Digital government in the education sector: progress, challenges, and perspectives from a systematic review

Gobierno digital en el sector educativo: avances, desafíos y perspectivas desde una revisión sistemática

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Abstract

Digital government in the education sector has sparked both academic and professional interest in recent years, consolidating itself as a topic with diverse backgrounds and perspectives. This approach seeks to transform teaching through the use of digital tools, for the benefit of society. However, its implementation faces significant challenges, such as resource management, educational quality, and coordination between public actors, which requires joint efforts and inter-institutional collaboration. In this context, this article aims to analyze the existing literature on digital government in education, based on a systematic review based on the PRISMA protocol. To this end, articles published in journals indexed in Scielo, Scopus, Redalyc, and Dialnet, from 2020 to May 2024, were selected to identify the most relevant findings and obtain a comprehensive overview of the topic. A total of 42 articles from various countries were reviewed, using a descriptive methodology. Among the main results, the growing international interest in digital government in education stands out. Likewise, the close relationship between digital government and the use of information and communication technologies (ICTs) is identified as a fundamental characteristic, both of which contribute to optimizing the efficiency of the education system.

Keywords: educational quality, digital government, technological tools.

Resumen

El gobierno digital en el sector educativo ha suscitado interés tanto académico como profesional durante los últimos años, consolidándose como un tema con diversos antecedentes y perspectivas. Este enfoque busca transformar la enseñanza mediante el uso de herramientas digitales, en beneficio de la sociedad. Sin embargo, su implementación enfrenta desafíos significativos, como la gestión de recursos, la calidad educativa y la coordinación entre actores públicos, lo que exige esfuerzos conjuntos y colaboración interinstitucional. En este contexto, el presente artículo tiene como objetivo analizar la literatura existente sobre el gobierno digital en el ámbito educativo, a partir de una revisión sistemática basada en el protocolo PRISMA. Para ello, se seleccionaron artículos publicados en revistas indexadas en Scielo, Scopus, Redalyc y Dialnet, comprendidos entre 2020 y mayo de 2024, con el propósito de identificar los hallazgos más relevantes y obtener una visión integral sobre el tema. En total, se revisaron 42 artículos provenientes de diversos países, empleando una metodología descriptiva. Entre los principales resultados, destaca el creciente interés internacional por el gobierno digital en la educación. Asimismo, se identifica como característica fundamental la estrecha relación entre el gobierno digital y el uso de tecnologías de la información y comunicación (TIC), las cuales contribuyen a optimizar la eficiencia del sistema educativo.

Palabras clave: calidad educativa, gobierno digital, herramientas tecnológicas.

Introduction

In recent decades, digital governance has gained increasing importance in the educational sector due to its ability to transform not only administrative processes but also pedagogical ones. This model is based on the integration of digital technologies into public systems with the aim of enhancing transparency, optimizing management, and facilitating access to educational services. Specifically, digital transformation in education seeks to modernize teaching, promote equity in access to information, and ensure more active participation from various social actors.

Various studies, such as those by Morales, Morillo & Tobar (2020) and Toro-García et al. (2020), have demonstrated that the adoption of open government platforms fosters accountability, while Muñoz et al. (2022) underline the role of these tools in expanding educational access. Furthermore, Bazurto & Meléndez (2024) highlight the impact of digitalization on the development of smart cities, reinforcing the relationship between educational innovation and technological transformation.

On the other hand, recent academic literature reflects a growing interest in analyzing the challenges and opportunities posed by digital governance in the educational sector, especially in contexts characterized by technological inequality. Alvarez et al. (2024) warn that the persistence of the digital divide in schools remains one of the main obstacles to the effective implementation of Information and Communication Technologies (ICT) and Learning and Knowledge Technologies (LKT), which directly affects educational equity. Similarly, Calle-Cordova, Tenecota-Huerta & Arevalo-Herrera (2024) assert that digital inclusion policies must go beyond mere access to devices, also encompassing teacher training, adaptive curricular design, and the creation of sustainable pedagogical environments. Both approaches agree that the success of digital governance strategies largely depends on adopting a systemic perspective that combines technology, pedagogy, and inclusive public policies.

