



Localizing AIED: moving beyond North–South narratives to serve contextual needs

David Dodick^{1,2}

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Abstract

This article problematizes simplistic Global North–South binaries in artificial intelligence in education discourse and implementation. The author draws on dual teaching experiences in Canada and Paraguay to demonstrate the diversity within and across regions, and challenges notions of a homogeneous “Global South.” The analysis emphasizes the importance of incorporating local actors’ perspectives when introducing new technologies rather than centering outside entities. It advocates examining the specific causes, conditions, and complexities within particular countries to develop tailored AIED solutions. Using Paraguay as a casestudy, the article explores the ethical and contextual considerations necessary for developing AIED solutions aligned with local realities. The conclusion argues that real progress in equitable AIED requires looking past technological solutionism and deficit narratives, empowering communities to guide integration based on their own needs and priorities. Responsible AIED must give voice to the underserved through small-scale, transparent implementations customized to local contexts.

Keywords Digital pedagogy · Digital equity · Paraguay · Cross-cultural issues · Contextualization

1 Introduction

The potential of artificial intelligence to transform education has generated tremendous enthusiasm and investment globally (Global Market Insights 2023; Mou 2019). However, realizing the equitable implementation of these technologies requires moving beyond the hype and avoiding sweeping regional comparisons, particularly in the Global South (Dados and Connell 2012). The diverse realities within both the Global North and the Global South underscore the need for more tailored, context-specific approaches to AI in education (AIED).

Technological capabilities and educational priorities can vary significantly across different regions. For instance, Canada prioritizes inclusive education and integrates technology across various levels of schooling, Germany emphasizes vocational training and apprenticeships supported by

advanced industrial technologies, and Japan focuses on technology and engineering education with a strong emphasis on innovation. Similarly, the Global South encompasses a wide range of contexts: India and Brazil are rapidly industrializing with growing investments in educational technology and infrastructure, while smaller, resource-constrained countries like Paraguay may have limited technological infrastructure and prioritize basic educational access and improvement.

To address these diverse conditions, this article adopts a qualitative approach incorporating data gathered through interviews, direct observation, and focus groups with local students, alumni, educators, and administrators. These methods provide in-depth insights into the unique conditions and needs of each context, enabling a comprehensive understanding of local perspectives and challenges. By focusing on human-centered systems as emphasized by Cooley (1980), Norman (1998), and Eason (1988), the article aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. Cooley's approach, which emphasizes designing systems that prioritize human needs and interactions, is particularly relevant in creating educational technologies that are adaptable and responsive to local contexts.

✉ David Dodick
ddodick@stanford.edu

¹ Fulbright U.S. Scholar, Universidad Columbia del Paraguay, Asunción, Paraguay

² Stanford Digital Education, Stanford University, Stanford, CA, USA

Building on this qualitative framework, the article delves into Paraguay's intricate educational landscape, highlighting the critical need to localize and customize AIED to align with its distinct local realities. Drawing on my experiences in Canada and Paraguay during the 2022–2023 AI Hype Cycle, it examines key aspects such as educational infrastructure, technological adoption, cultural context, and educational priorities and needs.

2 Dual perspectives from Canada and Paraguay

2.1 Perspective from Canada

From January to April 2023, I taught “Introduction to Artificial Intelligence in Education” at the Ontario Institute for Studies in Education of the University of Toronto (U of T). This online graduate course covered crucial AIED topics such as machine learning, adaptive systems, personalized learning, bias, privacy, and regulation.

U of T provides an ideal setting to explore cutting-edge AI. It houses Canada's top-ranked computer science program (QS World Rankings 2023) and, in 2019, established the country's largest university-based innovation node (University of Toronto 2019). U of T also has the largest research budget of any Canadian university, totaling \$1.41 billion in 2022, and a 2023–2024 operating budget of \$3.36 billion (University of Toronto 2023). Given this robust infrastructure, it was highly feasible for my Canadian students to experiment with the latest in AIED. Most of the AI tools they were trialing had been developed for English-speaking audiences, highlighting the Global North's advanced infrastructure and resource availability.

