# ARTIFICIAL INTELLIGENCE, INCLUSION, AND ACCESSIBILITY IN EDUCATION: POSSIBILITIES AND CONTRADICTIONS IN THE FACE OF THE DIGITAL DIVIDE

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**Maria Lucineide Moraes Vieira[1], Rafael dos Santos Nardotto[2], Janete de Souza Carneiro Athayde[3], Tauane Cristina Barreto Cardoso[4], Elâine Correia Jacobina[5], Jôfre de Moura Moraes[6], Adriana Pereira Moraes[7], Ronilda Roacab de Meneses[8], Lindamir Svidzinski[9] and Maria Elenice Pereira da Silva[10]**

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[1] Teaching Degree in Humanities/History, Universidade Federal do Maranhão
Teaching Degree in Pedagogy, Instituto Superior de Educação São Judas Tadeu
Specialization in Portuguese Language and Mathematics Teaching in Elementary Education, Universidade Federal do Maranhão
Lattes: https://lattes.cnpq.br/5431444520931504
[2] Master's Degree in Teaching, PPGEN
UENP - Universidade Estadual do Norte do Paraná
E-mail: rafaelsantosquimica2012@gmail.com
Lattes: http://lattes.cnpq.br/2720118155933737
ORCID: https://orcid.org/0000-0002-7106-3231
[3] Master's Degree in Cross-Cultural Practices
UNIFACVEST
Lages - SC
E-mail: janescat @gmail.com
[4] Master's Student in Police Sciences and Innovative Technologies / Specialist in Higher Education Teaching from the Instituto Federal Sul de Minas
Unimontes
Belo Horizonte - MG
E-mail: Tauane.pedagogia@gmail.com
Lattes: http://lattes.cnpq.br/8916251284035204
[5] Specialist in Geoenvironmental Studies and Licensing
IFPI
E-mail: elainejacobina@hotmail.com
Lattes: http://lattes.cnpq.br/2840745439040268
[6] Specialization in Literacy Acquisition, Literacy Practices, and Institutional Psychopedagogy (Course load: 1020h)
Faculdade de Educação São Luís – Jaboticabal - SP
Boa Vista - Roraima
E-mail: jofremm@hotmail.com
Lattes: http://lattes.cnpq.br/9118405332718967
[7] Specialization in Special and Inclusive Education
Faculdade de Educação São Luís
Jaboticabal - São Paulo
E-mail: dricamoraes_21_@hotmail.com
Lattes: https://lattes.cnpq.br/2962105105070066
[8] Master's Degree
UNIVATES
Boa Vista - Roraima
E-mail: oroacab@hotmail.com
[9] Master's Student in the Graduate Program in Natural Sciences and Mathematics Teaching (PPGEN) at Unicentro de Guarapuava - PR
E-mail: svidzinskilindamir@gmail.com
Lattes: https://lattes.cnpq.br/8158198842926465
[10] Professional Master's Degree in Intellectual Property and Technology Transfer for Innovation (PROFNIT) – Instituto Federal de Educação, Ciencia e Tecnologia da Paraiba - IFPB
E-mail: maria.elenice@ufpi.edu.br
Lattes: http://lattes.cnpq.br/0921297025342763
ORCID: https://orcid.org/0009-0009-7841-2447

**Abstract**

The incorporation of Artificial Intelligence into educational processes has expanded the possibilities for developing resources aimed at accessibility, personalization, communication, and the participation of students with diverse characteristics and needs. Machine translation systems, captioning, speech recognition and synthesis, intelligent screen readers, adaptive interfaces, and tools based on natural language processing exemplify applications that can help reduce educational barriers. However, the inclusive potential of these technologies coexists with inequalities related to infrastructure, digital skills, socioeconomic conditions, data representativeness, and linguistic, cultural, and algorithmic biases. This chapter aims to critically analyze the possibilities and contradictions of Artificial Intelligence in promoting educational inclusion and accessibility, considering the digital divide as a phenomenon that extends beyond the availability of devices and connectivity. It adopts a qualitative, bibliographic, and exploratory approach grounded in national and international studies on inclusive education, Artificial Intelligence, assistive technologies, and digital inequality. The analysis indicates that AI can increase autonomy, access to content, and forms of participation, but its benefits are not automatically distributed equitably. It concludes that an inclusive approach to AI requires accessible infrastructure, teacher education, participatory design, linguistic and cultural diversity, algorithmic transparency, and policies capable of ensuring that technological innovation is accompanied by educational justice.