Additionally, significant contributions related to the modernization of academic management through digital tools have been identified. Estrella & Bardales (2025) examine the evolution of digital governance in universities across the Americas from 2010 to 2020, evidencing a progressive adoption of educational management platforms that optimize processes such as enrollment, student performance tracking, and institutional transparency. In this context, Godoy Pereyra (2024) emphasizes that digital transformation also impacts the work performance of teachers and educational managers by facilitating access to digital resources and fostering an organizational culture based on innovation. However, Zaqueu (2024) warns that despite observed advances in countries like Mozambique, structural challenges persist, such as limited investment in technological infrastructure and resistance to change in some higher education institutions. These findings indicate that the consolidation of digital governance in education requires not only technical innovation but also political will and active participation from all system stakeholders.

The advancement of emerging technologies has reconfigured the conception and management of teaching and learning processes. Research by Montero (2021) and García & Sánchez (2023) demonstrates that digital tools strengthen both individual and collective competencies, promoting more autonomous and

contextualized learning. Farro (2021) identifies digital governance as a means to achieve shared social goals, while Huamán & Medina (2022) assert that these technologies directly influence citizens' digital quality of life. Thus, digital governance not only redefines educational management mechanisms but also introduces new forms of interaction, monitoring, and evaluation of learning, tailored to the demands of an increasingly connected citizenry.

Given this landscape, it is essential to conduct a systematic review of the most recent academic contributions on digital governance in education to identify advancements, limitations, and opportunities. Cazales et al. (2020) highlight the role of collaborative public policies as a driver of educational change, while Navarro et al. (2022) and Osorio & Barreto (2022) note that digital transformation has become a priority in various Latin American contexts. In this framework, the present study aims to analyze and systematize the scientific literature published between 2020 and May 2024 in databases such as Scielo, Scopus, Redalyc, and Dialnet. Through a descriptive approach and the review of 43 articles, the research seeks to answer the question: What are the predominant academic approaches to digital governance in the educational field? This investigation aspires to enrich specialized knowledge, guiding future research and teaching practices towards an ethical, sustainable, and effective integration of digital technologies in education.

Methodology

For the development of this research, a systematic review methodology was adopted, guided by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol. The main purpose was to identify, evaluate, and synthesize the most significant academic contributions on digital governance in the educational sector. This methodological strategy ensured rigor, transparency, and replicability throughout all stages of the process of searching, selecting, and analyzing documentary sources.

Information sources and search criteria

First, an exhaustive search of scientific literature was conducted in the Scielo, Scopus, Redalyc, and Dialnet databases, complemented by other academic journals of recognized national or regional indexing. The information collection took place between March and May 2024, prioritizing articles published between 2020 and 2024. However, previous studies were included when they provided relevant theoretical or conceptual background for the analysis.

For the search, combinations of keywords in Spanish were employed, such as: “gobierno digital”, “educación digital”, “TIC en educación”, “servicios públicos digitales”, “transformación digital educativa”, “gestión educativa digital” and “calidad educativa digital”. These keywords were applied in the internal search engines of the selected platforms, restricting results to scientific articles, case studies, and academic reviews published in Spanish.

Inclusion and exclusion criteria

Regarding the inclusion criteria, the following were considered:

- Articles published in peer-reviewed scientific journals.
- Publications indexed in at least one of the following databases: Scielo, Scopus, Redalyc, or Dialnet.
- Studies focused on digital governance applied to the educational sector, encompassing management, services, inclusion, innovation, or governance.
- Full texts available in Spanish.

Conversely, the exclusion criteria were as follows:

- Duplicate publications across different databases.
- Studies without a direct relationship to the educational sector.
- Opinions, editorials, or non-academic documents.

Selection and registration process

The selection process began with the identification of 113 articles. Of these, 27 were eliminated due to duplication and 32 for not meeting the established thematic criteria. Ultimately, 54 articles were selected for detailed review and analysis. The distribution of these articles by database was as follows: Scielo (35 articles, 65%), Dialnet (11, 20%), Redalyc (5, 9%), Scopus (1, 2%), and other indexed journals (2, 4 %).

