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Public education, equity and digital access: A systematic review of inclusive policies in hybrid learning environments

Educación pública, equidad y acceso digital: revisión sistemática de políticas inclusivas en entornos de aprendizaje híbrido

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Abstract

Digital equity in hybrid learning has gained significant importance since the pandemic, particularly in public education. This study conducted a critical analysis of policies, pedagogical approaches, and structural conditions using the PRISMA method, reviewing 24 research projects from Latin America, Asia, and Europe. The results show that hybrid environments have been key to ensuring educational continuity and student development. However, their implementation has revealed profound structural inequalities that especially affect rural communities, Indigenous peoples, people with disabilities, and those with limited connectivity. Furthermore, it is observed that government efforts to improve access to devices and virtual platforms are insufficient without inclusive policies, adequate teacher training, and culturally relevant curriculum redesigns. On the other hand, successful experiences were identified that combine accessible technologies, active methodologies such as the flipped classroom, and Universal Design for Learning (UDL) principles, demonstrating the possibility of creating highly competitive educational environments. In conclusion, digital equity must transcend physical access to technology and be understood as the true capacity of students to actively participate, acquire quality knowledge, and exercise their right to a fair and equitable education.

Keywords: learning, digital divide, public education inclusion, education policies.

Resumen

La equidad digital en el aprendizaje híbrido ha cobrado gran importancia desde la pandemia, sobre todo en la educación pública. Este estudio realizó un análisis crítico de políticas, enfoques pedagógicos y condiciones estructurales mediante el método PRISMA, revisando 24 investigaciones de América Latina, Asia y Europa. Los resultados evidencian que los entornos híbridos han sido clave para garantizar la continuidad educativa y el desarrollo estudiantil. No obstante, su implementación ha revelado profundas desigualdades estructurales que afectan especialmente a comunidades rurales, pueblos indígenas, personas con discapacidad y quienes cuentan

con conectividad limitada. Asimismo, se observa que los esfuerzos gubernamentales para mejorar el acceso a dispositivos y plataformas virtuales resultan insuficientes sin políticas inclusivas, formación docente adecuada y rediseños curriculares culturalmente pertinentes. Por otro lado, se identificaron experiencias exitosas que combinan tecnologías accesibles, metodologías activas como el aula invertida y principios del Diseño Universal para el Aprendizaje (UDL), evidenciando la posibilidad de crear entornos educativos altamente competitivos. En conclusión, la equidad digital debe trascender el acceso físico a la tecnología para entenderse como la verdadera capacidad de los estudiantes para participar activamente, adquirir conocimientos de calidad y ejercer su derecho a una educación justa y equitativa.

Palabras clave: aprendizaje, brecha digital, inclusión educativa pública, políticas educativas.

Introduction

Following the events stemming from COVID-19, there has been a significant increase in interest regarding research and the use of technology to explore information in both educational and health contexts. This trend was particularly notable in the initial stages of the pandemic and continues to grow substantially (Pullyblank et al., 2024). Hybrid education, in contrast to traditional models that rely on a single approach, offers enhanced interaction, autonomy, and support throughout the learning process.

Various studies demonstrate that this educational framework not only facilitates learning but also contributes positively to psychological well-being, as student motivation and engagement rise when the model is well-structured. While this may seem intuitive, it is a key factor in strengthening educational quality in higher education (Garizurieta & Gazca, 2024).

Nevertheless, the implementation of this model faces challenges, such as the inadequate training of educators in contemporary technologies, which creates numerous obstacles. Furthermore, in contexts with limited economic resources, some families are unable to fully access this educational modality. Consequently, hybrid education risks merely replicating a traditional style rather than fostering meaningful learning experiences (De la Paz Sánchez & Navarrete, 2024).

For this modality to be effective, it is essential to establish appropriate infrastructure and robust pedagogical management that ensures the sustainable inclusion of students while promoting an active teaching dynamic (Hernández-Suárez et al., 2024). This involves incorporating formative assessments and ongoing support into its structure and meticulously coordinating it with thoughtful course planning (Cruz-Porta & Orosco-Fabian, 2023).

