RESEARCH ARTICLE

Applicability of Artificial Intelligence in Students with Disabilities: Impact on Inclusion in Higher Education Institutions

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ARTICLE INFO	ABSTRACT
	The objective of this research article is to analyze the efficiency of the applicability of artificial intelligence in students with disabilities and its impact on higher education; to this end, it seeks to select cases of application of AI with disabled students in the context of higher education; thus, experiences of AI in the teaching of education on the importance of inclusion in students with disabilities are interpreted and, finally, the impact of this for inclusion is argued. The method implemented is qualitative through the systematic review process, taking into account research studies found in databases such as Scopus, Google Scholar, Dialnet, Redalyc and Scielo; The sample taken into account for this study is 15 studies that have been published in the last 4 years. As a result, 2 studies are identified for the year 2021, 3 studies for the year 2022, 3 for the year 2023 and 7 studies for the year 2024; as for the databases, 2 are selected in Dialnet, 1 in Redalyc and 1 in Scielo, 3 in Google Scholar and 8 in Scopus. In this way, it is concluded that the applicability of AI in students with disabilities in higher education institutions can be efficient and have a positive impact on access to information, personalization of learning, skill development, academic performance and motivation. However, it is important to consider the challenges and limitations associated with the use of AI in education.

INTRODUCTION

Learning and teaching for students with disabilities require the use of tools that foster knowledge at the higher education level. In this context, the advent of technology serves as a fundamental and significant resource for both educators and students, enabling the transformation of traditional methodologies into innovative and inclusive teaching approaches. According to Mero et al. (2024), traditional educational models follow a uniform approach that fails to address students' needs, making it imperative to employ tools such as artificial intelligence (AI) to create spaces for reflection, interactivity, and communication. In this regard, one of the challenges hindering the transformation of teaching is educators' insistence on traditional models that do not effectively address students' learning gaps.

Similarly, the use of artificial intelligence must provide access opportunities for all individuals without exception, taking into account the diversity of learning among students with disabilities. According to Contreras et al. (2021), inclusion serves as a means for transforming society and enhancing equality, which presents an academic challenge in terms of educational quality and the advancement of students' academic performance. Thus, AI functions as a supportive tool that can help reduce educational gaps and forms of inequality for students with diverse needs and unique abilities in terms of communication and cognitive development.

In light of the above, Pinargote et al. (2024) highlight in their study the need to overcome the limitations of traditional methods to better address students' individual needs, particularly in cases of academic failure and the growing apathy towards various fields of knowledge. In this regard,

traditional education follows a one-size-fits-all approach, disregarding the differences in how students learn, their pace, and their specific needs. To address this issue, it is essential to implement personalised methods that take into account each student's unique characteristics, allowing for a more effective and equitable education.

Additionally, as Sosa et al. (2024) state, "the pace of artificial intelligence adoption in education remains slow compared to other fields such as medicine, industry, and finance" (p. 68). In this regard, the author highlights a gap between AI's potential for educational transformation and, consequently, its slow implementation in the integration of teaching processes in higher education. Thus, it is observed that several barriers hinder this integration, including resistance to change, lack of technological infrastructure, insufficient teacher training, and concerns about security in the university environment. However, AI enables personalised learning, task automation, data analysis, and access to high-quality interactive educational resources.

Likewise, Ayudo and Gutiérrez (2022) point out that some institutions have concerns about how to ensure proper supervision of the educational process while maintaining a balance between technology use and fundamental skills such as critical thinking and problem-solving. This necessitates a reassessment of pedagogical methods and teacher training to integrate AI in a way that complements learning processes. In other words, it is essential to allow students to develop both technological and cognitive skills simultaneously while enabling educators to design effective, personalised, and contextually relevant learning experiences. This ensures the application of professional practices that align with society's needs.

Consequently, this research article aims to address the following research question: What is the efficiency and impact of the applicability of artificial intelligence for students with disabilities in higher education institutions? In response to this question, the following overarching aim is proposed: to analyse the efficiency of AI applicability for students with disabilities and its impact on higher education.

To achieve this, the study first considers the selection of AI application cases involving students with disabilities in the context of higher education. Secondly, it seeks to interpret the experiences related to the applicability of AI tools in teaching, with a focus on the importance of inclusion for students with disabilities. Lastly, it argues the impact of AI as a tool for fostering inclusion within the designated population.