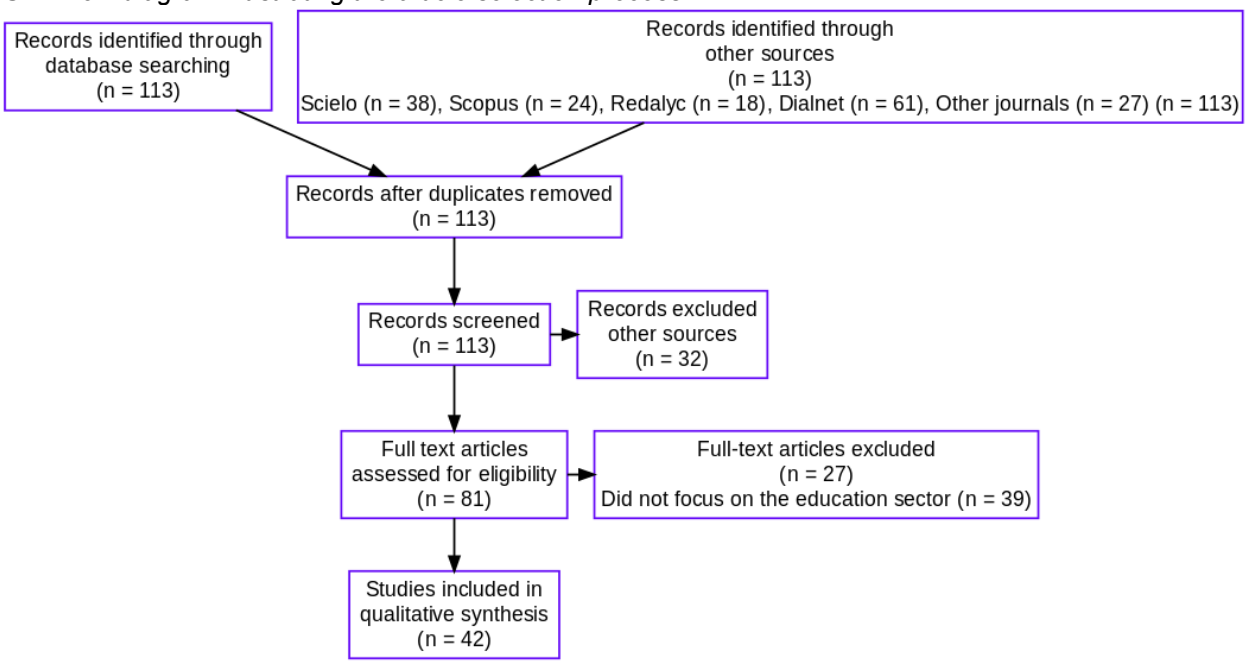
Characterization of the studies

The selected articles correspond to research conducted in Spanish-speaking countries and Spain, distributed as follows: Peru (10), Mexico (5), Colombia (6), Cuba (6), Venezuela (4), Spain (5), Ecuador (4), Brazil (3), Chile (1), and Argentina (1). Special attention was given to Latin American contexts, where the development of digital governance is emerging and exhibits significant inequalities.

Regarding the publication timeline, the distribution was as follows: 2024 (3 articles), 2023 (12), 2022 (9), 2021 (10), 2020 (9), and the remainder between 2016 and 2018 (11 articles), selected for their theoretical relevance and contribution to the critical background of the topic.

Figure 1

PRISMA flow diagram illustrating the article selection process



Note. Content generated from https://hollyhartman.shinyapps.io/PRISMAFlowDiagram/

Synthesis and analysis of information

First, the selected articles underwent a detailed analytical reading, during which key data were extracted using a systematic data collection form. This form coded fundamental aspects such as authors, objectives, methodology, country of origin, source database, theoretical or practical contributions, and the corresponding thematic category.

Subsequently, a qualitative content analysis was conducted to identify recurring patterns, key concepts, and common approaches among the reviewed studies. This process revealed six main thematic categories that facilitated the systematic organization of the findings: Digital Educational Administration, Access to Digital Education, Digital Educational Governance, Digital Educational Services, Data Security and Protection, and Innovation and Experimentation.