In several Latin American countries, numerous challenges are evident, including disparities in access to connectivity, insufficient digital preparation among faculty, and a lack of adequate planning for the proper development of study syllabi. For instance, Ecuador faces exacerbated issues due to inadequate teacher training and limited integration of contemporary pedagogical approaches. In response to this landscape, an innovative methodology is proposed that converges neuroscience, educational technology, and pedagogical philosophy, aiming to transform digital learning into more inclusive, motivating, and student-centered formative experiences (Ávila et al., 2025). However, without appropriate approaches, its implementation may exacerbate inequality in connectivity access, hindering digital preparedness among educators and highlighting the necessity of a teaching plan that ensures meaningful learning outcomes.

In contexts marked by diversity and inequity, as is the case in many Latin American countries, hybrid education will only be truly effective if it incorporates inclusive approaches that address the specific needs of students (Navas-Bonilla et al., 2025). The 31st edition of the Yearbook of Medical Informatics discusses the theme of "Inclusive Digital Health," illustrating how the aftermath of COVID-19 and the implementation of virtual modalities have affected students globally, revealing emotional deterioration and difficulties in safe interaction among peers (Staccini & Lau, 2022).

University life underwent profound changes post-pandemic, influencing everything from traditional academic activities to everyday informal interactions. In light of these changes and challenges, new ways of advancing were sought to bridge connectivity gaps among students, faculty, and communities worldwide (Day et al., 2021).

Moreover, while e-learning focuses specifically on online teaching, digital learning encompasses a broader spectrum of technological tools aimed at facilitating and enriching the educational process across various contexts (Barikzai et al., 2025). In many countries, such as Australia, preventive health policies and systems primarily target child or adult populations; however, adolescents require preventive care tailored to their developmental stage, as they present unique health and developmental needs (Partridge et al., 2023).

In recent years, the relationship between digital education and health information management has gained increasing relevance. This phenomenon has been driven by both the rapid advancement of digital technologies and global challenges that have altered priorities in both sectors (Gómez, 2023). For example, a study evaluated the inclusion of physical training within the physical education curriculum for university students and concluded, through the Analytic Hierarchy Process (AHP), that this inclusion significantly improves student health, additionally highlighting that AHP is a valuable tool for assessment.

From a public health perspective, the professional skills required for physical education teachers in this new era were also examined. To this end, a professionalization model was developed based on the Analytic Hierarchy Process (AHP) and fuzzy evaluation theory (Shan, 2021).

Concerning higher education, hybrid teaching necessitates a clear conceptual framework that acknowledges both its advantages and challenges. This framework is essential to facilitate the transition towards models that integrate in-person and virtual teaching and to update educational methodologies in response to current changes (Cruz-Porta & Orosco-Fabian, 2023).

Understanding the impact of hybrid education is crucial, as this model involves considering various aspects such as internet connectivity, flexibility, basic digital program management, and, notably, the essential role of cooperation between educators and students. Therefore, the objective of this research was to critically analyze how inclusive public policies contribute to bridging the educational digital divide, identifying their influence on learning opportunities and the academic development of students in contexts of inequality.

Methodology

This study was conducted as a systematic review aimed at understanding how inclusive public policies address the challenges related to equitable access to hybrid learning environments in Latin American public education. The analysis took into account the social, economic, and technological disparities characteristic of the region, with the central objective of answering the question: How do these policies contribute to reducing the digital divide in contexts of inequality?

To ensure methodological rigor, the PRISMA guidelines were applied, facilitating a transparent organization of the search, selection, and analysis processes of the evidence. Scientific articles published between 2021 and 2025 were reviewed in reputable databases such as Scopus and SciELO, prioritizing studies focused on digital inclusion, educational equity, public policies, and hybrid teaching models. The search was conducted in both Spanish and English, utilizing combinations of keywords such as "digital inclusion," "blended learning," "educational equity," "flipped classroom," and "indigenous education," to encompass both theoretical approaches and applied experiences.