***Keywords:*** Accessibility, Artificial Intelligence, Digital divide, Educational equity, Inclusive education.

## INTRODUCTION

Artificial Intelligence (AI) has come to occupy an increasingly prominent position in discussions about the future of education. Systems capable of producing texts, images, and audio; translating content; recognizing speech patterns; adapting materials; and supporting different forms of interaction have broadened the possibilities for using digital technologies in teaching and learning processes. In the field of inclusive education, these features are of particular interest because of their potential to reduce barriers to communication, access to information, and participation.

The relationship between technology and inclusion, however, is not linear. Holmes, Bialik, and Fadel (2019) had already emphasized that the educational benefits of AI depend on the pedagogical and social choices guiding its implementation. Selwyn (2019), in turn, questions technodeterministic perspectives that attribute to technology an autonomous capacity to solve educational problems. Along similar lines, UNESCO (2023) argues that the use of AI systems in education should be guided by principles of equity, rights protection, transparency, and human-centeredness.

When the analysis turns to inclusive education, this caution becomes even more necessary. Mantoan (2003) understands inclusion as the transformation of school conditions for participation and learning, rather than simply placing individuals within pre-existing structures. In their discussion of Universal Design for Learning, Zerbato and Mendes (2018) reinforce the importance of addressing diversity from the educational planning stage by expanding forms of representation, expression, and participation.

In this context, AI-based tools offer significant possibilities. Kooli and Chakraoui (2025) analyze intelligent screen readers, voice assistants, speech recognition, and natural language processing systems designed to include students with visual, physical, and cognitive disabilities. The authors identify contributions to autonomy, engagement, and content accessibility, while also noting limitations related to system accuracy, infrastructure, teacher preparation, data protection, and algorithmic biases.

Fitas (2025) broadens this discussion by simultaneously considering students with disabilities and those who face language barriers. Real-time translation, captioning, adaptive systems, and assistive technologies can facilitate the participation of groups that encounter obstacles in conventional models of communication and access to content. At the same time, the author cautions that the positive effects identified still coexist with limited long-term evidence and with the risk that differences in adoption between more and less advantaged institutions may create new digital divides.

This point significantly changes how the digital divide is understood. Warschauer (2003) had already argued that technological inequality cannot be reduced to computer ownership or the availability of connectivity. The capacity to participate meaningfully in digital environments also depends on skills, social resources, literacy practices, and institutional conditions. Van Dijk (2020) develops this conception further by distinguishing among different dimensions of access, demonstrating that inequalities may persist even after devices and connectivity become available.

With the expansion of AI, this discussion reaches a new level. Matjie, Nethavhani, and Matlakala (2026) demonstrate that the digital divide associated with Artificial Intelligence must account for access, skills, outcomes, cultural representativeness, and the very operation of algorithms. According to the authors, formal access to systems does not ensure that users benefit from them equally. The following formulation summarizes one of the theoretical foundations of this chapter:

> The adoption of AI in education is shaped by three interrelated dimensions. The digital access and skills divide emphasizes that mere access to devices and connectivity is insufficient; students and educators also require digital literacy and institutional support to interact meaningfully with AI. The algorithmic divide highlights that AI systems may reproduce social inequalities because of biases in unrepresentative datasets and design choices, disproportionately affecting marginalized students. Finally, sociocultural and institutional mediation determines how AI interacts with pedagogy, curricula, and community contexts. (Matjie; Nethavhani; Matlakala, 2026, p. 3, our translation).

This understanding makes it possible to move beyond a discussion of who has access to technology toward another question: who actually benefits from it? Matjie, Nethavhani, and Matlakala (2026) use the concept of a third-level digital divide to address inequalities in outcomes even when access is already available. Systems trained on inadequately representative data may provide less appropriate feedback, misinterpret the work of certain groups, or offer recommendations of uneven quality.

The linguistic and cultural dimensions make this issue even more complex. Systems developed predominantly in dominant languages may perform less effectively when dealing with local languages, language varieties, speech patterns, or cultural contexts that are underrepresented in training datasets.

Matjie, Nethavhani, and Matlakala (2026) argue that exclusion may therefore result not only from a lack of access, but also from the design of the technology itself. Digital inclusion ceases to be solely a matter of availability and comes to encompass representativeness as well.