These categories served to structure and enhance the understanding of the contributions from various works. For example, Gómez & Garza (2023) highlight how digital resources provided by the state promote transparency and improve access to information. Similarly, Navarro et al. (2022) emphasize the importance of adapting these processes to the particular socio-technical conditions of each country, underscoring the need to contextualize digital governance strategies based on local realities.

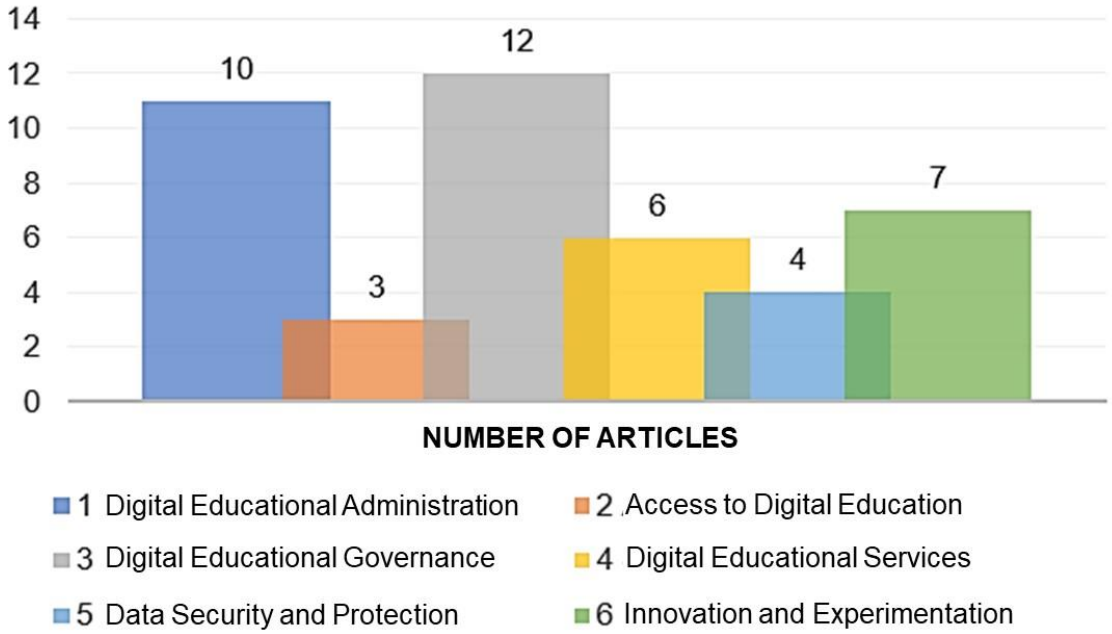
Results

Main research themes on Digital Governance in the education sector

First, the categories in which the articles were grouped were clearly identified and defined, highlighting common categories in digital governance studies.

Figure 2

Categories by articles



As illustrated, the chart reveals that the category with the highest representation in the reviewed articles is Digital Educational Governance, with 12 publications, followed by Digital Educational Administration (10 articles) and Innovation and Experimentation (7). This distribution reflects a predominant interest in aspects related to transparency and educational management through the use of digital technologies. In contrast, the category of Access to Digital Education is the least addressed, with only 3 articles, indicating a lesser focus on crucial issues such as equity and connectivity, which remain significant challenges in the development of digital governance within education.

Various studies demonstrate that digital governance in education has strengthened mechanisms of transparency and democratic governance. For instance, Ramos-Chávez (2024) argues that digital platforms ensure that information about public policies, school performance, and resource use is accessible and relevant to the entire educational community. In this same vein, Alegre & Padilla (2023) highlight that accountability is enhanced through the creation of clear channels for social oversight, where decision-makers in education must justify their actions. Ferriz (2022) emphasizes that this openness contributes to institutional integrity by facilitating citizen oversight and discouraging corrupt practices.