Articles that did not meet the specified publication period (2021-2025), those that did not directly address themes related to digital inclusion, educational equity, public policies, or hybrid learning models, as well as duplicates, inaccessible or incomplete reports, and those with content irrelevant to the objective, such as analyses outside of Latin America or approaches distinct from public education and the reduction of the digital divide, were excluded.

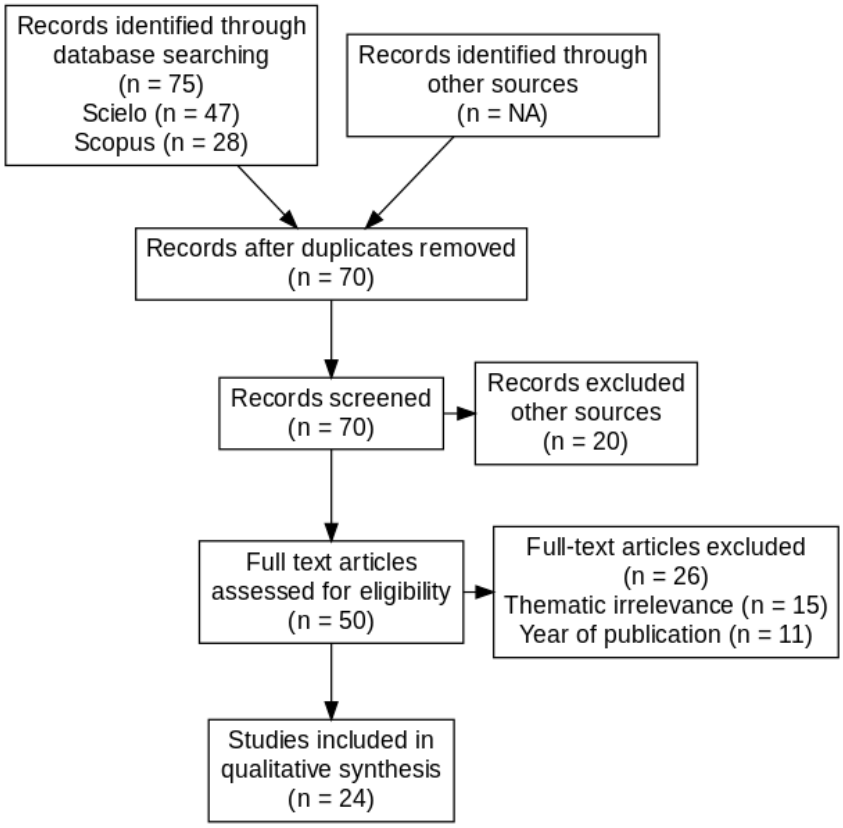
The search strategy, primarily conducted in the Scopus database, utilized predetermined terms to ensure the relevance of the results. Descriptors and keywords were combined using Boolean operators AND and OR, covering categories such as public education, equity, digital access, inclusive policies, and hybrid learning. The search string in both English and Spanish was as follows: ("*public education*" *OR* "educación pública") *AND* (*equity OR* equidad *OR* "*social justice*" *OR* inclusión *OR inclusion*) *AND* ("*digital access*" *OR* "acceso digital" *OR* "*digital divide*" *OR* "brecha digital") *AND* ("*inclusive policies*" *OR* "políticas inclusivas" *OR* "*educational policies*" *OR* "políticas educativas") *AND* ("*hybrid learning*" *OR* "*blended learning*" *OR* "aprendizaje híbrido" *OR* "aprendizaje combinado") *AND* ("*systematic review*" *OR* "revisión sistemática").

The systematic review process began with the identification of 75 records from various sources: Scopus (28), SciELO (47), and other sources (n=75). In the purification phase, five records were removed for various reasons: two were duplicates, one was deemed unfit according to automated tools, and two were excluded for other reasons. Thus, 70 records were analyzed in detail, of which 20 were discarded for not meeting general relevance criteria. During the eligibility assessment, complete information was retrieved for 50 reports, all available for analysis. In this phase, 11 studies were excluded for not corresponding to the period 2021-2025, and 15 were discarded for containing irrelevant content.

