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Technological Tools and Inclusive Pedagogy for Students with Disabilities in Higher Education: A Systematic Review

Herramientas tecnológicas y pedagógica inclusiva para estudiantes con discapacidad en Educación Superior: revisión sistemática

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Abstract

To study inclusive education, it is important to identify the technological tools used in the teaching-learning process, as well as the pedagogical components that enable the elimination of digital and educational gaps in students with disabilities who access Higher Education. A systematic review was carried out following the PRISMA model and the Cochrane Manual 5.1.0, with the collection of information from the Web of Science and Scopus databases. The results showed the variety of technological tools used by teachers in classrooms, by students to advance in their studies, and in the innovation projects implemented by universities. Likewise, the methodologies and models implemented in inclusive pedagogy for the teaching-learning process were identified. It was concluded that the use of Information and Communication Technologies in Higher Education leads to a dichotomy between learning to use digital resources or dropping out of school due to the impossibility of adapting to these tools.

Keywords: technologies; ICT; pedagogy; inclusive education; disability; higher education.

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Resumen

Para estudiar la educación inclusiva, es importante identificar las herramientas tecnológicas utilizadas en el proceso de enseñanza-aprendizaje y los componentes pedagógicos que permiten la eliminación de brechas digitales y educativas en estudiantes con discapacidad que acceden a la Educación Superior. Se desarrolló una revisión sistemática siguiendo el modelo PRISMA y el Manual Cochrane 5.1.0, con la recopilación de información en Web of Science y Scopus. Los resultados mostraron la variedad de herramientas tecnológicas utilizadas por el cuerpo docente en las aulas de clase, por el estudiantado para avanzar en sus estudios y los proyectos de innovación ejecutados por las universidades. Asimismo, se identifican las metodologías y modelos implementados en la pedagogía inclusiva para el proceso de enseñanza-aprendizaje. Se concluye que el uso de Tecnologías de la Información y la Comunicación en la Educación Superior, conlleva a una dicotomía entre aprender a utilizar los recursos digitales o suspender los estudios por la imposibilidad de acoplarse a las herramientas.

Palabras clave: tecnologías; pedagogía; educación inclusiva; discapacidad; educación superior.

Introduction

According to Naicker (2018), from a traditional model of 'special' education, pedagogy is biased and restricted, as it places limits on students, mainly on those with intellectual, physical and/or sensory difficulties. Consequently, it is determined that inclusive pedagogy challenges the limiting practices of contemporary education (Spratt & Florian, 2015), as it represents a methodological approach that provides differentiating teaching practices, through an inclusive and pleasant learning environment (Reddick & Taylor, 2018). In this sense, the inclusion component is defined by universal design, culturally sustainable perspectives, and constructivism; that is, it is based on an educational environment characterized by classroom dynamics, the student's teaching-learning experience and interaction with the teacher (Grier-Reed & Williams-Wengerd, 2018).

Veck (2014) considers that pedagogy may usually be reduced to concepts or ideas subjectively constructed by people, such as a scheme or set of procedures that are executed by teachers in different educational settings. Thus, the alternative conception of an inclusive pedagogy tends to develop when there are students who are perceived as being different from the norm (Mintz & Wyse, 2015). In this framework, the inclusive pedagogy approach focuses on respecting students as individuals from a wide range of contexts, derived from different learning needs and previous experiences with a diversity of nuances in the educational environment (Morina, 2022). It also highlights the importance of providing students with leadership and ownership responsibilities in the teaching-learning process, to promote motivation and positive attitudes (Patey et al., 2021).

In that order of ideas, Reddick and Taylor (2018) outlines four principles of inclusive pedagogy that focus on facilitating student engagement. The first one refers to the teacher-student relationship, which leads to trust and positive relationships. The

second corresponds to power sharing, whereby students and teachers are expected to co-construct knowledge and contribute equitably to the teaching-learning process. The third one is linked to the dialogic interaction between teacher and student, characterized by constant dialogue and problem-solving. The fourth is articulated with experiential learning, as a way to integrate students with creative and critical thinking elements, especially when accessing Higher Education (HE).