Regarding innovation and experimentation, the reviewed literature evidences how digital governance fosters new educational and collaborative practices. Díaz & Ospina (2023) underscore the value of digital tools for diversifying learning environments, while Muñoz & García (2021) reflect on the contemporary conceptualization of innovation in education. Additionally, León & Garza (2023) delve into the implementation of active methodologies, such as project-based learning, and Ríos & Ruiz (2020) provide empirical evidence demonstrating how these practices enhance student performance. Furthermore, Bravo (2021) raises the need to consider the ethical and social challenges posed by digitalization, and Castellanos (2023) emphasizes the importance of designing flexible curricula that respond to the demands of a constantly evolving global and technological environment.

Similarly, in the category of digital educational services, a profound transformation in teaching and academic management has been identified. Huamán & Sotelo (2022) describe platforms that facilitate the management of content, courses, and interaction between teachers and students; Navarro (2021) analyzes interactive applications that replace traditional materials; and García et al. (2023) explain how synchronous interaction is promoted through virtual classes. Pereyra (2024) highlights the importance of online tutoring as a fundamental support for personalized learning.

Regarding access to digital education, authors such as Osorio & Barreto (2022), Camargo & Pinzón (2022), and Ruiz et al. (2021) agree that technology implementation should be conducted with an inclusive, equitable, and formative approach to close the digital divides that still persist in many contexts. Finally, concerning security, Wolpes (2022), Ortín (2023), and Farro (2021) caution that the protection of personal data and the ethical management of information are essential conditions for building trust in digital educational environments.

Table 1

Analysis Matrix with Main Proposals and Contributions Identified

Author (Year)	Proposals or contributions on digital governance	Source / Database
Alderete et al. (2022)	The strategic use of digital platforms enhances technological competencies in both public officials and citizens, optimizing institutional performance.	Revista de Investigación, Desarrollo e Innovación / Scielo
Boza & Torres (2021)	Highlights the need for continuous teacher training and equitable public policies to ensure access to ICT from an early age.	ReHuSo / Scielo
Reyes & Prado (2020)	The unification of digital financial control systems in educational institutions improves transparency and resource management.	Revista Educación / Scielo
Cazales et al. (2020)	Suggests reformulating the basic educational approach to include flexible methods and technology to address new pedagogical challenges.	Revista Latinoamericana de Estudios Educativos / Redalyc
Barreto & Osorio-Sanabria (2020)	The study emphasizes adapting successful open government experiences to the cultural and administrative context of Latin America.	Boletín Mexicano de Derecho Comparado / Scielo
Bazurto & Meléndez (2024)	Effective digital governance requires coordination between institutions and the use of advanced technology to promote smart cities.	593 Digital Publisher / Dialnet
Anaya et al. (2021)	Reducing digital divides in rural areas requires improving connectivity and strengthening teacher training in ICT.	Educación / Scielo
Alegre & Padilla (2023)	The analysis of citizen feedback through digital channels should be incorporated into the design of public services.	Visual Review / Dialnet
Blanco (2020)	Proposes accountability mechanisms for those managing e-government platforms, especially in non-transparent environments.	Economía y Desarrollo / Redalyc
Bravo (2021)	The digital transformation of the state must consider frameworks that allow for rapid organizational adaptation to technological changes.	Ciencia Latina / Dialnet