For example, a student who was an instructional technology specialist at a local university assessed Trinka's ability to serve as an online grammar checker for academic writing. Another student, a faculty liaison coordinator at a different university, researched Packback's usefulness as an AI-powered discussion platform for college and university courses. Additionally, a job coach developer at a community college explored the possibility of using Wysa to support their students' mental health.

However, these tools also raised concerns for students about the rapid pace of technological advancement without checks and balances. One student exclaimed, “It's moving too fast!” Others expressed trepidation about potential job displacement due to automation, contrasting with the “move fast and break things” ethos of the earlier internet era. This blend of excitement and apprehension appeared to mirror common perspectives in the Global North, where recognition of both the benefits and

drawbacks of technological advancement seem to coexist (Anderson and Rainie 2018).

2.2 Perspective from Paraguay

In contrast, when I traveled to Asunción, Paraguay in May 2023 as a Fulbright Specialist at Universidad Columbia del Paraguay (UCPY), I encountered starkly different realities on the ground. My aim was to help bridge the gap between rapidly advancing digital technologies and the capacity of UCPY's faculty to teach with them.

Both faculty and students at this smaller institution faced significant resource constraints. Most professors worked additional jobs, limiting their opportunities for professional development. Students struggled with full-time employment on top of classes, and unreliable home internet access exacerbated these challenges. In a focus group, one frustrated student commented that professors lacked knowledge of basic digital tools, yet had little time or support to learn them. A professor expressed in an interview, “We want to better prepare our students to meet the needs of the 21st-century workplace, but lack of time and access to resources is our biggest challenge.” Unlike Canada's cutting-edge environment, technology infrastructure and training were limited in Paraguay. The enthusiasm was there, but the realities of the context posed significant challenges.

While Paraguay certainly faced significant obstacles, I also observed exciting potential through the passion of university stakeholders eager to bridge these digital divides. UCPY faculty and administrators were keen to engage in collaborations with international partners. As a smaller, private institution, they were nimbler than the larger public universities, which were often more beholden to the government. This experience provided my first insight that advancing AIED more broadly across Paraguay would require a deep understanding of these nuanced local realities in order to build capacity effectively.

However, it is crucial to acknowledge that not all cultures or communities may embrace AIED readily. There may be valid reasons for rejecting such technologies, including cultural values, ethical concerns, or skepticism about the benefits of AI. For example, some communities might prioritize traditional teaching methods and interpersonal interactions over technological interventions. It is essential to respect these preferences and explore alternative pathways that align with local values and educational goals.

This initial Paraguayan experience also revealed the flaws in assuming the Global South simply lags uniformly behind the North technologically (Bon et al. 2022). Years of colonization may have concentrated resources and power in the Global North, profoundly influencing contemporary technological capabilities (Mohamed et al. 2020). However, such deficit-based narratives fail to capture the

intricate dynamics at play. In fact, they underscores the substantial diversity that exists both between and within regions and nations.

3 Paraguay's distinct needs and realities

Paraguay captured my interest precisely because it often goes unnoticed on the global stage. With a population of approximately 6.8 million (World Bank Open Data 2022), it is a small, landlocked nation frequently overshadowed by its larger neighbors, Brazil and Argentina. The relatively small population, concentrated primarily in and around Asunción, provided a focused geographical context that was also manageable. Paraguay presents an intriguing South American context ripe for deeper exploration and analysis, having received relatively little attention from scholars and policy-makers to date. It offers a unique blend of sociopolitical and economic challenges that significantly impact its educational landscape.

3.1 Sociopolitical context

Understanding Paraguay's educational landscape requires careful consideration of its sociopolitical context. The country's political dynamics have been shaped by a history of authoritarian rule and the concentration of power among a few elite families. This historical context has resulted in a centralized governance structure that affects all aspects of society, including education (Lambert 2000; Nickson 2015). Such centralized governance can both pose challenges and offer opportunities for the implementation of new technologies. For instance, while centralized governance may streamline decision-making processes and policy implementation, it can also lead to a lack of local autonomy and responsiveness to specific community needs.

The influence of elite families often ensures that policy decisions reflect their interests, which can either support or obstruct technological integration depending on how these align with their goals. The presence of powerful local stakeholders results in varied educational experiences across regions, making localized participatory approaches essential for effective implementation (Bardhan and Mookherjee 2006; Bray 2022; UNESCO 2017).