Fitas (2025) offers a complementary perspective by showing that translation and language-processing technologies can, paradoxically, have opposing effects. When appropriately developed and used, they can reduce barriers faced by students learning in a language different from the one used in their home environment. When they perform poorly for certain languages or are implemented without cultural sensitivity, they may reproduce precisely the inequalities they are intended to address.

It is also necessary to recognize that technological accessibility does not result solely from technical features. Kooli and Chakraoui (2025) emphasize that the successful implementation of AI-based assistive technologies depends on compatible devices, stable connectivity, technical support, and teacher preparation. Without these conditions, potentially inclusive tools may remain inaccessible in precisely the educational settings that could benefit most from them.

Teacher education therefore occupies a decisive position. It is not enough for teachers to be aware that these tools exist; they must develop the capacity to assess their pedagogical relevance, accessibility, limitations, and associated risks. Such preparation includes the ability to evaluate automated responses, recognize biases, protect student information, and determine when a technological solution actually expands participation.

There is also a political and participatory dimension. Systems developed for historically marginalized groups cannot dispense with the participation of those very groups. Fitas (2025) recommends that students with diverse needs participate in testing new tools, allowing their experiences to guide modifications or reveal that a particular solution is unsuitable. Kooli and Chakraoui (2025) likewise advocate codesign processes involving people with disabilities and the adoption of international accessibility standards from the earliest stages of development.

The question guiding this chapter arises from this tension: under what conditions can Artificial Intelligence enhance educational inclusion and accessibility, and how might the digital divide, algorithmic biases, and sociocultural inequalities limit or contradict this potential?

The general objective is to critically analyze the possibilities and contradictions associated with using Artificial Intelligence to promote educational inclusion and accessibility in the face of the various dimensions of the digital divide. More specifically, the chapter seeks to discuss the expansion of the concept of the digital divide in the context of AI; examine the possibilities offered by assistive technologies and intelligent resources; critically address linguistic, cultural, algorithmic, and institutional inequalities; and reflect on the conditions required for more equitable implementation in education.

In addition to this introduction, the chapter presents the methodological approach and develops three main areas of discussion: the possibilities of Artificial Intelligence for inclusion and accessibility; the transformation of the digital divide in the context of intelligent systems; and the contradictions related to bias, infrastructure, teacher education, participation, and governance. The final considerations revisit the idea that AI is neither inherently inclusive nor inherently exclusionary: its effects depend on the social, pedagogical, cultural, and political conditions that guide its development and use.

## METHODOLOGICAL APPROACH

The study adopts a qualitative, bibliographic, and exploratory approach. This choice reflects the objective of critically understanding a phenomenon that is still undergoing rapid transformation by bringing together contributions concerning inclusive education, accessibility, Artificial Intelligence, and the digital divide. The analysis is not limited to the technical features of the tools but seeks to relate them to the social, pedagogical, cultural, and institutional conditions that affect their adoption.

The corpus consisted of books, documents produced by international organizations, and scientific articles, with priority given to recent studies directly addressing AI, inclusive education, assistive technologies, and digital inequalities. The conceptual references include Warschauer (2003), Holmes, Bialik, and Fadel (2019), Selwyn (2019), Van Dijk (2020), and UNESCO (2023). For the contemporary discussion, Fitas (2025), Kooli and Chakraoui (2025), and Matjie, Nethavhani, and Matlakala (2026) are central, complemented by Brazilian studies related to inclusion and accessibility.

The selection prioritized studies that did not present AI exclusively as a technical innovation, but simultaneously discussed its possibilities, limitations, and implications for different groups of students. This approach is similar to the procedure adopted by Fitas (2025), whose review focused specifically on the intersection of AI, education, inclusion, and accessibility. The author describes it as follows:

> The article is based on a comprehensive review of the literature and reports at the intersection of Artificial Intelligence, education, inclusion, and accessibility. Peer-reviewed journals, conference proceedings, and academic databases were examined, primarily for articles published in the preceding three years. [...] The inclusion criteria encompassed studies that explicitly addressed AI in an educational context, involved students with disabilities and/or multilingual contexts, and discussed outcomes, benefits, or challenges related to inclusion. (Fitas, 2025, p. 5730, our translation).

The present chapter does not constitute a systematic review and does not replicate the procedures employed by Fitas (2025). The similarity lies in the choice of a recent, interdisciplinary corpus that allows technological potential to be examined alongside the conditions required for inclusion. The analysis was organized along three lines: the possibilities of AI for accessibility and participation; the transformation of the digital divide in the context of intelligent systems; and the ethical, pedagogical, and institutional conditions required for more equitable integration.