Finally, after applying the methodological and thematic criteria, 24 representative studies were included, forming the basis of the analysis. These studies were organized and compared to identify patterns, best practices, and challenges in inclusive public policies, their impact on hybrid education, and the reduction of the digital divide.

The selected articles are presented in a comparative table that allows for the observation of common patterns, identification of best practices, and persistence of challenges across different countries. The classification considered variables such as the type of policy applied, educational level, technological resources employed, and observed outcomes.

Figure 1
PRISMA diagram



Results

The findings indicate that both physical activity and inclusion are essential elements for improving quality of life. Regular participation in physical education not only enhances physical condition but also reduces stress and promotes emotional well-being. Similarly, creating spaces where all individuals feel included and respected contributes to building a more just and healthy society. The reviewed studies unanimously agree that the integration of these two approaches within university educational programs strengthens the commitment to public health and sustainable development.

Table 1
Articles included in the selection process

No.	Author, year, and country	Approach / Design	Results
1	Staccini & Lau (2022) France and Australia	Systematic Review (State of the Art)	Access to and sustained use of digital health information by vulnerable populations depend on digital literacy, technological accessibility, and inclusive design. Many digital platforms do not consider language or socioeconomic barriers. Comprehensive strategies are needed, including training, accessible design, and equity-oriented public policies.

2	Day et al. (2021) United States	Qualitative Research	Crowdsourcing in universities facilitated the collection of ideas related to well-being, equity, and institutional communication. This strategy strengthened the sense of belonging and can be replicated in other educational contexts, contributing to mental health, reducing inequalities, and improving access to resources.
3	Barikzai et al. (2025) Afghanistan	Qualitative Research (102 participants)	Barriers such as inadequate infrastructure and sociocultural restrictions for digital education, especially for women, were identified. Inclusive public policies and strategies that empower students through technology were proposed.
4	Gómez et al. (2024) Peru	Systematic Review	Peruvian universities face obstacles such as lack of resources, resistance to change, and limited teacher training in integrating the Sustainable Development Goals (SDGs). Identifying priority areas and the pedagogical strategies employed is necessary.
5	Romero et al. (2025) Peru	Quantitative Study (Structural Equations)	Stress, anxiety, and depression are predictors of academic procrastination, being more prevalent among non-scholarship students. Interventions in mental health are recommended to improve academic responsibility.
6	De la Paz Sánchez & Navarrete (2024) Mexico	Qualitative Study	In rural areas, hybrid education faces material and digital barriers. A lack of infrastructure and digital literacy limits student autonomy and negatively impacts educational equity in the absence of adequate support policies.
7	Gudoniene et al. (2025) International	Systematic Review	Hybrid teaching in higher education enhances flexibility and promotes strong student engagement. For effectiveness, it requires solid technological integration, innovative pedagogical strategies, and adequate infrastructure and specialized training for teachers.
8	Hernández-Suárez et al. (2024) Colombia	Descriptive Quantitative Study	The virtual platform PLAD promotes social and collaborative learning in all its aspects. Strengthening teacher feedback and adjusting teaching strategies is necessary to enhance academic training in hybrid environments, alongside implementing policies that create a conducive atmosphere for students.
9	Navas-Bonilla et al. (2025) Latin America	Systematic Review	Inclusive technologies such as augmented reality, screen readers, and collaborative platforms are crucial for eliminating barriers. Blended learning should be accompanied by institutional policies, accessibility principles, teacher training, and social justice to ensure a practical, effective approach.
10	Wang & Si (2023) China	Quantitative Study	Social and cultural capital influence students' capability and participation in digital environments. It is recommended to design educational policies that reduce inequalities and structure digital education access appropriately.
11	Partridge et al. (2023) Australia	Comparative Policy Analysis	Analyzing strategies regarding adolescent obesity and the lack of specific policies for this stage is crucial, suggesting a strengthening of public policies that consider factors such as mental health and nutrition.