3.2 Economic development challenges

In addition to sociopolitical factors, economic development plays a critical role in shaping educational opportunities in Paraguay. The country's economy has historically been characterized by significant disparities in income and resource distribution. Challenges such as poverty

and limited access to financial resources directly affect educational outcomes. According to the World Bank, in 2022, approximately 5.6% of the population lived below the poverty line of \$3.65 per day, reflecting ongoing economic difficulties exacerbated by drought, high inflation, and the lingering impacts of the pandemic (World Bank 2023). These constraints limit the availability of educational resources, including up-to-date technology and adequately funded schools.

Schools in economically disadvantaged areas often lack basic facilities, and students frequently face challenges such as unreliable internet access and inadequate learning materials. Addressing these disparities through targeted economic development policies is essential. For instance, investing in infrastructure to ensure reliable internet access in rural areas, providing financial incentives for teachers, and creating scholarship programs for students from low-income families can significantly improve educational outcomes. Furthermore, aligning economic policies with educational initiatives can foster environments where technological integration supports broader socioeconomic development.

3.3 Professional development

Given these challenges, professional development in Paraguay should be contextualized within the broader sociopolitical and economic environment. Continuous professional development for teachers is crucial for integrating new technologies in education. However, such programs often lack the necessary funding and support, particularly in rural and disadvantaged areas. Effective professional development should be participatory, involving teachers in the design and implementation of training programs. It also aligns with the constructivist paradigm, which emphasizes the importance of building knowledge through experience and interaction. By addressing unique local contexts and promoting collaboration among educators and communities, policies can create supportive environments for professional growth.

3.4 Integration into a constructivist paradigm

The issues discussed above are integral to understanding the broader context in which educational technologies are introduced. A constructivist approach to education, which emphasizes active, participatory learning, can benefit significantly from incorporating local sociopolitical and economic contexts. This approach not only improves educational outcomes but also fosters a sense of ownership and empowerment among local communities, facilitating a shift toward a more participatory and inclusive educational paradigm in Paraguay (Bruner 1996; Vygotsky 1978; Freire 2000).

4 The Paraguayan education system

To further contextualize these points, it is important to understand the structure of the education system in Paraguay. Foundational education in Paraguay spans nine years, starting at the age of six. This system is structured into three distinct cycles: the first cycle encompasses grades 1 to 3, the second cycle comprises grades 4 to 6, and the third cycle includes grades 7 to 9 (Cariola Huerta 2015).

Higher education in Paraguay consists of both non-university and university levels. The non-university level focuses on technical and vocational training programs lasting three years, while the university level offers programs with a minimum duration of four years (Robledo and Morales 2017).

Although progress has been made, with school enrollment rates in Paraguay reaching around 90% for primary grades in recent years, completion rates drop to only 68% for lower secondary and 65% for upper secondary education, revealing persistent challenges in student retention and graduation, especially as students advance to higher grade levels (Carine 2018). Dropout rates increase in lower secondary grades and beyond, disproportionately impacting students from disadvantaged backgrounds who leave school before graduation. These disparities in completion rates across income levels are largely driven by economic factors (Carine 2018).

These structural challenges and disparities in completion rates underscore the need for careful consideration when introducing new educational technologies. During my stay, I became mindful of potential challenges integrating AI tools like conversational agents and adaptive learning software, designed from an individualistic Western perspective, into Paraguayan cultural contexts. For example, AI chatbots meant to supplement teachers could negatively impact traditional student–teacher bonds if not thoughtfully implemented (Nye 2015).

In conducting focus groups, interviews, and meetings with UCPY stakeholders, including students, teachers, administrators, alumni, and employers, I came to appreciate that successfully integrating new digital technologies like AI into Paraguayan education would require careful alignment with existing societal and cultural values rather than imposing foreign models (Palomares et al. 2021; Truby 2020). Paraguayan culture values warm interpersonal relationships and verbal communication in person or on the phone over written formats (Lambert and Nickson 2012). This cultural trait is deeply ingrained given the country's history and social norms.