## ARTIFICIAL INTELLIGENCE AND INCLUSION: RESOURCES THAT CAN REDUCE BARRIERS

AI has expanded the range of resources that can be used to address certain educational barriers. Screen readers enhanced by intelligent processing, speech recognition and synthesis, transcription systems, automatic captioning, real-time translation, image description, and adaptive interfaces offer important possibilities for students with diverse needs.

Kooli and Chakraoui (2025) analyze these applications in relation to students with visual, physical, and cognitive disabilities. The authors emphasize that AI-based screen readers can go beyond the linear conversion of text into speech by incorporating features such as voice modulation, contextual identification, and navigational support. Voice assistants and speech-recognition systems can also reduce dependence on keyboards and mice, enabling greater autonomy in school activities.

This type of application changes the meaning of assistive technology by incorporating a greater capacity for adaptation. The purpose is not to replace existing technologies, but to add interpretation, prediction, and personalization capabilities. The inclusive potential thus emerges when technology reduces a specific barrier and expands a student’s opportunity to participate.

Fitas (2025) identifies a similar process when addressing translation and language support. In multilingual classrooms, text and speech translation tools can assist students who have not yet mastered the predominant language of schooling. Real-time captioning systems, bilingual glossaries, and adapted explanations can provide an additional layer of understanding that would not be available in conventional materials.

Inclusion, in this sense, can be understood as extending beyond disability. Linguistic, cognitive, communicative, and format-related barriers also affect opportunities for learning. This understanding brings the discussion closer to the Universal Design for Learning perspective presented by Zerbato and Mendes (2018), insofar as different forms of representation can foster the participation of a broader range of students.

Kooli and Chakraoui (2025) summarize the potential of these technologies while simultaneously drawing attention to a fundamental condition:

> Despite these benefits, successful implementation requires more than simply making the technology available. Robust technical infrastructure is essential, including compatible devices, stable internet connectivity, and processing capacity. Without these conditions, the benefits of AI tools may remain inaccessible, especially in underserved educational settings. In addition, educators must be prepared not only to operate these tools but also to integrate them meaningfully into pedagogy. (Kooli; Chakraoui, 2025, pp. 3–4, translation).

This passage is particularly relevant because it prevents the analysis from being reduced to software capabilities. Between a potentially accessible technology and a genuinely inclusive experience lie several intermediate conditions: compatible equipment, connectivity, support, planning, and teacher education.

The authors themselves acknowledge technical limitations. Intelligent screen readers may struggle with scientific language, multimedia content, and complex visual structures. Speech-recognition systems produce different results depending on noise, accent, and the characteristics of the user's speech. Interfaces based on language processing may oversimplify certain content or misinterpret less standardized forms of expression.

This point reveals an important contradiction. A tool created to enhance accessibility can produce a new barrier when it interprets certain patterns of language, voice, or behavior more effectively than others. A system's average performance is therefore insufficient to assess how inclusive it is. It is necessary to ask for whom it works adequately and who remains subject to higher error rates.

Fitas (2025) reaches a similar conclusion. Although the author identifies benefits for students with disabilities and those who face language barriers, he stresses that long-term evidence remains limited and that unequal adoption among schools with differing economic resources may undermine inclusion objectives.

Thus, the first possibility offered by AI is real but conditional: intelligent systems can reduce barriers to access, communication, and interaction, but they do not automatically transform an educational experience into an inclusive one. Their contribution depends on the relationship among the student's needs, the quality of the tool, and the conditions under which it is used.

## FROM THE ACCESS DIVIDE TO THE ALGORITHMIC DIVIDE: NEW FORMS OF INEQUALITY

The expansion of AI requires a reassessment of simplified conceptions of the digital divide. Warschauer (2003) had already demonstrated that owning equipment does not necessarily entail meaningful participation in digital culture. Van Dijk (2020) also distinguishes among material access, skills, and forms of use, showing that inequalities persist even as connectivity expands.

In the context of AI, Matjie, Nethavhani, and Matlakala (2026) deepen this discussion by demonstrating that educational benefits may be distributed unequally even among formally connected users. Their analysis considers divides related to access, digital skills, outcomes, language, culture, and the characteristics of algorithms.