In this regard, one of the alternatives to apply inclusive pedagogy in classrooms is linked to the use of technological tools that facilitate the teaching-learning process, specifically in students with disabilities. This perspective derives from the changes represented by the implementation of inclusive pedagogy, regarding the creation of an environment that involves diversity of options with classroom alternatives and class spaces that benefit all students (Orozco & Moriña, 2023). In this context, the use of Information and Communication Technologies (ICT) can be implemented for student assessment, preparation of supplementary reading materials and monitoring of learning progress (Ferede et al., 2022).

According to OECD (2020), the promotion of student learning through the use of digital technologies requires training in skills for the use of ICT in teaching, teacher self-efficacy and peer collaboration. These elements lead to the construction of thought by students, in order to enhance skills such as creativity, innovation and problem solving (Buitrago et al., 2022). In this sense, the advantages of using ICT in inclusive pedagogy can be of particular benefit both to students with disabilities and their teachers.

For students with disabilities, the use of ICT in inclusive pedagogy promotes independence and autonomy (Mejía-Caguana et al., 2021), the development of technological skills, strengthening skills and abilities to face everyday challenges (Andrade et al., 2020; Buitrago et al., 2022), equal opportunities and universal accessibility in the learning process with respect to their peers (Espínola, 2020). At the same time, interactive, dynamic and motivating learning experiences are created; promoting participation and greater commitment to the content of the class, in order to overcome learning barriers and access education (Arteaga, 2023; Cruz-Picón & Hernández-Correa, 2022). In this way, students with disabilities discover how to learn strategically, and to work assertively (Montoya-González, 2021).

Regarding teachers who participate in the teaching-learning process of students with disabilities, several authors agree that the benefits of using ICTs in inclusive pedagogy are consolidated when they receive training in the proper implementation of technological tools (Mendoza & Heymann, 2022; Tracey et al., 2021); consequently, teacher training has shown to have a positive impact on attitudes regarding educational inclusion (Mendoza & Heymann, 2022). There will also be impact on university policies, building alliances with stakeholders, changes in academic curricula, access to resources, willingness and openness to inclusive education (Mendoza & Heymann, 2022; Stăiculescu et al., 2022). Among the advantages we find individualized educational plans aimed at each student as unique subjects (Fasting & Breilid, 2023) and co-teaching with the addition of a special educator that meets the demands of teaching-learning in classrooms (Hackett et al., 2021).

It is important to note that ICT have played a transformative role in access to education for people with disabilities, mainly through assistive technologies related

to the use of software for screen reading or text enlargement (Lyner-Cleophas, 2019). However, the existence of digital gaps that prevent access to and participation in content and information is a form of exclusion that is made evident through the poor availability of resources and/or knowledge to acquire technological tools (Torán & Sendra, 2022). Additionally, educational gaps persist due to deficiencies in meeting the needs of students with disabilities and the insufficient actions that involve that reality (González et al., 2023). In this context, an interest arose in analyzing the technological tools used in the teaching-learning process and the components of inclusive pedagogy that allow for the bridging of digital and educational gaps in students with disabilities who access HE.

Objectives

To analyze the technological tools used in the teaching-learning process and to identify the components of inclusive pedagogy which make it possible to breach digital and educational gaps in students with disabilities who access Higher Education.

To achieve this objective, a systematic review with a qualitative approach and PRISMA methodology was carried out; the most relevant sources of information on the topic of interest were identified, and the information collected in the studies found at the global level was interpreted.

As a hypothesis, it was proposed that there is a tendency to affirm that if universities and teachers supply electronic devices to students with disabilities and use digital tools in classrooms, then inclusive pedagogy with the use of ICT will be applied in Higher Education.

