, education and pedagogical support. Italy (2025) also supports this position and points out that digitalization processes should be seen as cultural rather than technological transformations. In this way, educational innovation depends on how well institutions can transform their practices and the values and organizational structures of the institutions.

The findings of this study support this notion. Technology obtains an educational benefit only when it is put into practice by trained teachers who can transform those digital resources into useful learning activities. So the real challenge of digital transformation is not just adding technology, but building human capabilities in such a way that the full potential of that technology can be realized.

Data-Driven Learning: Technology and Educational Inclusion

Currently, the relationship between digital transformation and educational inclusion is one of the most difficult and debated topics in recent literature. One way to understand the new possibilities is through digital technologies, which allow us to increase access to knowledge and diverse teaching practices while making learning more individualized. However, they can also be a source of ever-increasing inequalities that are not possible due to access conditions.

Chariguamán-Curipallo (2025), Merino Casco (2025), and Sosa Zerna et al. (2025) agree that the digital divide remains one of the main obstacles to achieving inclusive education in Latin America. These studies illustrate that it is not only about access to devices and connectivity, but also about other factors such as the skills to use technology in practice, which are related to inequalities. Nevertheless, the evidence suggests that the inclusive possibilities for digital transformation are more optimistic.

Herrera Azuero et al. (2025) argue that digital technologies can create more flexible educational experiences to meet the learning needs of diverse students. Similarly, Sanipatin Potosi et al. (2025) highlight the potential of these technologies to enhance participation, intercultural understanding, and the strengthening of inclusive learning communities. This duality reveals a tension between risk and opportunity, a growing tension between the two. While technological gaps can lead to new forms of exclusion, improving teachers' digital skills can help technology become a powerful tool for democratizing the distribution of knowledge among students and improving access to education.

Consequences for Ecuador and Latin America

The findings demonstrate that the challenges in Ecuador are similar to the barriers found in other parts of Latin America. Insufficient technological infrastructure, a lack of teacher training, and territorial imbalances emerge in most of the studies analyzed. However, national contexts vary widely. Nevertheless, while connectivity in some countries and the development of digital policies are also important, structural challenges persist for other countries on this front, hindering the pursuit of sustainable educational innovation processes. Such heterogeneity validates what is known about the state of digital transformation: there is no single method that can be applied, but rather approaches that are required by the specific environment of each territory.

Research has been conducted to examine the Ecuadorian case, which has shown, using various methods (e.g., Loaiza Rodríguez et al. (2021), Rodríguez Revelo and Villegas-Ricaute (2025), Hernández-Sellés and Massigoge-Galbis (2024)), that progress in digital capacity and educational leadership is already advancing strongly. However, challenges remain in reducing geographical gaps and consolidating digital cultures within institutions. In comparison, the current situation in Esmeraldas reflects many of the tensions facing Latin America. Socioeconomic disparity, limited connectivity, and the demand for developing educational capacities are not conducive to progress, but they also present an opportunity to build contextually and socially meaningful models of digital transformation.

Sustainable Digital Culture in Church-Based Institutions

The discussion throughout this study reaches an important conclusion: educational digital transformation can never be sustained over time unless it is integrated into the institutional culture. Therefore, it is necessary to go beyond isolated technological solutions, focusing more on an integrated management approach that involves innovation, continuous training

for staff members, and involvement in the educational system.

Church-based institutions have particularly good opportunities to carry out this process. Their organizational identity, social commitment, and close relationship with communities are among the strengths that can build a digital culture focused on lifelong learning, as well as educational innovation. This conceptualization of the model becomes particularly relevant in this context, as it proposes a path toward a transformative process of gradual improvement of human and institutional capacities. The sequence of teaching vocation–digital competence–pedagogical innovation–educational inclusion–institutional digital culture presents a systemic vision that allows the perspective of educational change to appear as a continuous and sustainable process.

The private schools in Esmeraldas now have the potential to become regional examples of contextualized educational innovation. The essential step to achieve this will be to strengthen teacher training programs, radically enhance digital leadership, ensure alignment with technology inclusion strategies, and introduce permanent mechanisms for evaluation and continuous improvement. The task should not be merely one of technological adaptation; it is also the challenge of creating a new educational culture that integrates the potential of digital technologies with the principles of equity, inclusion, and human development. In this way, teachers' digital competence is positioned not only as a professional skill, but at its core as a primary force for sustainable educational transformation in the 21st century.

Limitations of the Study

As with other research based on a systematic literature review, some limitations of this study should be considered when interpreting its results. First, only academic databases (Scopus, Web of Science, ERIC, SciELO, and Dialnet) limited the search for documentary articles. However, there is a possibility that relevant studies indexed in other specialized databases and/or in grey literature were not included in the analysis.