5 Language and culture

Another key factor to consider when implementing new technologies is the integration of local languages. Currently, most AI systems strongly favor dominant languages

like English and Mandarin due to the wealth of training data available (Baker et al., 2020; Stanford HAI, 2021; Wu et al., 2020). This propensity threatens to exclude linguistic minorities and indigenous communities. Guarani, an indigenous language spoken extensively in Paraguay, plays a significant role in the daily lives of many Paraguayans. To develop culturally responsive AIED solutions, it is important to design AI tools that support both Spanish and Guarani, reflecting the linguistic diversity of the country. This involves not only translating existing AI systems but also developing new tools that understand and respond to the specific dialects and cultural references prevalent in Paraguay. For example, AI conversational agents should be trained to handle the nuances of Guarani and engage with students in a manner that respects their cultural heritage.

Integrating indigenous languages like Guarani must be done thoughtfully and in consultation with native speakers to ensure that these tools are relevant and effective in a country's educational context. I was poignantly reminded of this by a First Nations student in my Canadian course who raised concerns about AI inappropriately co-opting their indigenous language without consent (Government of Canada 2021). Their commentary underscores the ethical obligation technologists have to uphold linguistic sovereignty by prioritizing heritage languages in AI systems and consulting directly with marginalized groups when developing AI intended for their communities.

To illustrate one cultural difference observed between my Global North and Global South encounters, I created a persona named “The Digital Outlaw” for a microlesson in my Canadian AIED course. This persona, crafted using AI-generated media, was intended to teach students about bias in large language models through a Western cowboy archetype. However, when adapting this microlesson for Paraguay, simply dubbing the character with a Paraguayan Spanish voice overlooked key cultural differences. While Canada has familiarity with the cowboy mythology, Paraguay's distinct cattle ranching history lacks the same cultural reference points. This experience illustrates the importance of researching local cultural references, histories, and media contexts when adapting educational content across global regions. Assumptions of shared knowledge can inadvertently exclude or confuse students from different backgrounds, emphasizing the need for culturally sensitive educational design.

By incorporating these cultural, economic and sociopolitical considerations, we can gain a comprehensive understanding of Paraguay's contextual needs. This approach ensures that AIED solutions are not only technologically advanced but also culturally appropriate, aligning with the real-world challenges and opportunities present within Paraguayan society.

6 The role of key stakeholders in AIED adoption

To move toward successful and ethically sound AI adoption in education in a country like Paraguay, it is essential to incorporate and elevate the perspectives of local stakeholders, rather than relying solely on external entities. Key local stakeholders include, first and foremost, the students who will be most impacted by AIED implementation, as well as the teachers and administrators who interact with students on the ground (Bhimdiwala et al. 2022). They are central to the success of AIED adoption and need to be actively consulted and provided with co-design opportunities to shape technologies that align with classroom realities. Imposing systems without their involvement risks resistance, as they have legitimate concerns about deprofessionalization, increased workloads, and skills gaps that must be addressed through professional development.

Companies engaged in product development and infrastructure provision must also be active partners to ensure their products and services are relevant and accessible to users. Government education departments hold the responsibility for shaping policies and standards regarding AIED, while non-profits can assist in selecting technologies tailored to their specific contexts and training users on them (Bhimdiwala et al. 2022).

Given the diversity that can exist within countries, appropriate methods must be considered to address different needs and realities. Initiatives solely shaped by external ecosystems, divorced from local realities, frequently result in shortcomings or outright failures. Introducing new technologies does not happen in a vacuum; it necessitates rigorously examining the broader context, including causal factors, existing societal structures, and surrounding conditions that influence implementation (Bhimdiwala et al. 2022; Delgado et al. 2021). For example, investigations of Bridge International Academies, a for-profit education company in sub-Saharan Africa, found their standardized curriculum and technology model did not align with on-the-ground realities in local communities. Teachers could not adapt content and pedagogy to local languages, cultures, and norms, leading to student dissatisfaction and high teacher turnover. Parents complained that schools were not fostering desired skills and values in their children. This underscores the risks of external entities imposing educational models without extensive input from local stakeholders (Riep 2017). Engaging local stakeholders provides crucial insights to guide context-appropriate AIED adoption.

Now, let's take a closer look at each of these stakeholders.