Method

Search Strategy

This paper takes a qualitative approach. The systematic review method, related to the exhaustive search of literature with predetermined inclusion and exclusion criteria, was used to systematically identify, classify, and evaluate different publications with an objective in mind (Rios Osorio et al., 2016). The model of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) statement was followed, which provides a guide for academics in the development of scientific literature reviews (Page et al., 2021a).

The PRISMA model checklist facilitated the evaluation of documents, which serves as a reference for systematic reviews referring to socio-educational interventions (Page et al., 2021b). This reference provides rigor to the search, selection and identification process of studies for inclusion in the analysis (Tong et al., 2012); likewise, it also serves as a guiding format for the reporting, exclusion and organization of information (France et al., 2019).

Based on the research objective, the keywords that determined the construction of the search equation were selected, based on the combination of synonyms extracted

from the UNESCO and ERIC thesauri. Table 1 shows the terms associated with the technological field and pedagogical innovation, as determining elements in teaching-learning processes.

Table 1

Analysis categories and search equation

Categories			**Keywords**	
Disability	Handicap	Special needs	Disabled	
Inclusive education	Inclusive learning	Inclusive teaching	Special education needs	Special educational needs
Higher education	University studies	Post secondary education	Undergraduate study	Postgraduate study
Educational technology	Teaching materials	Technological innovation	Innovation pedagogy	Information and Communication Technology

The four categories of the search equation are related to each other, while inclusive education refers to a large number of scientific studies during the past 30 years (Amor et al., 2019), specifically with analyses that demonstrate the limitations in access to HE for people with disabilities, an aspect that leads to obstacles in the implementation of ICT from everyday life and reveals setbacks in relation to the evolution of assisted technology (Seale, 2020).

The following inclusion criteria were implemented to evaluate the studies: (i) reference to inclusive pedagogy and/or the use of ICT for HE students with disabilities, (ii) focus on inclusive education in HE (undergraduate/graduate studies), (iii) the sample of the studies should correspond to students with disabilities and/or teachers who have participated in the training of students with disabilities, (iv) papers, book chapters and reviews were included to expand the analysis, (v) various areas of knowledge were tracked (social and human sciences, health, engineering), as the subject of study provides interpretations from different academic fields, (vi) manuscripts written in English and Spanish, (vii) complete documents, published between January 1, 2017 and May 31, 2023 in peer-reviewed journals. Studies that did not meet the inclusion criteria were excluded. All the guidelines were agreed to by the members of the research team.

The Scopus and Web of Science (WoS) databases were selected, as they are considered the two most popular bibliographic references worldwide. They are characterized by being complementary when performing bibliographic analyses, and over the years the number of researchers and countries that implement them has increased (Zhu & Liu, 2020).

Information analysis

Figure 1 shows the PRISMA flowchart, in which the three stages of verification and selection of the manuscripts included in the literature review are shown. A total of 440 documents were found, of which 36 were removed when duplicates appeared between the two databases. In parallel, 15 publications without open access (payment was required) or with download restrictions (databases or publication sites) were discarded. This specific criterion was confirmed by some of the authors contacted. Table 2 lists the 15 excluded papers.

