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Artificial intelligence and other educational digital technologies to promote accessibility for people with disabilities

Abstract

The inclusion of students with disabilities in higher education remains a multifaceted challenge that requires integrated approaches, involving effective public policies, innovative pedagogical practices, and the strategic use of accessible and assistive digital technologies. Despite normative and institutional advances, architectural, communicational, pedagogical, and technological barriers persist, compromising access, retention, and academic success for these students. In this context, although implementation is still incipient in many educational institutions, resources based on Artificial Intelligence (AI) and other educational digital technologies can, if properly used, become promising tools for personalised teaching, content adaptation, and the production of accessible materials. This literature review article aims to investigate and systematise pedagogical practices that integrate AI and digital technologies with a focus on accessibility, contribute to teacher training guided by ethical, critical, and creative principles, and produce scientific and technical knowledge that can facilitate inclusive teaching strategies and institutional policies, to support a research project that studies the pedagogical use of Artificial Intelligence to promote accessibility for people with disabilities in education and training. For this review, the inclusion criteria encompassed peer-reviewed articles, policy documents, and institutional reports published between 2000 and 2025, with a particular emphasis on studies that address accessibility in higher education and the pedagogical applications of AI. Data from Portuguese and Brazilian higher education institutions reveal persistent challenges, including dropout rates among students with disabilities exceeding the general average, largely due to limited digital accessibility and insufficient pedagogical support. These findings justify the need for targeted investigations in the context of inclusive practices supported by AI.

Keywords: artificial intelligence, accessibility in higher education, AI assistive technologies, inclusive education, teacher training

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Introduction

Brazilian universities, particularly within the Portuguese-speaking context, are recognised as a reference in Special Education. In this regard, this research aims to explore the importance of Artificial Intelligence and other digital technologies in promoting accessibility for people with disabilities in higher education. A federal university in Brazil will serve as the field of study. Accordingly, the general objective of this article is to present the development plan for a research project on AI resources and other digital technologies to promote accessibility for people with disabilities in higher education.

The inclusion of people with disabilities in higher education is a global challenge that demands concrete actions, effective public policies, and pedagogical innovations supported by accessible and assistive technologies. Despite legislative and institutional progress, many students with disabilities still face significant barriers to accessing, remaining in, and completing their university studies. These barriers are not only physical but also related to communication design, pedagogy, and technology.

In this context, the use of Artificial Intelligence (AI) and other digital technologies emerges as a strategic opportunity to transform educational practices and foster more inclusive learning environments. It can already be affirmed that AI-based tools can offer personalised support, adapt content to students' specific needs, and assist educators in creating accessible materials. However, the adoption of these technologies remains limited in many higher education institutions, especially regarding their application for accessibility purposes.

This research project is therefore justified by the need to: i) Investigate and systematise innovative pedagogical practices that use AI and digital technologies to promote accessibility in higher education; ii) Contribute to the training of university teachers in the ethical, critical, and creative use of these technologies to support students with disabilities; iii) Produce scientific and technical knowledge to support institutional policies on inclusion and digital accessibility.

The relevance of this project lies in three main dimensions:

i Social: It promotes equity and social justice by proposing solutions that expand educational opportunities for people with disabilities, aligning with the Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education) and SDG 10 (Reduced Inequalities).

ii Scientific: It contributes to the advancement of knowledge at the intersection of special education, artificial intelligence, and digital technologies, with a focus on accessibility in higher education.

iii Formative and Institutional: It strengthens teacher training for the critical and creative use of AI technologies that can facilitate inclusion, contributing to the transformation of pedagogical practices and the development of a more accessible and welcoming institutional culture.

Based on the above, this section contextualises a research project, presenting the main objectives to be achieved and highlighting its justification/relevance. The theoretical framework briefly presents a

review of the literature, highlighting the state of the art of the relevant literature. The methodology highlights a set of procedures and techniques used to conduct this research systematically and rigorously, seeking to generate valid and reliable knowledge. The application of the scientific method will guide the observation and formulation of hypotheses through to the analysis and interpretation of the results. The expected results and final considerations correspond to the final sections of this work proposal.