6.1 The student perspective

Students, frequently underestimated, offer invaluable perspectives on the adoption of AIED. Drawing from their real-life academic experiences and dynamic interactions with technology, students can become active co-creators of knowledge through constructivist approaches, rather than merely passive recipients of AI content. Their interests and concerns should be central to the development process. For instance, participatory research methods such as student focus groups, technology immersion workshops, and design thinking can unveil experiential learner perspectives (Kijima et al. 2021; Scheer et al. 2012).

Younger students can participate directly in activities such as coding chatbots, creating machine learning art, or conducting AI ethics inquiries (Su and Zhong 2022; Zhu and Van Brummelen 2021). Active engagement empowers students to shape the role of AIED in their education and should be scaffolded for younger learners while avoiding tokenism.

Older students should be equipped with broader knowledge, skills, and character qualities needed to navigate societal changes driven by technological advancement (Williamson et al. 2020). Labor market shifts due to increasing automation will require flexibility, creativity, and lifelong learning. Changing information environments demand critical thinking to evaluate AI's impact across disciplines and diverse cultures. The COVID-19 pandemic necessitated rapid adaptation for students as learning abruptly shifted online, making emerging technologies essential educational tools. In this new landscape, students have had to exercise resilience, digital literacy, and self-direction.

The ultimate goal is to position students as co-creators of their AIED experiences, not just recipients of predetermined programming (Holstein et al. 2019). AI should become a creative tool for learner expression and capacity building, grounded in student insights.

6.2 The teacher perspective

Teachers are indispensable to the successful integration of AIED and should not be marginalized in implementation efforts. As mentioned earlier, imposing new systems without consultation often risks resistance; teachers may feel deprofessionalized. AI analytics, for example, should offer insights to inform teaching rather than just evaluate performance externally. Teachers should play an active role in shaping technologies that enhance, rather than automate, instruction. Educators must feel confident that human-centered teaching remains core to their work. Change processes must accommodate legitimate teacher concerns about heavier workloads or skills gaps that could arise with AIED integration. Structured co-design activities, where educator

expertise helps mold tools fitting their classroom realities, can build teacher investment in AIED (Holstein et al. 2019). Teacher needs and perspectives should drive integration strategies. Building local capacity requires comprehensive, sustained professional development programs, not disconnected one-off workshops.

Some of the initiatives I proposed at UCPY to bridge the gap between rapidly advancing digital technologies and the capacity of faculty to deliver them included the following:

- A *digital technologies in education* course and *AI literacy training* that incorporates local language and culture.
- A steering committee composed of diverse university stakeholders to shape future curricula.
- An incentivized professional development program for faculty.
- A faculty mentor program comprised of early-adopting tech champions to support colleagues.
- An evidence-based digital resources hub.

While considering academic voices is crucial, the outsized influence of global technology corporations also merits examination when considering the complex landscape of AIED adoption.

6.3 The role of corporations

The influence of large technology corporations in AIED adoption cannot be overstated. We have witnessed multinational giants like Google, Meta, and Microsoft play pivotal roles in the advancement of AI, with smaller, renowned companies like OpenAI (Bass 2023) and DeepMind (Chowdhry 2014) also receiving substantial corporate investment and acquisition. These companies stand to profit from the massive AIED market through sales, data collection, and positioning themselves as leaders in an emerging field. However, their involvement also raises important questions about data practices and ethical considerations in AIED.

6.3.1 Current data practices

A critical issue often overlooked in AIED discussions is the nature and source of data used in AI systems. Most AI models are trained on data generated from English-speaking, profit-driven platforms such as social media and search engines. This raises significant concerns about the applicability and ethical implications of using such data in educational contexts, especially in non-English-speaking countries like Paraguay. For instance, data generated from social media may not reflect the cultural and educational nuances of Guarani-speaking communities in Paraguay. Therefore, it is crucial to critically examine the sources of data used in AIED and strive for inclusive data practices that respect and

incorporate local languages and contexts. This may involve collecting and using data generated within educational settings in Paraguay, ensuring that AI systems are trained on data that is representative of the local population. Addressing these concerns naturally leads to a broader discussion on the importance of human-centered and locally focused AI systems.