Camargo & Pinzon (2022)	Recommends cybersecurity policies that protect data in governmental digital environments, such as the cloud or virtual platforms.	Revista Ibérica de Sistemas e Tecnologías de Información / Scielo
Castellanos (2023)	Suggests creating a national digitization strategy aligned with development goals, centered on citizens and public efficiency.	Revista de Ciencia e Investigación en Defensa
Dávila et al. (2023)	Initiating digitization in stages and through pilot tests allows for early detection of failures and adjustment of implementation.	Revista de Climatología Ed. Ciencias Sociales / Scielo
Díaz-Canel & Delgado (2021)	Proposes developing governmental innovation plans with concrete goals and defined timelines for integrating technology into management.	Universidad y Sociedad / Scielo
Díaz & Ospina (2023)	Promoting interoperability between institutional systems facilitates information flow and improves decision-making in government.	Administración & Desarrollo / Dialnet
Espinoza et al. (2023)	Designing accessible and user-focused interfaces enhances citizen experience on municipal digital platforms.	Revista Internacional de Investigación en Ciencias Sociales / Scielo
Farro (2021)	Suggests training officials in digital tools to improve efficiency and modernization of public services.	Ciencia Latina / Dialnet
Férriz (2022)	Technology can increase democratic participation when combined with inclusive and transparent mechanisms for citizen involvement.	Dialnet
García et al. (2023)	Recommends designing inclusive digital tutoring that allows all students to participate regardless of their technological conditions.	Horizontes / Scielo
Huamán & Medina (2022)	Fostering a culture of continuous improvement in public administration enables the sustainable integration of emerging technologies.	Comunicación / Scielo
León & Garza-Montemayor (2023)	It is vital to safeguard personal data on institutional social networks while complying with digital protection regulations.	Universitas-XXI / Scielo
Medina-Quintero et al. (2021)	Designing user-based digital services reinforces citizen trust and satisfaction on e-government platforms.	Investigación Administrativa / Scielo
Montero (2021)	Promoting inclusive digital education policies addresses the diverse needs of students facing educational barriers.	Actualidades Investigativas en Educación / Scielo
Morales et al. (2020)	The collaboration between government, academia, and industry facilitates the collaborative advancement of digital governance in Latin America.	FIGEMPA / Scielo

Muñoz et al. (2022)	Establishing timelines and indicators for the adoption of digital standards improves state efficiency and transparency.	Revista Española de la Transparencia / Dialnet
Navarro (2021)	Developing advanced search engines within digital archives optimizes public access to information.	Revista del Archivo General de la Nación
Navarro et al. (2022)	Implementing digital citizen consultation platforms strengthens participatory democracy and collaborative public policy design.	Revista Venezolana de Gerencia / Dialnet
Ortín (2023)	Establishing regulatory guidelines for document valuation ensures the preservation and authenticity of digital archives.	Ciencia Latina / Dialnet
Osorio & Barreto-Granada (2022)	Intergovernmental cooperation and collaboration with civil society are key to strengthening transparency and open government.	Innovar / Scielo
Pérez & Reeves (2023)	Digital innovation pilots in inclusive education allow for technology adaptation before widespread scaling.	Actualidades Investigativas en Educación / Scielo
Pereyra (2024)	Promoting the certification of digital competencies increases labor productivity and better prepares human talent for the digital era.	Revista InveCom / Scielo
Ramos-Chávez (2024)	Ethics committees must oversee the use of data in digital governance to safeguard citizen rights against technological surveillance.	Investigación Bibliotecológica / Scielo
Ríos-Cabrera & Ruiz-Bolívar (2020)	Distributing quality digital educational materials supports autonomous and personalized learning in public systems.	Innovaciones Educativas / Scielo
Rodríguez-Cruz (2020)	Promoting digital literacy among citizens strengthens effective interaction with government platforms and participatory processes.	Alcance / Scielo
Rodríguez Muñoz & Ruiz-Domínguez (2021)	Investment in digital equipment in schools ensures effective integration of technology in literature teaching.	Texto Livre / Scielo
Rodríguez-Román (2021)	Improving internet access in peripheral and rural areas is essential for expanding the reach of local electronic government.	Koinonía / Redalyc
Ruiz et al. (2013)	Comparing advancements in digital literacy and e-government helps identify gaps and guide future technological policies.	ResearchGate
Támara & Espinoza Olcay (2023)	Participating in international networks of public innovation allows for the transfer of experiences and solutions in digital governance.	ReHuSo / Scielo
Toro-García et al. (2020)	Intersectoral collaboration projects enhance governmental responses to complex problems through technology.	Trilogía Ciencia Tecnología Sociedad / Redalyc

Wolpes Álvarez (2022)	Optimizing resources through public-private partnerships and international cooperation is vital for sustaining digitization in public administrations.	Retos de la Dirección / Scielo
Yépez et al. (2021)	Using interactive content on public portals improves citizen understanding of state policies and services.	Universidad y Sociedad / Scielo

Note. Authors' own elaboration

The analyzed studies demonstrate that digital governance in the education sector not only modernizes administrative and pedagogical processes but also acts as a catalyst for promoting equity, transparency, educational quality, and citizen participation. Thus, the incorporation of digital tools in education should be understood not merely as a technological advancement but as a comprehensive transformation requiring inclusive, sustainable, and ethically responsible public policies.