Literature review

Inclusive education is a fundamental right, as established by the Convention on the Rights of Persons with Disabilities (UN, 2006), and entails ensuring access, retention, and success for all students, regardless of their conditions. In the context of higher education, this requires overcoming pedagogical, communicational, and attitudinal barriers.[1, 2]

Despite legal and institutional progress, the inclusion of people with disabilities in higher education still faces significant challenges. Architectural, communicational, curricular, and attitudinal barriers persist in many institutions, hindering access, retention, and academic success for these students. Furthermore, the absence of clear institutional policies and qualified human resources contributes to covert exclusion, even in contexts that claim to be inclusive. Studies such as those by Alves[3] and Silva et al.[4] indicate that digital and pedagogical accessibility remains a critical gap in higher education, requiring structured and ongoing actions.

Authors such as Booth and Ainscow,[5] through the Index for Inclusion, have emphasised the importance of institutional practices that promote participation and learning for all, including students with intellectual disabilities and/or Autism Spectrum Disorder (ASD).

A theoretical approach also relevant to promoting inclusion in higher education is Universal Design for Learning (UDL), which advocates for the creation of flexible and accessible educational environments from the outset of pedagogical planning. According to Rose and Meyer,[6] UDL is based on three core principles: providing multiple means of representation, action and expression, and engagement. The integration of AI can enhance these principles by enabling, for example, content personalisation, automatic adaptation of materials, and offering multiple forms of interaction with knowledge. Thus, UDL and AI can interact synergistically in building more inclusive and responsive pedagogical practices that meet the needs of all students.

Nevertheless, the literature review may also consider other theories and models that enrich the theoretical foundation, particularly those aligned with the themes of inclusion, accessibility, teacher training, and digital technologies, such as:

i Habermas's Theory of Communicative Action (1984): This can be used to support the importance of dialogue, intersubjectivity, and collective construction of meaning in the educational process. In inclusive contexts, this theory reinforces the need for pedagogical practices that value active listening, participation, and the recognition of diversity as a constitutive element of learning.

ii TPACK Model: Offers a framework for understanding the competencies teachers need to effectively integrate technology, pedagogy, and content. In the context of inclusion, TPACK can be expanded to include knowledge of accessibility and assistive technologies, promoting more comprehensive and sensitive teacher training for students with disabilities.

iii Vygotsky's Sociocultural Theory (1978): Highlights the role of social interactions and cultural mediations in human development. AI can be understood as a mediating tool that, when well used, expands the zone of proximal development for students with disabilities, offering personalised support and promoting autonomy.

iv Sen's Capability Approach (1999): Proposes that social justice should be measured by the real freedom individuals have to realise their potential. Applied to inclusive education, this theory reinforces the importance of removing barriers and providing effective conditions for all students, with or without disabilities, to fully participate in academic life.

Teacher training is central to the effective implementation of inclusive technologies. According to Moran[7] and Valente,[8] it is necessary to develop critical and creative digital competencies, as well as an ethical and inclusive stance towards technology.

The proposal for training trainers aligns with the concept of communities of practice,[9] in which teachers learn collaboratively to integrate AI and digital technologies into their pedagogical practices.

AI has the potential to transform education by offering:

i Intelligent tutoring systems that adapt to the student's pace.[10]

ii Educational chatbots that assist with communication and student support.[11]

iii Predictive analytics tools to identify learning difficulties early.[12]

iv Generic tools to generate multimedia or audio-script visual content (including coding games); to create lesson plans; support academic research; analyse documents; automate data extraction and organisation; assist with reading, comprehension, and organisation of scientific articles; and even generate and structure academic papers, among many others.

In the context of inclusive education, AI can be used to:

i Automatically create accessible materials (e.g., subtitles, text-to-speech).

ii Develop personalised assistants for students with disabilities.

iii Facilitate the organisation of academic work and scientific articles.

iv Support teachers in adapting content and pedagogical strategies.

Recent studies have highlighted the importance of understanding the perceptions, practices, and challenges faced by university teachers in supporting students with disabilities. Research by Brito and Ambrósio[13] shows that collaborative teacher training, combined with the use of technologies such as AI, can significantly enhance teachers' ability to foster more accessible and inclusive learning environments. A recent case study demonstrated that AI can be used to generate adapted visual and auditory resources, particularly benefiting students with visual impairments or attention difficulties.