The so-called third-level digital divide is particularly important. It shifts the question from "Who has access?" to "Who achieves better outcomes through that access?" Systems trained on inadequately representative datasets may provide less accurate feedback to certain groups, misinterpret their work, or classify them according to inappropriate standards. Matjie, Nethavhani, and Matlakala (2026) observe:

> AI systems trained on datasets that underrepresent certain populations generate biased predictions, provide less appropriate feedback, and misinterpret students' work, producing what may be understood as a third-level digital divide, related not to access but to who ultimately benefits from AI. In educational settings, these unequal outcomes manifest themselves in differences in the quality of the feedback and recommendations provided to students. (Matjie; Nethavhani; Matlakala, 2026, p. 3, translation).

This interpretation significantly broadens the debate on equity. Two students may have access to the same system and use similar equipment yet derive different benefits because the algorithm responds more effectively to the language, context, writing pattern, or cultural references of one of them.

Linguistic inequality is a particularly striking example. According to Matjie, Nethavhani, and Matlakala (2026), many AI-based educational technologies privilege dominant languages, especially English, while local and Indigenous languages and languages with a smaller digital presence remain underrepresented. The result is not only a matter of translation: examples, metaphors, discursive structures, and cultural references also affect the pedagogical relevance of responses.

Fitas (2025), on the other hand, demonstrates that the same technology can be used to address language barriers. Translators, captioning systems, and language-processing tools can facilitate communication between teachers and students from different backgrounds. The contradiction lies precisely here: AI can simultaneously reduce and reproduce linguistic inequalities, depending on the quality of the models, the languages covered, and the cultural conditions under which they were developed.

The study by Matjie, Nethavhani, and Matlakala (2026) also presents experiences that point to alternative paths. In Kenya, a translation project involving English and Kenyan Sign Language used codesign and included the participation of the Deaf community. In Mali, the production of content in Bambara combined AI with human editing and culturally contextualized resources. In African countries, open educational resource initiatives linked AI localization to teacher education.

These cases suggest that representativeness should not be treated solely as a technical feature of a dataset. It is also a matter of social participation. Communities, teachers, and students can help test tools, identify inadequacies, and produce resources that reflect their contexts.

There are also inequalities related to skills. Matjie, Nethavhani, and Matlakala (2026) present the case of mathematics teachers in urban and rural schools in China, where the problem lay not simply in the absence of infrastructure, but in differences in professional preparation for the pedagogical use of technologies. This finding is consistent with the second dimension of the digital divide discussed by Van Dijk (2020): access without skills does not ensure meaningful appropriation.

The authors' comparative analysis demonstrates that interventions implemented without teacher preparation or contextualization can lead to underuse, student dissatisfaction, and widening inequalities. By contrast, experiences associated with community participation and professional education yield more favorable outcomes.

The digital divide in the age of AI therefore encompasses multiple layers. Traditional inequalities in infrastructure and connectivity persist, but they are compounded by differences in skills, quality of use, outcomes, linguistic and cultural representativeness, and algorithmic treatment. The more extensively AI participates in educational processes, the more important it becomes to investigate these dimensions.

## TEACHER EDUCATION, PARTICIPATION, AND GOVERNANCE: CONDITIONS FOR INCLUSIVE AI IN EDUCATION

If the effects of AI depend on conditions that extend beyond technology, the discussion must address the responsibilities of institutions, teachers, developers, and public policy. UNESCO (2023) maintains that generative systems used in education must preserve human agency, data protection, and equity. Selwyn (2019) adds that decisions about educational technologies are also social and political decisions, as they determine who participates, who controls resources, and which conceptions of education are prioritized.

Teacher education is one of the conditions most frequently identified in the studies analyzed. This does not merely mean teaching educators how to operate a particular platform. The incorporation of AI requires competencies to evaluate responses, identify biases, assess accessibility, understand data-related risks, and make pedagogical decisions about when a given tool should or should not be used.

Fitas (2025) draws attention to the enduring importance of the human role even in environments where AI begins performing tasks that previously depended directly on teachers. In summarizing the conclusions of his review, he states:

> AI technologies do not constitute a universal solution and present challenges of their own. Issues related to equitable access, such as the digital divide and biases in AI systems, pose genuine risks of widening inequalities if they are not directly addressed. [...] This means investing in infrastructure, selecting or developing culturally and linguistically inclusive solutions, and keeping human beings in the loop to identify and correct the limitations of algorithms. Teachers remain irreplaceable as facilitators, decision-makers, and providers of emotional support in the classroom. (Fitas, 2025, p. 5755, translation).