Theoretical framework

The theoretical framework developed below establishes the conceptualisation of the main categories, namely: artificial intelligence, students with disabilities, and inclusion, all within the context of higher education.

Artificial intelligence

Artificial intelligence, according to Ocaña et al. (2019), refers to the simulation of the brain's intellectual capabilities through the field of computer science focused on designing intelligent systems. This means that these systems exhibit characteristics associated with human behaviours. Thus, AI is characterised by machine learning, which enables it to learn from data, process understanding, and generate natural language, in order to produce reasoning that provides problem-solving solutions through logical decision-making. In this regard, applications of artificial intelligence intervene in virtual assistance environments, data analysis and predictions, content automation, efficient diagnoses of students' needs, and cybersecurity.

In line with the above, García (2017) defines AI as a set of techniques, algorithms, and tools that enable problem-solving in situations that require a degree of intelligence, that is, challenges that pose difficulties for the human brain. Thus, artificial intelligence technology offers the advantage of articulating automatic systems that facilitate the execution of activities enabling understanding, interpretation, and reasoning capabilities. Based on this, Cabanelas (2019) explains that AI simulates processes of perception, selection, association, assimilation, prediction, and control inherent to human reasoning, providing advantages such as efficiency, speed of knowledge acquisition, precision, and continuous improvement through decision-making and personalised education.

Therefore, the use of this tool is considered fundamental to consolidating proposals for innovation and inclusion in the classroom through the use of devices within the learning environment, enabling students to utilise them in an integrated way beyond the academic setting. In this regard, the use of artificial intelligence introduces strategies that influence the educational process of students, as it enables the use of applications that intervene in learning activities, reasoning, and communication between students, as well as between educators and students.

Educational inclusion

Urías and Pino (2024) define inclusion as an alternative to exclusion, the latter being considered a fracture in society that affects marginalised or segregated individuals, specifically those who do not have access to cultural and educational opportunities. In this way, forms of educational inclusion provide opportunities to intervene in teaching methodologies that bring marginalised or segregated individuals closer to the learning possibilities available to all other individuals. Essentially, inclusion seeks to overcome exclusion through equitable access to educational opportunities, ensuring they are available to everyone and socially integrating students, thereby improving self-esteem, the development of skills, and active participation both in the educational environment and in cultural and social spaces through strategies such as curriculum adaptation, inclusive methodologies, accessible technologies, and teacher supportIn summary, artificial intelligence and educational inclusion combine to transform education by offering constructive tools that help students strengthen their learning, overcoming knowledge gaps and challenges. This is achieved through the simulation of cognitive processes, task automation, and decision-making. Specifically, personalised learning adapts content and methodologies to individual needs, fostering self-regulation and competencies, while educational inclusion promotes equitable access, overcoming exclusion and marginalisation. Thus, the integration of AI in education involves innovating methodologies, utilising technologies and devices to improve teaching and learning experiences, and consolidating proposals for innovation and inclusion.

Students with disabilities in higher education

Disability, according to the World Health Organization (WHO, 2023), "is part of being human and is intrinsic to the human experience" (p. 1) and classifies conditions such as blindness, spinal cord injuries, dementia, or impairments caused by environmental and personal factors. In this context, disability refers to the loss of function in an organ or body system, which allows the individual to develop abilities in a different way and, along with this, to carry out activities outside the boundaries typically considered normal for a human being. However, the definition of disability has undergone significant evolution from a medical perspective, placing emphasis on the importance of access, inclusion, and understanding the opportunities available to all individuals.

In turn, the study by García and Rodríguez (2022) defines disability according to the following classification: first, physical disabilities that encompass conditions affecting mobility and body coordination; second, sensory disabilities, which affect one or more of the five senses; third, cognitive disabilities, such as those impacting learning, memory, attention, and reasoning. In this way, students with disabilities are human beings who are part of a higher education institution, possessing any of the aforementioned disabilities and, therefore, requiring attention to special educational needs from both educators and the curriculum implemented during their teaching process.

On this note, Vélez and Manjarrés (2020) explain that students with disabilities have historically been the group that has suffered the greatest severity from exclusion processes in formal schools, as disability has undergone definitions that undermine and ignore the specific needs of these groups regarding their ways of learning and acquiring knowledge. In this context, the importance of researching the efficiency of resources and tools such as AI to foster interaction and social participation among students with disabilities is highlighted, in order to reduce limitations in both academic and social environments.