However, it is important to note that the literature also shows that access to higher education alone does not guarantee retention and academic success for students with disabilities. National and international research data indicate higher dropout rates among these students, often linked to a lack of pedagogical support, limited digital accessibility, and absence of institutional follow-up. Initiatives such as the INnetCampus project, funded by Erasmus+, demonstrate that personalised support policies and the use of assistive technologies

can significantly reduce these rates, promoting more equitable and welcoming environments.

Fruauff et al.[14] highlight that although assistive technologies have a positive impact on the learning of students with special needs, ongoing teacher training is still insufficient, limiting the effective use of these tools in the classroom.

Bećirović[15] also points out that the lack of training, self-confidence, and positive attitudes among teachers is a significant barrier to the integration of digital technologies, especially in inclusive contexts.

Silva et al.[16] emphasised that the absence of specialised and continuous training undermines the effective application of assistive technologies in higher education, reinforcing the importance of structured and evidence-based training actions.

Therefore, the literature suggests that many teachers still lack specific training in digital accessibility and the use of assistive technologies, which reinforces the need for institutional diagnostics such as the one proposed in this project.

The most recent literature reinforces that AI can be a powerful ally in promoting inclusion, provided that its use is guided by ethical and pedagogical principles. A hybrid model for automated assessment of short answers, with the potential to be adapted for students with cognitive difficulties, may be a solution. Leite[17] highlights that GenAI has revolutionised traditional approaches to higher education, complementing human work and promoting changes in the role of educators. White's[18] work discussed how AI could be applied to solve practical problems faced by people with disabilities, including communication barriers and access to information.

In recent years, we have seen a significant increase in the use of AI for assessment and feedback, which is much faster than human grading. AI-based platforms such as Kahoot!, Socrative AI, Wayground AI (formerly Quizizz), Padlet TA (AI-powered teaching assistant) or Nearpod Renaissance (interactive lessons, quizzes and gamified experiences created with AI), have been increasingly used, recognising them as the main learning applications that have transformed the conventional assessment process into a student-centred process. We can add many other applications for learning, such as: Grammarly (suggestions for improving grammar, spelling and writing style); Socratic (search for better, more complete and more visual explanations for class materials); Copyscape (free plagiarism checker to find copies of your web pages online); or even MSL - MyStudyLife (personal academic assistant), among others.

In the context of the literature review, prompt engineering is increasingly recognised as a key practice in crafting and refining instructions to obtain precise and relevant responses from AI models. This technique allows for greater control over generated outputs and helps reduce ambiguity and errors, thereby maximising the educational potential of AI tools.

Broadly speaking, prompts used for literature review and extraction of relevant information can be classified into: i) Conditional Prompts: Designed to explore hypothetical scenarios and generate reflective insights; ii) Comparative Prompts: Used to highlight similarities, differences, and implications; iii) Critical Prompts: Aimed at evaluating, reviewing, and enhancing academic content.

One of the first steps in this process is to foster informal training for the correct and appropriate use of chatbots and research assistants, such as ChatGPT, Copilot, Gemini, or Claude.ai.

Based on this, identifying the most relevant works, authors, and tools that discuss the use of prompt engineering, generative AI, adaptive platforms, and learning support tools for students with disabilities is a constantly evolving goal. This effort seeks to offer a more updated perspective aligned with the post-pandemic context and the rapid digital transformations without neglecting the ethical considerations required when using such AI-based tools.

Acknowledging the ongoing need for updates, the literature review presents a set of tools grouped into categories: i) Literature Search and Review Tools (Semantic Scholar, Research Rabbit, Samwell AI, Elicit, Perplexity AI, Wonders, Afforai, Search Smart, Litmaps, Connected Papers, etc.); ii) Academic Writing and Editing Tools (Scholarcy, Jenni AI, PaperGen, Grammarly, Lex, Yomu AI, Penelope AI, Samwell AI, Tenorshare AI, etc.); iii) Data Analysis and Visualisation Tools (Flourish, Dataline, Julius AI, Bricks, etc.); iv) Presentation and Visual Content Creation Tools (Napkin, Pitch, Mapify, Gamma AI, Microsoft Designer, etc.); v) Information Extraction and Document Interaction Tools (SciSpace, Explainpaper, ChatPDF, Avidnote, Coral AI, Paperguide.ai, Lateral, docAnalyzer.ai, Powerdrill AI, Aether Brain, etc.); vi) Learning and Knowledge Organisation Tools (iki.ai, NotebookLM, MyLens, Heuristica, TutorIA.me, etc.); vii) Other Tools for Creating Activities (Canva, gamma.app, paracasainclusivo.com.br, Conker.AI, Diffit.me, Google Lens, etc.).