6.3.1.1 Human-centered and locally focused The emphasis on human-centered systems (Cooley 1980; Norman 1998; Eason 1988) underscores the importance of designing AI technologies that prioritize the needs, capabilities, and well-being of humans. In the context of AIED, this means involving local stakeholders throughout the design and implementation process to ensure the systems meet their real-world needs. Instead of imposing top-down, one-size-fits-all solutions, AIED should be co-created in collaboration with educators, students, and community members. Technology companies should move beyond focusing solely on maximizing returns and directly involve local communities in developing contextually tailored AIED solutions. The goal should be to empower diverse populations, not homogenize education.

With thoughtful development and localized implementation, AIED can help equip the next generation worldwide with collaborative skills to shape an equitable future. However, when local contexts are overlooked, initiatives can fail, as demonstrated by the One Laptop Per Child program, where lack of teacher preparation, technical support, language barriers, and cultural disconnects – not the devices themselves – led to its downfall in developing contexts (Warschauer and Ames 2010). AIED risks similar pitfalls without a holistic understanding of local realities, making the involvement of local communities in the development and implementation of these systems crucial.

Moreover, the products and services developed by technology companies can have detrimental effects, such as perpetuating gender or racial biases or enable increased surveillance of students and teachers (Baker and Hawn 2022; Holmes et al. 2022). Applying AI systems primarily designed for relatively affluent Global North regions to vastly different Global South contexts presents significant challenges (Mohamed et al. 2020) due to the diverse needs, available resources, and pre-existing conditions in these regions. To address these challenges, companies in the Global North should actively collaborate with local educators, governments, and communities in the Global South to deeply understand contextual needs, challenges, and priorities. A one-size-fits-all approach will fall short. Product design and development should emphasize access, including support for low-bandwidth connectivity, local languages, and addressing the diverse range of resource limitations and challenges faced in different regions.

Building trust, securing informed consent, and addressing privacy concerns, requires companies to be transparent in how they collect and use data. They should prioritize localized capacity building by training students, teachers, and developers in AI skills and responsible usage while engaging directly with the community. Advocating for policy reforms to strengthen educational infrastructure, digital literacy, and data regulation, where lacking, is essential. This approach promotes digital equity and sustainable progress for learners worldwide.

Ultimately, the active involvement of technology companies in AIED should go beyond profit maximization and prioritize responsible, contextually tailored solutions that empower diverse populations and promote equitable education.

6.4 The role of government, non-profits, and community

While corporate entities wield substantial influence, governments, grassroots non-profits, and community initiatives in AIED have the potential to better serve local interests. Governments play a key role in formulating policies and funding large-scale initiatives. For instance, the Canadian government recently allocated \$443.8 million over ten years (starting in 2021–2022) to the Pan-Canadian Artificial Intelligence Strategy, aimed at strengthening AI research and commercialization, improving AI skills and talent, and promoting responsible AI (Government of Canada 2021). Similarly, in Paraguay, government policy should prioritize digital literacy initiatives to ensure broad access to essential AI knowledge, laying a strong foundation for effective AIED implementation.

In contrast, authoritarian approaches like China's mandatory AI courses may raise concerns about surveillance rather than empowerment (Wu et al. 2020; Yang 2019). Initiatives rooted in educator and student insights, rather than central mandates, can foster more human-centered integration. Systems perceived as overly intrusive in some cultures may be welcomed in others, making it crucial to capture nuanced perspectives for successful implementation.

Public engagement also plays a vital role in bringing cultural outlooks to the forefront, allowing communities to shape their AIED future based on their collective priorities. Inclusive discourse can build critical perspectives on the risks and benefits of AIED while empowering participation despite barriers like digital divides or state censorship (UNESCO 2017). Such engagement ensures that the development and deployment of AIED are aligned with the values and needs of the communities they serve.

Partnerships with grassroots non-profits and community initiatives trusted by local populations can offer valuable

insights to contextualize AIED. Organizations like Fundación Paraguaya, which promotes entrepreneurship and economic development, could be pivotal in aligning AI solutions with local needs (Fundación Paraguaya 2023). Collaborative, grassroots efforts are essential for tailoring AIED initiatives to the unique contexts of each community, thereby increasing their effectiveness and sustainability.

Countries should approach AIED implementation through inclusive consultation and small-scale pilots before large-scale enforcement. Rapid, widespread implementation without localized testing risks failure and disillusionment. A gradualist approach that explores incremental AIED integration tailored to specific learning environments allows for iterative improvements based on evidence. This method helps build trust and ensures that solutions are effective and culturally appropriate.