12	Ávila et al. (2025) Ecuador	Theoretical Methodological Proposal	A methodology integrating neuroscience, educational technology, and pedagogical philosophy is proposed to transform digital learning and create inclusive, motivating, and sustainable formative environments, particularly adapted to Latin American contexts.
13	Wang et al. (2024) China	Quantitative Study	The study examines how social and cultural capital affects students' cognitive capabilities and access to digital communication. Structural inequalities at home limit digital participation and affect educational equity, emphasizing the need for policies that take these contextual variables into account.
14	Gómez Cano (2023) Colombia	Interdisciplinary Review	Trends in digital education and health post-pandemic are analyzed, highlighting the importance of technologies like artificial intelligence and blockchain, while warning of risks if inclusive approaches are not applied. A critical educational policy that considers cultural and social contexts is demanded.
15	Ramírez-Díaz (2024) Latin America	Critical Review	Many digital equity policies are criticized for merely providing devices without addressing teacher training or real connectivity. An integrated vision is proposed that includes emerging pedagogies and community participation, pointing out failures in programs like "Rural Connectivity" in Mexico.
16	Betancurth-Loaiza et al. (2022) Colombia	Systematization of Experiences	A successful model of primary social care in Caldas that connects community, academia, and government is presented, promoting a health approach with territorial and interdisciplinary focus. This model strengthens primary care networks with an impact on inclusion and sustainability.
17	Félix-D'Egidio (2024) United States (California)	Case Study / Human Rights Approach	The educational inequalities faced by Mixtec indigenous students in public schools in California are analyzed, where lack of federal recognition hinders their access to rights and services. A normative reform based on an intercultural and human rights approach is recommended.
18	Cruz-Porta & Orosco-Fabian (2023) Peru	Pre-experimental Study	The effectiveness of hybrid classes for Agroindustrial Engineering students was evaluated, showing significant improvements in competencies such as sensory analysis and quality tool usage. The hybrid model fosters autonomy, active participation, and academic performance post-pandemic.
19	Pierella & Pidello (2022) Argentina	Qualitative Research / Narrative Approach	The research examines how youth from marginalized sectors reinterpret their experiences in secondary school, revealing tensions between aspirations, structural limitations, and symbolic supports. School emerges as a space for containment, symbolic dispute, and future construction.
20	Jorre de St Jorre & Boud (2022) OECD Countries	Exploratory Review (Scoping Review)	Equity in hybrid learning in higher education is studied, identifying that without inclusive curriculum redesigns, inequalities are perpetuated. The application of Universal Design for Learning (UDL) is emphasized to enhance student participation and sense of belonging.

21	Rodríguez & Gaeta (2024) Mexico	Quantitative Study - Comparative Analysis	The study reveals deep educational inequalities during the pandemic, showing differences by federal entity that reflect structural gaps. It emphasizes that any hybrid policy must acknowledge these inequalities and prioritize teacher training beyond mere technology provision.
22	Zurita-Alarcón & Álvarez-Gómez (2024) Spain	Mixed Study	The study explores how learning style preferences influence written communication skills in hybrid environments. It concludes that personalizing flipped classrooms improves equity, motivation, and engagement, provided there is adequate infrastructure and teacher training.
23	Garizurieta & Gazca (2024) Mexico	Comparative Study	Hybrid and face-to-face models in higher education are compared, revealing that the hybrid model demonstrated greater effectiveness in developing digital competencies, adaptability, and student participation, although it requires increased investment in teacher training and instructional design.
24	Julca et al. (2023) Peru (Áncash)	Qualitative Study (Institutional Review)	Social and cultural inclusion in universities of Áncash is evaluated, finding that only one public university implements actions such as the use of Quechua and special exams for rural communities but lacks trained teachers. It concludes that a profound institutional commitment is necessary to achieve effective intercultural education.

The findings from this review have significant implications for educational practice and public policy design. The success of the educational models analyzed is not solely dependent on access to technology; it also hinges on the implementation of student-centered pedagogy, inclusive policies, and a focus on social justice. In vulnerable populations, these models have proven effective tools for reducing educational gaps when applied with criteria of equity, sustainability, and cultural relevance.