The recognition of educational inclusion highlights the importance and need to address the barriers faced by students with disabilities. In this way, the use of AI, as a technological tool, can personalise and enhance the learning of students with disabilities, tailored to the individual needs of these individuals. Similarly, understanding disability provides a solid foundation for analysing the

efficiency of the applicability of AI in students who have diverse learning needs due to physical or cognitive reasons.

This section explains the implementation of the method used to analyse the efficiency of the applicability of artificial intelligence in students with disabilities and its impact on higher education. To begin with, a qualitative methodology is applied, which, according to Hernández and Mendoza (2018), is defined as a process of identifying perspectives and forms of action in response to a social and cultural environment. In this case, the qualitative method is used to understand the applicability of the educational environment, taking into account teaching practices and teachers' perceptions regarding the implementation of AI in students with disabilities at the higher education level.

METHODS

The data collection procedure is a systematic review, which consists of clear and structured summaries of the available information aimed at answering a specific question, thus constituting a compilation of articles or prior information on a specific topic (Moreno et al., 2018). In this regard, systematic reviews are characterised by describing practices in a comprehensible and transparent manner through the collection, selection, and critical evaluation of activities. In this case, a systematic review is conducted to recognise the applicability of AI in students with disabilities and, based on this, evaluate the efficiency and impact of the tool in promoting inclusion in higher education.

Population and sample

On the one hand, according to Hernández and Mendoza (2018), the population is a finite or infinite set of elements with common characteristics, delimited by the problem and objectives of the study; similarly, Arias et al. (2016) state that the population of a study is a set of cases, defined or limited and accessible, which will be part of the sample selection and meets specific criteria. Thus, in this study, the population consists of previous research conducted on the topic of AI for students with disabilities in higher education.

On the other hand, according to Hernández and Mendoza (2018), the sample is defined as a subgroup of the population or universe of interest, from which the relevant data will be collected, and it should be representative of the designated population. In this case, studies published in the last 4 years that specify the applicability of AI for university students who also have a disability are considered. Thus, the following inclusion and exclusion criteria are taken into account for the sample delimitation:

Inclusion criteria

- Publication date: Studies published between 2021 and 2025

- Databases: Studies from databases such as Scopus, Scielo, Redalyc, Dialnet, and Google Scholar

- Topic: Artificial intelligence in students with disabilities in higher education

- Focus: Studies conducted in higher education institutions

Exclusion criteria

- Publication date: Studies published before 2021.

- Types of publications: Articles or documentary studies, literary or documentary reviews.

- Irrelevant topic: Studies that do not address AI in higher education.

- Language: Studies in languages not included (Chinese, Arabic, Russian, etc.).

- Not higher education: Studies focused on primary, secondary, or special education.

- Irrelevant: Studies that do not provide significant information on AI in higher education.

RESULTS

The systematic review of the present research shows that there is a wide variety of studies regarding the topic of AI in students with disabilities. However, most of these are documentary and systematic studies that do not correspond to applied research. Furthermore, there is a broad range of studies concerning primary, secondary, and high school education. As a result, many of these studies are excluded as they do not meet the specified research criteria. In this regard, a total of 15 studies are

selected, corresponding to applied research in higher education institutions. Thus, results are established based on documents published by year, documents published in databases, documents by country, and documents by thematic area.