The successful implementation of AIED in Paraguay and similar contexts requires a holistic approach that takes into account the diverse needs and perspectives of all stakeholders, including students, teachers, corporations, government, and non-profits. By incorporating local languages, culture, and sociopolitical realities into the design and implementation of AIED, we can develop solutions that are not only technologically advanced but also contextually appropriate and equitable. This multifaceted approach is essential for ensuring that AIED contributes to the overarching goal of providing inclusive and equitable quality education for all.

7 Discussion

7.1 Preparing students for an AI-driven world

As artificial intelligence continues to advance, human-centered, ethical practices should be paramount (McNamara 2023). Educational systems should prioritize cultivating compassion, responsibility, and discernment in students, including building healthy connections in a technology-driven society. While AI and educational technology offer exciting possibilities, students still benefit immensely from human relationships beyond AI's reach. While leveraging AI's capabilities, the objective of education should remain focused on helping all individuals realize their full potential and thrive, rather than replacing them with technology. A holistic approach remains essential, nurturing each person's unique gifts (Pedro et al. 2019).

Reflecting on my dual experiences in Canada and Paraguay, I believe that Paraguayan higher education could benefit from incorporating several key competencies to prepare students for an AI-impacted future. These competencies include the following:

- Promoting critical thinking skills to evaluate AI and data-driven technologies across disciplines.
- Encouraging creativity and complex problem-solving through project-based learning, enabling students to analyze community issues and develop AI solutions.
- Offering ethics courses that explore the societal impacts of AI from various perspectives.
- Emphasizing communication, collaboration, and socioemotional learning through group projects and community service initiatives.
- Providing programming and AI literacy to demystify AI and empower students to leverage technology for positive change.

Such competencies, integrated throughout the curriculum and coupled with evolving technical skills, can empower Paraguayan higher education students to actively shape an equitable AI future. The promise of AIED lies in facilitating new avenues for learning, connecting, creating, and finding meaning. International cooperation, when approached with mutual respect and reciprocity, can significantly support these efforts.

7.2 Constructive partnerships

Constructive partnerships between the Global North and South can facilitate the beneficial exchange of AI and pedagogical expertise across cultural divides. Addressing lingering power imbalances stemming from colonialism is important, as these historical inequities may manifest in collaborations. Recognizing the long history of extractive relationships, where Northern institutions imposed their knowledge systems and agendas on Southern nations, is crucial for building truly reciprocal partnerships.

Partnerships should be established based on mutual goals identified by Southern partners, prioritizing local capacity building through flexible technology training and research support. Projects should be co-designed with meaningful input from both regions to promote bilateral learning. Northern partners can commit to transparency around data usage, IP rights, and dissemination to build trust. Investing in foundational infrastructure needs voiced by Southern institutions is essential.

Two-way exchange programs between students, educators, and researchers can foster cross-cultural understanding and debunk assumptions. Establishing mentorship programs between Northern and Southern institutions can dismantle paternalistic dynamics. Supporting Southern researchers in disseminating findings globally while respecting local knowledge-sharing norms is important.

Institutions with ample resources can offer AIED training and collaboration without dictating agendas, allowing

Southern partners to direct initiatives based on their realities. Developing countries can reciprocate by presenting authentic challenges and diverse voices to expand AIED for all. However, Southern partners must direct initiatives based on their realities, rather than external assumptions. Mutual learning, cultural humility, and respect for local contexts are essential for the success of these collaborations.

7.3 Participatory design

Realizing culturally responsive AI necessitates sustained engagement with local contexts. Participatory Design (Jesper and Toni 2013) offers a relevant theoretical framework to guide this process. This approach emphasizes actively involving end-users throughout the design and development of AI systems, rather than imposing technology in a top-down manner.

In the context of AIED in Paraguay, Participatory Design would involve identifying and collaborating with key stakeholders in the education system, including students, teachers, administrators, alumni, policymakers, and families. Through co-design workshops, focus groups, and ongoing consultation, Paraguayan stakeholders can provide critical input on how AI can address local needs and integrate with existing teaching practices. Local knowledge is vital for ensuring AI is culturally relevant and aligned with Paraguayan epistemology.