A second limitation relates to the methodological heterogeneity of the selected studies. The reviewed literature does not directly compare results between studies and generalizes some findings or findings overall because the research has been synthesized from quantitative, qualitative, mixed (quantitative, qualitative, mixed studies, systematic reviews), and case study methodologies. Similarly, variations in geography, education levels, and measures used to assess educators' digital competence levels may generate variations that should be considered. Furthermore, the presence of research limited to semi-private (fiscomisional) institutions, and specifically to the province of Esmeraldas, was acknowledged. Most of the studies presented are more focused on the national or regional context, indicating a lack of awareness regarding the dynamics of digital transformation in this type of educational institution. Another major drawback is the dynamic nature of digital technologies and educational innovation processes. The rapid development of tools, platforms, and pedagogical models means that new approaches and trends will emerge in a short (not very long, in fact) time, thus changing the conditions under review. Nevertheless, the research offers a revised and structured interpretation of the strategic importance of teachers' digital competence in educational transformation processes, providing a solid conceptual foundation for future research and decision-making in similar educational settings.

Future Research Directions

The findings indicate that further research is needed to conduct a more comprehensive investigation into teachers' digital competence, providing an empirical and context-based perspective so that data can be extracted for a greater understanding of educational experiences in Ecuador and Latin America. Therefore, one of the main lines of future research is the development of field studies within private schools in the province of Esmeraldas to establish actual levels of teachers' digital competence, training needs, and factors that are conducive to, or barriers to, digital educational transformation processes.

Similarly, it is a priority to improve the development and validation of specific instruments designed to measure teachers' digital competence based on specific aspects of Ecuador. Developing country-specific tools that adapt to the country's sociocultural and institutional landscape would allow for more nuanced diagnoses and could be used to inform the training and professional development of educators.

Furthermore, a related area of research concerns the construction of predictive models for educational transformation. When we attempt to integrate variables such as teachers' digital competence, institutional leadership, and the technological infrastructure for instruction, as well as pedagogical innovation and organizational culture, we will ultimately develop explanatory models capable of predicting success levels in the digital transformation phase of education.

Furthermore, it is useful to delve deeper into digital leadership and its relationship with institutional performance. Based on the evidence we reviewed, we found that sustainable educational transformation goes beyond teachers who are digitally competent but includes leaders who can articulate a vision centered on a future-oriented strategy, one focused on innovation and continuous improvement.

Finally, future research could investigate the relationship between teachers' digital competence and educational inclusion, student well-being, and learning outcomes, providing evidence to support a broad view of the effects of digital transformation on various actors within the education system. This type of work would serve to improve the scientific understanding of these trends and generate valuable input to inform fairer, more representative, and more sustainable education policies.

CONCLUSIONS

Our findings: The results of the review suggest that teachers' digital competence is the predominant human factor influencing the digital educational transformation processes of 21st-century schools. It is not limited to technical knowledge of digital tools; this competence combines pedagogical, communicative, ethical, and innovative knowledge to enable teachers to meet the needs of a constantly evolving technological society.

Teachers' digital competence has been established as the strategic driver of education and innovation and a vital mechanism for effective training in the face of 21st-century challenges. The results indicate that the impact of teachers' digital competence on educational transformation is direct and multidimensional. Teachers who report greater digital competence are better able to use active practices, develop interactive learning activities, apply technology critically, and create inclusive and participatory learning environments.

Therefore, this digital educational transformation is not just about employing technology, but about the willingness of teachers to effectively transform technology into a process of effective learning and institutional development. This research also reveals that semi-private schools face significant challenges in connectivity gaps, provision of technological infrastructure, continuing teacher education, digital leadership, and the sustainability of innovation processes.

These limitations are exacerbated in historically vulnerable territories such as the province of Esmeraldas, where socioeconomic and territorial inequality persistently ensures unequal access to digital education opportunities in terms of equity. However, alongside these challenges, some promising possibilities for pedagogical innovation are emerging.

The use of technology now favors an education based on active, collaborative, gamified, hybrid, and personalized practice. While these strategies can result in a better response to student diversity, they can also strengthen educational inclusion, as well as capacity-building processes to empower students' digital citizenship skills. Based on the results obtained, it is determined that digital strengthening strategies should clearly reflect ongoing teacher training, the strengthening of the organization's institutional leadership, the integration of organizational cultures toward innovation, closing the digital divide, and cultivating student-centered teaching.

The research demonstrates that focusing solely on investments in acquiring technological infrastructure is inadequate without systematic professional development and an accompanying cultural shift. Ultimately, this research focuses on the Educational Transformation Model Based on Teachers' Digital Competence (ETM-TDC), a systemic description of educational transformation processes within the context of digital transformation.

The model introduces an educational sequence in terms of teacher vocation, digital competence, pedagogical practices that foster innovation, educational inclusivity, institutional digital culture, and sustainable educational transformation. Its implementation in private schools in Esmeraldas presents a viable alternative for enabling continuous improvement processes, developing teachers' skills, and facilitating inclusive and sustainable educational transformation driven by the context.

The model also offers a framework that could be adopted and validated in other territories with similar characteristics and contributes to the development of educational research and management in Ecuador and Latin America.

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B. data research and statistical analysis:	25%	25%	25%	25%
C. elaboration of figures and tables:	25%	25%	25%	25%
D. drafting, reviewing and writing of the text:	25%	25%	25%	25%
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