To begin with, of the 15 studies found in the databases, a total of 2 studies published in 2021 are considered, 3 studies published in 2022, 3 studies published in 2023, and 7 studies published in 2024. Thus, the 2 studies found from 2021 account for 13% of the total, the studies from 2022 account for 20%, the studies from 2023 account for 20%, and the studies from 2024 account for 47%. The following figure specifies the aforementioned:
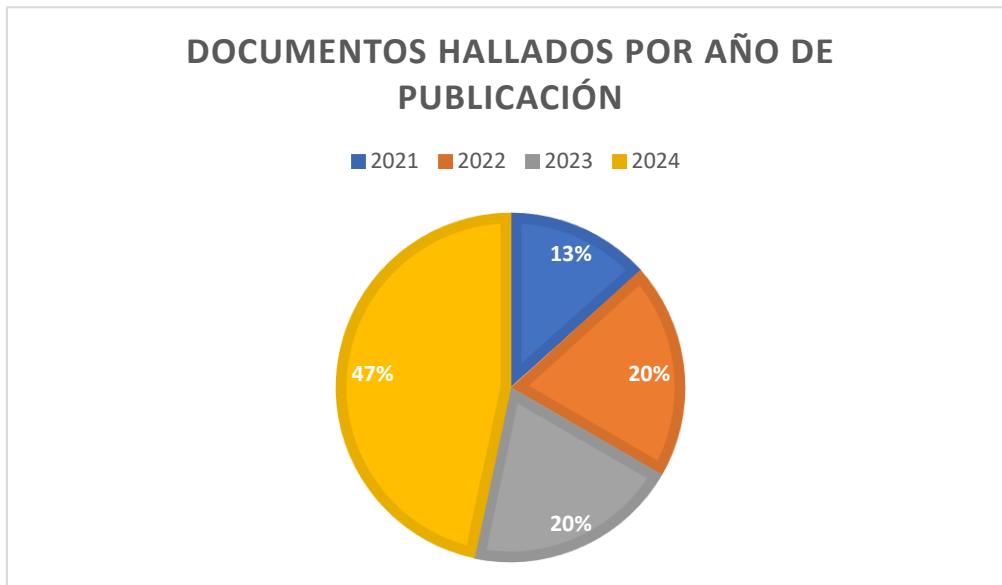

Figure 1: Documents selected by year of publication

Source: Own elaboration

In this way, of the total studies, 2 studies are identified from Dialnet, which accounts for 13%, 1 study is identified from Redalyc, representing 7%, and similarly, 1 study is selected from Scielo. On the other hand, 3 studies are selected from Google Scholar, which accounts for 20%, and 8 studies are identified from Scopus, making up 53%. Thus, it is analysed that the majority of the studies are published in Scopus, followed by Google Scholar, with fewer studies selected from Dialnet and Redalyc.
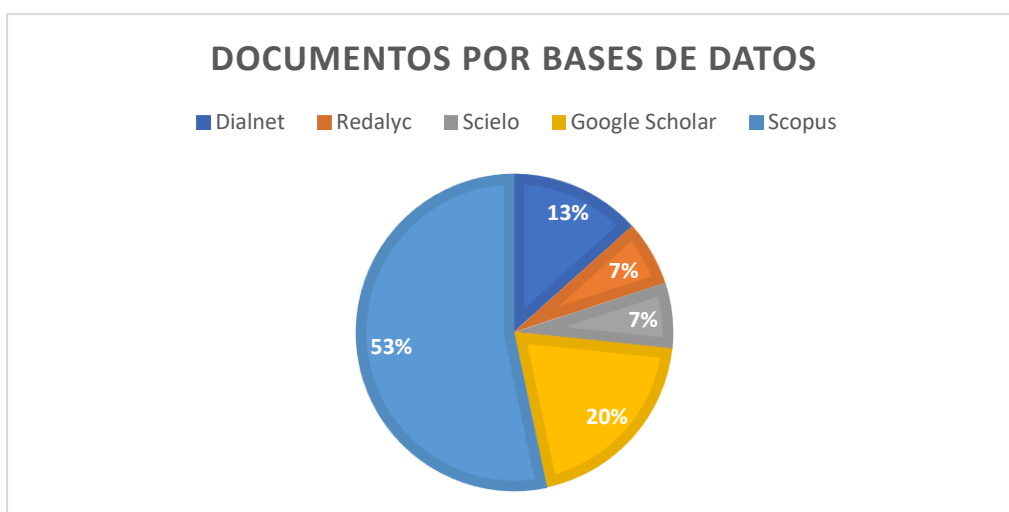