Thus, hybrid education represents a valuable opportunity to transform teaching and advance towards deeper inclusion. However, its success will rely on the commitment of states to ensure appropriate educational policies that are sensitive to the context, as well as the capacity of institutions to adapt to the challenges of the digital environment, without losing sight of the student's overall well-being.

Discussion

The transition to hybrid learning models in Latin America and the Caribbean has highlighted the importance of digital inclusion as a key factor in guaranteeing equitable and quality education. In this context, analyzing the policies, barriers, and facilitators of digital inclusion is fundamental to understanding the challenges and opportunities faced by the educational systems in the region.

A central element in this discussion, as noted by Muñoz et al. (2024), focuses on digital inclusion policies that often concentrate on objectives related to infrastructure, connectivity, devices, and teacher training. These national and regional plans form the basis for reducing the digital divide, although their implementation presents challenges. Ruiz (2025) points out that significant technological and sociocultural barriers persist, while infrastructure and connectivity limitations, also highlighted by Calle-Córdova et al. (2024), continue to pose obstacles that may exacerbate inequalities both between and within countries.

Beyond technological challenges, sociocultural barriers such as a lack of digital literacy and the costs associated with technology usage represent considerable impediments. Ruiz (2025) emphasizes the importance of training for both teachers and communities to overcome these difficulties, a notion that complements findings from Calle-Córdova et al. (2024), who argue that regular use of digital tools by students and families is a determining factor for achieving real inclusion.

In light of this landscape, the literature identifies several facilitators that can promote effective digital inclusion. Solano-Becerra et al. (2024) and Mera et al. (2024) agree on the relevance of public-private partnerships to provide equipment, as well as the importance of talent and teacher preparation. Additionally, the use of open

learning platforms and the promotion of participatory governance are key elements for countering the identified obstacles.

Finally, it is essential to address equity in hybrid learning environments. Guadalupe et al. (2025) emphasize the need for measures that ensure equal opportunities for all students, regardless of their background or circumstances. This includes actions aimed at diversity, the inclusion of students with special needs, the provision of resources in indigenous languages, and the adoption of equitable evaluation systems. These actions are crucial so that the shift to hybrid models does not widen existing inequalities but instead contributes to reducing them.

In conclusion, the discussion on digital inclusion in hybrid learning in Latin America and the Caribbean is complex and multifaceted. Although policies and strategies aimed at promoting access to and use of technology exist, significant barriers remain that must be addressed comprehensively. A combination of efforts in infrastructure, training, strategic partnerships, and, above all, an equity-centered approach will be essential to establishing more inclusive and resilient educational systems in the digital age.

Conclusion

This systematic review, encompassing 24 studies conducted in Latin America, Asia, and Europe, critically analyzed the policies, pedagogical approaches, and structural conditions that influenced equity within public education under hybrid learning models. While the implementation of these environments was viewed as a strategic response to ensure educational continuity post-pandemic, their deployment accentuated profound structural inequalities, particularly affecting rural, indigenous populations and students with disabilities.

The findings revealed that state efforts focused solely on delivering devices and providing access to virtual platforms proved insufficient when not complemented by sustainable inclusive policies. The lack of specialized teacher training and curriculum redesigns that addressed cultural and social diversity significantly limited the impact of these initiatives. However, positive experiences also emerged that demonstrated the feasibility of building genuinely equitable learning environments. The integration of active methodologies, such as the flipped classroom, alongside the principles of Universal Design for Learning (UDL), exemplified how technology can enhance both accessibility and educational quality.

It was concluded that digital equity in public education transcends mere technological infrastructure, conditioning the guarantee of active participation and quality learning, essential elements within the right to education in a framework of social justice. To establish a hybrid model that does not reproduce inequalities but mitigates and transforms them, systemic, intersectoral, and culturally contextualized public policies must be implemented. Only through an approach that recognizes the multiple dimensions of exclusion can a more just and accessible educational system be constructed for all students.

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