The integration of AI in education undoubtedly requires a critical approach to ethical challenges, especially in vulnerable contexts such as disability. The theoretical framework must be expanded to address issues such as algorithmic bias, privacy of sensitive data, digital exclusion, and transparency of automated systems. These aspects are essential to ensure that AI use does not reproduce inequalities but rather contributes to overcoming them.

Recent literature has emphasised the need for clear ethical guidelines and responsible governance of AI in educational environments. Therefore, this project cannot overlook these concerns, which must be treated as a cross-cutting dimension.

The use of AI is also related to the legal and regulatory frameworks that support inclusive education. The theoretical basis may include references to the Brazilian Inclusion Law (LBI) or other international laws, the UN Convention on the Rights of Persons with Disabilities, and UNESCO guidelines on educational technologies. This integration strengthens the project's alignment with public policies and highlights its commitment to promoting rights. In addition, it will also allow the research results to have a greater institutional and social impact, contributing to the formulation of digital accessibility policies in universities.

It will also be relevant to include practical examples and case studies. In addition to identifying case studies on the use of intelligent tutors, AI screen readers, or adaptive learning platforms and presenting their real impacts, we highlight two projects that illustrate how Artificial Intelligence has been applied to promote the inclusion of people with disabilities in higher education:

i Oscar sala chair project – USP (Brazil)

This project focuses on the responsible use of AI for accessibility and inclusion in higher education. It explores technologies such as voice recognition, machine translation, screen readers, and adaptive learning platforms to eliminate barriers faced by students with disabilities. The project also discusses the ethical risks of AI, such as algorithmic bias and personal data protection, proposing guidelines for a fair and inclusive application of the technology (Silva, 2024).[16]

ii STHEM Brazil primer on AI and accessibility (2024)

This booklet guides educators and managers of higher education institutions on how to use AI tools to promote accessibility. Among the highlighted resources are text-to-speech conversion, automatic transcription, auditory description of visual content, adaptation of educational content, and cognitive support with AI. The material also presents international experiences, such as those of the University of Washington, which used AI to support students with cognitive and visual difficulties.[19]

iii Studies with AI for visual and cognitive disabilities (2024)

Researchers at the University of Washington have developed AI-based tools, such as chatbots and image generators with automatic description, to support students with visual impairments and cognitive difficulties. These solutions were applied in real teaching contexts, with a focus on content personalisation and learning mediation, demonstrating the potential of AI to create more accessible educational environments.[19]

iv Erasmus+ project results platform

The official Erasmus+ results platform contains several projects focused on digital inclusion and accessibility in higher education. Although not all of them are exclusively about AI, many addresses emerging technologies applied to inclusion.[20]

We must also mention that it is essential to address or even deepen the discussion on teacher training for the use of inclusive technologies. Therefore, the theoretical framework will also explore models of continuing education, inclusive digital skills, and professional development strategies based on communities of practice. In general, we can already mention that the literature points out that many teachers still lack specific training on digital accessibility, which limits the effective use of AI in the classroom. By addressing this gap, the project reinforces its educational relevance and proposes concrete actions to enable teachers to act ethically, critically, and creatively with digital technologies.

Finally, it is important to recognise that disability is not an isolated condition, but interacts with other dimensions of identity, such as gender, race, social class, and territory. The intersectional approach allows us to understand how multiple forms of inequality overlap and affect the academic path of students with disabilities. Thus, inclusive policies and practices must consider this complexity, promoting not only physical and digital accessibility, but also social justice in a broad sense.