Figure 2: Documents published by databases

Source: Own elaboration

Additionally, of the identified documents, 3 (20%) studies are selected from Colombia, 1 (7%) study from Chile, 1 (7%) study from Venezuela, 2 (13%) studies from Ecuador, 2 (13%) studies from Mexico, and 6 (40%) studies from Spain.
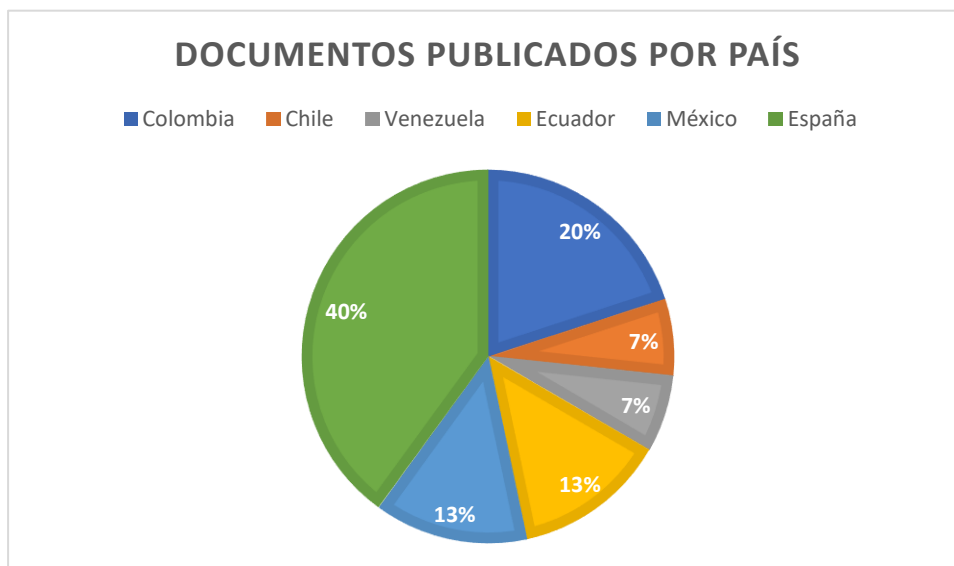

Figure 3: Documents selected by country

Source: Own elaboration.

Finally, of the 15 studies identified, the following topics are specified: first, 2 studies address the theme of AI in higher education for students with disabilities, which corresponds to 13%; 5 studies address the categories of AI in higher education, accounting for 33% of the total studies; 1 study specifies the inclusion of hearing impairment through the mobile app Listen App, representing 6%; similarly, 1 study, or 7%, corresponds to disabled students in the subject of tax legislation in higher education; a total of 4 studies, or 27%, delve into AI in teacher training; and finally, 1 study specifies AI for students with Special Educational Needs (SEN) and 1 study corresponds to AI for students with blindness, which accounts for 7%.
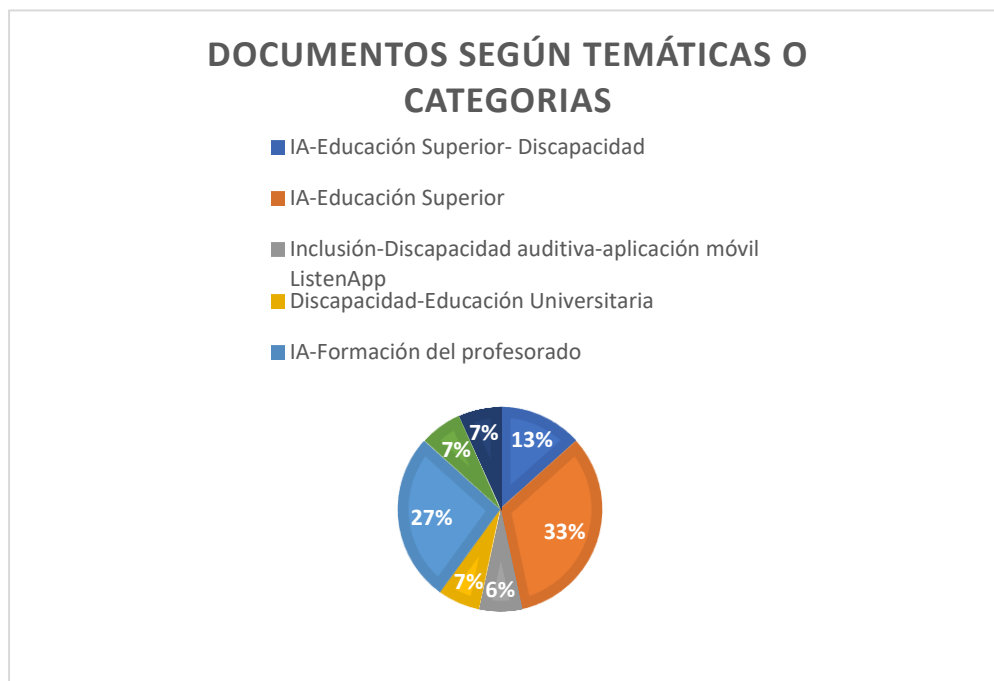

Figure 4: Documents by topic

Source: Own elaboration.