Discussion

The findings of this review reveal a broad consensus regarding the transformative role of digital governance in education. It is not only seen as a management tool but also as a central axis for public policies aimed at efficiency, transparency, and inclusion. Research by Morales et al. (2020), Osorio & Barreto (2022), Navarro et al. (2022), Toro-García et al. (2020), and Díaz-Canel & Delgado (2021) highlights how governmental digital systems facilitate better decision-making, access to public information, and citizen oversight in educational processes. In this context, Bravo (2021), León & Garza (2023), and Barreto & Osorio (2020) emphasize that open governance mechanisms must adapt to digital environments to ensure a modern, collaborative, and democratic educational administration. This model, as reinforced by Wolpes (2022) and Ramos-Chávez (2024), helps establish a culture of institutional transparency, reducing opacity in resource allocation and budget execution in the education sector.

Regarding digital educational administration, various authors agree that technological platforms are redefining the planning, execution, and evaluation of educational services. Alderete et al. (2022), Espinoza et al. (2023), Farro (2021), Medina et al. (2021), Rodríguez-Román (2021), Navarro (2021), and Castellanos (2023) argue that implementing digital systems improves academic management, facilitates tracking of institutional indicators, and optimizes communication channels with the educational community. Additionally, Camargo & Pinzón (2022), Ortín (2023), Támara & Espinoza (2023), along with Huamán & Medina (2022), highlight that digital governance enhances interoperability among administrative units, promoting more agile and efficient processes. In this same line, Díaz & Ospina (2023) and Boza & Torres (2021) link digital transformation with increased citizen satisfaction by reducing wait times, simplifying procedures, and ensuring remote access to key services.

In terms of innovation and experimentation, studies indicate that digital governance has paved the way for new learning methodologies centered on the creative and strategic use of technologies. Research by Ríos & Ruiz (2020), Pereyra (2024), Reyes & Prado (2020), Rodríguez & Ruiz (2021), Muñoz et al. (2022), and Rodríguez-Cruz (2020) shows that adopting ICT, virtual platforms, and interactive resources in teaching not only improves academic performance but also fosters more inclusive, flexible, and collaborative learning environments. Díaz & Ospina (2023) and Bravo (2021) delve into the necessity of adapting curricula to these new dynamics, while García et al. (2023), Cazales et al. (2020), Castellanos (2023), and Navarro et al. (2022) propose that digital innovation should be accompanied by ongoing teacher training, coherent public policies, and adaptive regulatory frameworks that respond to rapid technological changes.

Finally, significant challenges remain in relation to digital equity, data protection, and the sustainability of these initiatives. Anaya et al. (2021), Rodríguez Muñoz & Ruiz-Domínguez (2021), Ríos-Cabrera & Ruiz-Bolívar (2020), Pérez & Reeves (2023), and Montero (2021) warn about the technological gaps that still limit equal access to digital services, especially in rural areas or marginalized sectors. Similarly, Blanco (2020), Ramos-Chávez (2024), and Ortín (2023) point out that the absence of robust cybersecurity protocols and personal data management poses a risk that urgently needs to be addressed. Lastly, Valenzuela et al. (2020) and Rodríguez-Román (2021) agree that the sustainability of digital governance in education will depend on the ability of states to institutionalize these tools, ensure universal access, and build trust in the implemented systems.

Conclusion

The analysis of 42 studies on digital governance in the education sector revealed significant advances in the modernization of public management, pedagogical innovation, and the expansion of educational services through digital technologies. A growing focus on transparency, citizen participation, and institutional efficiency was also evident. However, important structural challenges remain, such as access gaps, insufficient teacher training, and the fragility of information security policies.

The documented experiences demonstrate that the success of digital governance does not solely depend on technological adoption but on its strategic, inclusive, and ethical integration within the educational system. Therefore, it is essential to promote a coordinated agenda involving public, academic, and social actors to ensure sustainability, digital equity, and educational quality in increasingly interconnected environments.

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