Methodology

Broadly speaking, after this literature review, this research will adopt a mixed methodological approach, combining both quantitative and qualitative techniques. Initially, a questionnaire will be administered to lecturers at a Brazilian federal university to map pedagogical practices, perceptions of accessibility, and the use of digital technologies, including AI. Subsequently, focus groups will be conducted with teachers who work directly with students with disabilities, allowing for a deeper understanding of their experiences and the challenges they face. Data analysis will follow the principles of descriptive statistical analysis and content analysis. The triangulation of data will strengthen the validity of the results and support the planning of training actions and the development of AI-based pedagogical resources.

Thus, the research combines quantitative and qualitative techniques to provide a more comprehensive understanding of the teaching landscape in the context of the inclusion of students with disabilities in higher education.

In the first phase, a questionnaire survey will be conducted with lecturers at a Brazilian federal university, aiming to identify and describe the initial scenario in terms of pedagogical practices, perceptions of accessibility, and the use of digital technologies, including AI-based resources. The data collected will be statistically analysed using software such as PSPP or SPSS, enabling a general overview of the conditions and challenges faced by educators.

Complementarily, a second phase of qualitative nature will be carried out through focus groups with teachers who work directly with students with disabilities. This technique will allow for a deeper understanding of the experiences, difficulties, strategies, and expectations of educators regarding the use of inclusive digital technologies. Data analysis will be conducted based on content analysis, as proposed by Bardin, enabling the identification of emerging categories and patterns of meaning in participants' discourse.

The triangulation of quantitative and qualitative data will reinforce the validity of the findings and provide robust support for planning the next stages of the project, namely teacher training and the development of AI-based pedagogical resources.

Following the mixed methodology, the work plan will include the following phases:

Phase 1: Describing and Analysing the Student Scenario

i Identify and describe the initial scenario of university lecturers working with students with disabilities at a Brazilian federal university through a questionnaire-based survey. The data will be analysed and discussed using PSPP or a similar tool.

Phase 2: Focus Groups for Lecturers and Data Analysis and Discussion

i Conduct a focus group with lecturers who teach students with disabilities.

ii Analyse and discuss the data using content analysis (Bardin).

Phase 3: Planning the Training for Trainers or Lecturers

i Evaluate tools and resources and plan training sessions with lecturers aimed at acquiring basic concepts of Artificial Intelligence and exploring AI tools to develop support materials for students with disabilities.

Phase 4: Training of Trainers and Data Analysis and Discussion

i Develop a training unit on Artificial Intelligence targeted at lecturers working with students with disabilities (6 hours).

ii Collect data on the post-training scenario and analyse and discuss it.

Phase 5: Simulation of Lecturers' Plans for Students with Disabilities

i Present and evaluate simulations of lecturers' training plans for using AI tools aimed at supporting students with disabilities (2 hours).

ii Collect data on the post-training scenario and analyse and discuss it.

Final considerations

The literature review presented here allows us to conclude that AI in support of Education and Training is here to stay. However, we

must not underestimate the significant ethical challenges that need to be addressed so that everyone can benefit from AI technologies without their disadvantages undermining their promising outcomes, namely:

a) Autonomy and Control: the issue of machine autonomy and human control over them.

b) Safety: risks associated with the use of AI, such as cybersecurity and misuse.

c) Algorithmic Bias: algorithms can reflect and amplify existing prejudices, particularly in relation to: i) Representation Bias (groups that are absent or underrepresented in the data); ii) Measurement Bias (differences in the quality of collected data); iii) Aggregation Bias (assuming one model fits all groups); iv) Evaluation Bias (using inappropriate metrics to measure performance); v) Historical Bias (reproducing discriminatory patterns from the past).

The outcomes of ongoing projects reinforce these conclusions. The Oscar Sala Chair Project – USP highlights the responsible application of AI in higher education, offering concrete guidelines to address accessibility barriers. The STHEM Brazil Primer on AI and Accessibility (2024) provides practical resources for teachers and managers, bridging policy and classroom practices. International experiences, such as the Studies with AI for Visual and Cognitive Disabilities (2024), demonstrate how AI-based solutions can effectively support students with visual and cognitive impairments. Moreover, the Erasmus+ Project Results Platform consolidates several European initiatives on digital inclusion, underlining the relevance of collaborative efforts to strengthen global practices in accessible education.

AI is undoubtedly changing the course of Education and Training. It is up to each of us to maximise the benefits it offers while minimising the biases and limitations it may cause.

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Conflicts of interest

The authors declare that there is no conflict of interest.

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