Ultimately, the majority of the studies, a total of 47%, were published in 2024, indicating a growing interest in research on Artificial Intelligence in students with disabilities in higher education. This trend suggests a progressive increase in the number of studies in this field. Similarly, the majority of the studies found, 53%, are in Scopus, indicating that this database is an important source for research in the field of this study. Following this, Google Scholar is the second most frequent database with 20%, suggesting that the platform is a relevant source for research.

In addition to what has been mentioned, the majority of the studies were conducted in Spain, indicating that this country is a leader in research on Artificial Intelligence in students with disabilities in higher education. Following this, Colombia is the second country with the highest number of studies, suggesting it is a significant player in research related to the selected topic. Furthermore, 33% of the studies focus on AI in higher education as an area of interest for researchers, while 27% address AI during teacher training, specifically the preparation of educators to work with students with disabilities.

Based on all the above, the results highlight that research on artificial intelligence in students with disabilities in university institutions represents a growing field for the exploration of new technologies that can enhance teaching for inclusion and equal opportunities. Therefore, the following discussion will address the applicability of AI as a meaningful teaching strategy for inclusion in students with disabilities, aiming to argue its efficiency and impact in higher education.

DISCUSSION

The applicability of AI represents a significant process in ensuring inclusion and access to information for all students, regardless of their learning acquisition methods. According to UNESCO (2019), AI tools such as Dytective are highlighted. According to Fengchun (2021), this tool features enhanced artificial voices for individuals who are unable to speak or face difficulties with speech articulation. Similarly, the Voiceitt application is used for people who cannot articulate speech, offering 71 designed voices. Another tool is the global digital library, which aids individuals with literacy difficulties, enabling them to search for books using voice commands García and Rodríguez (2022). Lastly, the StorySIGN application incorporates augmented reality to assist deaf children in reading by translating texts into sign language Fengchun (2021).

Similarly, the study by Lucero and Acuña (2022) presents AI virtual tools such as the digital library, used by 3.57% of students, Email.net used by 6.28%, Moodle (24%), MS Teams (22%), and Zoom used by 11.71%. This indicates that the student population is familiar with and uses virtual tools in their classes, thereby creating learning opportunities both in the classroom and in life. Therefore, it is essential that these tools are used appropriately to ensure higher percentages in terms of their effectiveness and efficiency for students with disabilities.

In this regard, UNESCO (2021) highlights the importance of applying AI in the context of inclusive education through independent, integrated, and thematic policies, meaning that they should be applied universally and complement teaching with advanced learning. Additionally, the European Union (EU, 2018) states that the impact of artificial intelligence on learning, teaching, and education represents a significant advancement in developing cognitive skills in children, adolescents, and adults with different learning styles; this is because it fosters skills and abilities that emphasise the personal learning approaches of students with disabilities.

The study by Vera (2023) uses AI tools such as Plagscan, Turnitin, Socrative, ChatGPT, Natural Reader, and Google Classroom, identified by a group of teachers as the most commonly used to motivate students to develop writing skills and critical thinking, allowing them to produce their own content rather than copying and pasting from external sources. The results of the study reveal a significant benefit for students with disabilities, as these tools ensure access to information for individuals with visual impairments or dyslexia by enabling text-to-speech. Furthermore, applications such as ChatGPT and Socrative allow teachers to adjust the difficulty level of tasks and activities based on the individual needs of each student.

In the specific case of students with hearing disabilities, the use of the mobile application ListenApp serves as an educational support tool for students with such disabilities. According to the study by Contreras et al. (2021), the tool can be improved to allow the transmission of images used by the teacher, along with the relevant explanations of the topics, so that these can be saved on the student's

device. In particular, the inquiry regarding its effectiveness with teachers through surveys reveals that 100% of teachers consider it an effective AI tool, as it accurately recognises voice and converts it into text, thus facilitating communication and interaction with the student.