Further, Participatory Design upholds that those impacted by technology should have agency in shaping it (Jesper and Toni 2013). For example, co-design workshops could engage Paraguayan teachers in collaborative prototyping of AI-powered lesson planning tools tailored to the national curriculum. This empowers Paraguayans to guide the development trajectory of AIED based on their goals and values, giving them ownership over emergent AI systems. This also builds capacity by developing Paraguay's expertise in human-centered AI design.

Grounding the introduction of AIED in Paraguay within a Participatory Design framework will lead to systems that are technically robust, culturally appropriate, and ethically sound. It ensures AI avoids homogenizing global educational norms and instead amplifies Paraguay's unique strengths. Sustained local involvement is vital for AI's equitable and transformative education potential, and this should serve as a model for future implementations.

7.4 Limitations

The transition from the promise of AIED to its practical implementation reveals a complex landscape characterized by global disparities. For instance, AI-driven educational platforms initially developed in Silicon Valley may assume reliable access to high-speed internet, a certain level of

digital literacy among students, and standardized curricula. However, when introduced in a rural school in a low-income region of a Global South country, such assumptions can quickly prove erroneous.

For example, Paraguay faces disparities in access to cellular plans and Wi-Fi. While this has risen steadily in recent years, in 2016 only 26% of Paraguayan households had Internet access and 41.7% of its citizens had active mobile broadband subscriptions (International Telecommunication Union 2017). For countries with poorer access, AIED systems should be designed to function on public Wi-Fi and offline to serve marginalized students.

In the implementation process, crucial questions should be addressed:

- What is the economic and digital development level in the target region?
- What limitations exist in the local education system?
- Is there a basic technology infrastructure in place?

These questions underscore the multifaceted nature of the challenge, extending far beyond technological considerations.

It is also crucial to examine the motivations behind AIED adoption, discerning whether initiatives are driven by equitable goals or self-serving interests like profit or data appropriation (Eynon and Young 2020). Closely examining both national and regional cases unveils a more nuanced portrayal of how AI manifests in the Global South, dispelling “technosolutionist fantasies”—the notion that technology alone can solve systemic issues.

To highlight differences that can occur between and within regions in just a few months, from January to April 2023, I taught Canadian AIED students who all had access to ChatGPT and were able to explore it extensively. However, they did not have access to Google Bard, which I was able to use while teaching them remotely from the U.S. Therefore, it was necessary to use a screenshare to demonstrate how Bard performed relative to ChatGPT on similar tasks. Shortly thereafter, I gained access to Anthropic’s Claude, but my Canadian students still could not access it.

By comparison, during my visit to Paraguay in May 2023, I observed limited use of generative AI for teaching and learning among my South American colleagues. Meanwhile, my North American colleagues were actively engaged in revising their syllabi, rethinking their assessments, and exploring plagiarism detection tools for AI-generated writing. These disparities, both within and across regions, reiterate the significance of localizing AIED to serve contextual needs.

8 Conclusion

This analysis underscores that advancing artificial intelligence in education equitably worldwide requires moving beyond simplistic Global North–South dichotomies and considering the diverse needs and resources of each region. Nations labeled as “Global South” encompass a wide range of contexts, with varying needs, resources, and systemic challenges. Imposing one-size-fits-all AIED solutions risks neglecting these complex local realities, potentially further exacerbating the marginalization of communities rather than empowering them.

Genuine progress toward equitable, quality education demands a contextualized approach that prioritizes participatory processes, elevating local voices, priorities, and experiences. As illustrated in the case of Paraguay, successful integration hinges on incorporating culture and languages, engaging diverse stakeholders, and co-creating AIED grounded in self-defined needs rather than assumptions. This requires building widespread capacity, implementing gradual localized pilots tailored to limitations, and respecting students as partners in shaping AIED rather than passive consumers.

Constructive North–South collaborations have a role to play, but they must prioritize the empowerment of local communities to guide decision-making based on their realities. We must shift from techno-centrism and deficit narratives to serious commitments of time and resources for participation and capacity building. By embracing mutual learning and cultural humility, we can ensure that AIED not only advances educational opportunities, but also respects and amplifies the voices of those it seeks to serve.

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