The human presence mentioned by Fitas (2025) should not be understood merely as the final supervision of an automated response. It involves pedagogical judgment. Systems can recognize patterns, generate materials, and propose pathways, but they do not have complete access to the relationships, histories, and circumstances that shape a class. Teacher mediation remains necessary to determine whether an adaptation preserves learning objectives and whether a particular resource is appropriate for a given context.

Kooli and Chakraoui (2025) also connect teacher education with infrastructure. In the case of speech-recognition tools, for example, successful implementation depends on devices, microphones, connectivity, and professional preparation. When these conditions are absent, students may theoretically have access to an inclusive solution while remaining unable to use it adequately.

Another factor is data protection. Accessibility resources may process voice data, writing patterns, performance information, and characteristics associated with a student's disability or needs. Kooli and Chakraoui (2025) caution that intelligent interfaces frequently process sensitive data, requiring specific safeguards for the storage, sharing, and use of such information.

Inclusion also requires participation in technological development. Matjie, Nethavhani, and Matlakala (2026) demonstrate that models built with community participation and the integration of local languages have greater potential to reduce cultural biases. In their comparative framework, the study shows that projects based on codesign with Deaf users or on culturally contextualized content produce results different from those implemented through top-down approaches.

Such participation changes the traditional position of users. People with disabilities, students from linguistic minority communities, and teachers cease to be merely the recipients of externally developed solutions and begin contributing to their design, evaluation, and improvement.

From an institutional perspective, governance must keep pace with innovation. The adoption of AI without clear policies on accessibility, data protection, criteria for selecting tools, and responsibilities may transfer important decisions to private platforms or opaque automated processes. In this regard, UNESCO

(2023), Selwyn (2019), and Matjie, Nethavhani, and Matlakala (2026) converge on the need to treat technology integration as an educational and social decision, rather than merely an administrative one.

The case analysis conducted by Matjie, Nethavhani, and Matlakala (2026) leads the authors to a particularly significant conclusion: equitable outcomes depend on participatory design, sustained teacher education, and institutional preparedness. Mere access to tools does not guarantee meaningful use, and the operation of systems must be analyzed in relation to skills, cultural context, and institutional capacity.

An AI policy committed to inclusion must therefore address multiple areas simultaneously: accessible infrastructure, critical professional development, bias assessment, linguistic and cultural diversity, user participation, data protection, and outcome monitoring. The absence of any one of these dimensions may transform a tool designed to reduce barriers into yet another source of inequality.

## FINAL CONSIDERATIONS

The analysis developed in this chapter demonstrates that the relationship among Artificial Intelligence, inclusion, and accessibility is marked by concrete possibilities and equally significant contradictions. Intelligent screen readers, speech recognition, interfaces based on natural language processing, machine translation, captioning, and adaptive systems can enhance autonomy and reduce certain barriers to accessing educational processes.

The existence of these resources, however, does not ensure that their benefits will be distributed equally. The contemporary digital divide extends beyond the availability of connectivity and equipment. It encompasses skills, conditions of use, the quality of outcomes, data representativeness, linguistic and cultural appropriateness, and institutions' capacity to integrate technologies in pedagogically meaningful ways.

The studies by Fitas (2025), Kooli and Chakraoui (2025), and Matjie, Nethavhani, and Matlakala (2026) show that the same AI capable of enhancing accessibility may also produce new forms of exclusion. Systems may perform unevenly when processing certain languages, accents, forms of expression, or user characteristics; schools may possess differing capacities to implement the tools; and formally connected students may derive profoundly different educational benefits.

In this sense, the issue examined in this chapter cannot be resolved simply by stating that AI either promotes or hinders inclusion. Its inclusive potential depends on the conditions under which it is developed, accessed, used, and governed. Intelligent resources contribute to more accessible education when they respond to concrete barriers, are evaluated in diverse contexts, preserve human participation, and are supported by adequate infrastructure and teacher education.

It is also necessary to shift the discussion from AI created for certain groups to AI built with their participation. The involvement of people with disabilities, linguistic communities, students, and teachers in development and evaluation processes can help identify barriers that would not be recognized by technical teams alone.

It can therefore be concluded that the central issue for inclusive education in the age of Artificial Intelligence is not merely expanding access to technologies, but ensuring that students have equitable opportunities to benefit from them. The more intelligent systems mediate access to information and learning, the greater the commitment must be to accessibility, representativeness, participation, transparency, and educational justice. Innovation can be considered inclusive only when its technical capabilities are matched by the social and pedagogical conditions required to ensure that no students are excluded from its benefits.

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