The study also finds that 80% of students with disabilities find it satisfactory to use the tool synchronously with their subject teacher (Contreras et al., 2021). In line with this, Delgado et al. (2024) identifies several limitations regarding the use of AI, including: inadequate use or lack of knowledge on how to effectively use the technology, the absence of critical review of the studies provided, the reduction in the development of student skills, decreased attention, overdependence on AI, lack of rigor in assignments, and reduced human interaction. Therefore, for AI to be used effectively with students with disabilities in higher education, it is essential to take these factors into account, as neglecting them can negatively impact communication acquisition, knowledge, and the personalisation of teaching.

Thus, the study by Anchundia et al. (2024) highlights the use of Grandescope as a tool for the learning process in the classroom for students with SEN. In addition, it was found that Capcut is used by 30% of students to enhance learning, Grandescope by 40%, and ChatGPT by 30%. In line with this, Malinka et al. (2023) argues that the use of AI enables students to receive assistance with their tasks and in the educational process through appropriate literacy. The results suggest that the integration of AI into the curriculum can be beneficial for learning, adapting to the individual needs of students with SEN.

Another study by Amaya and Rodríguez (2024) specifies that the use of Talkback is a Google accessibility service that enables visually impaired individuals to use smart devices, while TapTapSee offers an opportunity for individuals with visual impairments to identify objects in their everyday life. Thus, the use of these applications helps students with disabilities develop skills based on their impairments, allowing them to recognize images, take photos, or videos through the corresponding functions. In this way, the teacher can contribute to the proper management of these tools, facilitating not only their use as a game but also as a tool for performing daily activities.

From the students' perspective on the use of AI, the study by Cervantes et al. (2024) finds that 78.4% of participants believe the tool has positive functions for learning, enhancing creativity and innovation within the educational institution. In contrast, 38% think that AI influences academic decisions, which represents a significant percentage that could be improved with the appropriate use of the tool. Based on this, the study by Zapata (2023) demonstrates a significant improvement in students' academic performance through the use of AI, with scores increasing from an average of 60.5 to 70.3, indicating a positive impact on students with disabilities. Furthermore, student motivation also improves, rising from an average of 4.2 to 7.5.

Building on this, Zepeda (2024) suggests Braille technology as a tactile and kinesthetic element that combines to provide precise information about language, making communication possible for individuals with blindness. However, despite Braille being a written communication system for people with blindness, not all students are familiar with or use it. Nevertheless, this system facilitates access to reading and writing, helping improve comprehension and retention of information, thereby enabling the development of linguistic skills such as grammar, syntax, and vocabulary.

In summary, AI tools such as Grandescope, a functional application for the learning process in the classroom for students with special educational needs (SEN), Talkback, a Google accessibility service enabling visually impaired individuals to use smart devices, and the Braille system, which facilitates literacy activities for individuals with blindness, stand out as crucial. It is essential to consider benefits such as access to information, personalized learning, and skill development. Furthermore, student perspectives emphasize the importance of AI acceptance by teachers, along with evidence of improved academic performance and increased motivation.

CONCLUSIONS

In conclusion, in response to the research question posed in this article, it is argued that the efficiency of AI in students with disabilities facilitates access to information, such as reading aloud, and the personalization of learning, allowing teachers to adapt methodologies to meet the individual needs of students based on their disabilities. This, in turn, leads to better academic performance and greater opportunities for intervention and knowledge acquisition. Moreover, the impact of AI is evident in

the improved motivation of students with learning differences. As they engage more deeply with knowledge and their own abilities, they achieve better outcomes in their learning processes.

Furthermore, it is evident that AI promotes inclusion and equity in education by providing opportunities for students to engage not only in the classroom but also in a broader social and cultural context. However, challenges such as the improper use of AI, which could negatively impact learning, and the lack of knowledge that may limit its effective use, are also highlighted. Additionally, excessive dependence on AI can affect human interaction and the development of skills in students with disabilities. Therefore, it is crucial for educators to recognise the capabilities of AI to enhance students' abilities, particularly those with disabilities, ensuring that technology is used to empower and not hinder their learning experience.

Therefore, the applicability of artificial intelligence in higher education institutions can be efficient and have a positive impact on access to information, personalised learning, and the development of academic performance and motivation. All of this significantly impacts inclusion processes in education, aiming to reduce gaps and limitations associated with the use of the tool. This suggests that, according to the results, many educators and educational institutions are unaware of the effectiveness of AI tools and, as a result, limit the capabilities of students with disabilities.

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