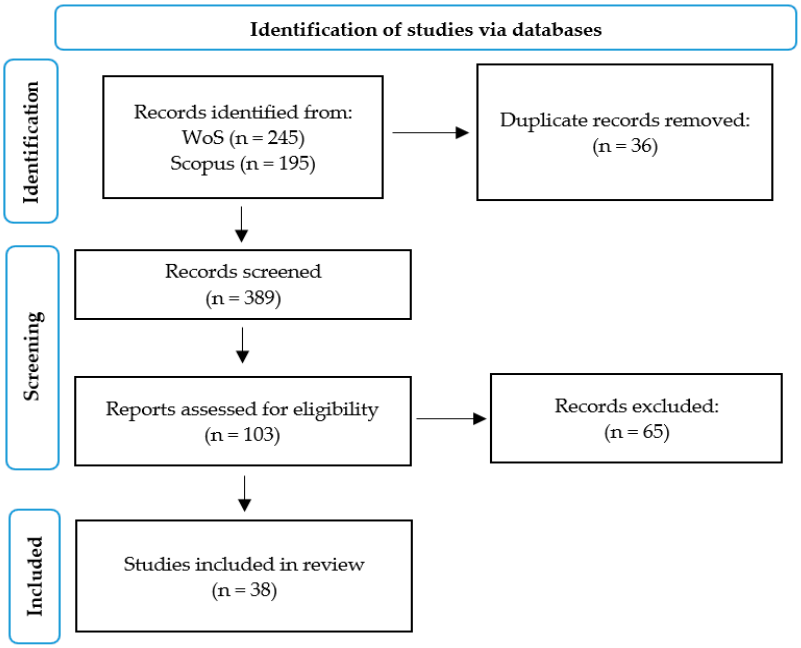

Figure 1. PRIMA flowchart 2020

Table 2

The 15 papers without open access or with download restrictions

Article	Restriction
Biographical research and inclusive education. An innovative teaching experience at the university with an enormous potential	Databases or publication sites
Approach to digital educational experiences in the face of the COVID-19 crisis in the university context with students of functional diversity	Databases or publication sites

Article	Restriction
E-learning in higher inclusive education: needs, opportunities and limitations	Open access
Digitalization and Digital Culture in the Context of Inclusive Higher Education	Databases or publication sites
Blended Learning Environments in Inclusive Education at the University	Retracted
Assessment Requirements of Disabled Students in Higher Education	Databases or publication sites
Improving Accessibility and Personalisation for HE Students with Disabilities in Two Countries in the Indian Subcontinent - Initial Findings	Databases or publication sites
DID. Value: An Overview of Professional Development and Its Challenges for Students with Disabilities	Open access
Higher Education and Virtuality from an Inclusion Approach	Open access
Influence of Digital Assistive Technologies Used in Higher Education on the Development of Individual Educational Strategies among Students with Disabilities	Open access
Success factors for utilizing e-Learning systems in higher education institutions	Open access
Assistive technologies as an ODeL strategy in promoting support for students with disabilities	Open access
Diversity and innovation management skills	Open access
The inclusion of persons with disabilities in engineering education and careers	Open access
Study of the level of preparation of the Universities to attend students with disabilities	Databases or publication sites

Despite the projection of selecting a period of 10 years for systematic review, the small number of studies focused on innovative inclusive pedagogy strategies, based on the use of ICT and assisted technology, led to restricting the observation window to five years, trying to include the most up-to-date publications. This comes in addition to the large amount of information found when reviewing the content of the papers found, which is equivalent to the results and discussion about the deficient technological resources and innovative strategies that are implemented in the university education of students with disabilities.

After the initial filter, the three researchers teamed up to read the titles and abstracts, determining the preliminary eligibility of 103 studies.

The research team proceeded to review each of the 103 publications. The revision protocol of the Cochrane Manual 5.1.0 was taken as a reference for the selection of the documents, specifically under the following criteria: objectives, type of participants, methodology and discussion/conclusions. Thus, 65 manuscripts were excluded for reasons such as the following:

1) They lacked scientific rigor and presented inconsistencies with the achievement of the objectives.
2) They did not refer to the participation of HE students with disabilities (under-graduate/graduate), university professors who interact with this type of population, or a mixture of the two categories.
3) Although they focused on disability and inclusive education, there was no connection with the use of ICT in classrooms.
4) The pedagogical elements of teaching-learning were not perceptible.

In short, 38 documents were included, 17 from WoS and 21 from Scopus. Of the total, 31 papers, 2 reviews and 5 conference papers were collected.

For the analysis of the documents, the NVivo software (v12) was implemented. As a criterion of reliability, text units were standardized by means of codes to reduce coding errors; consequently, agreements were established when defining the particular categories, with the aim of cross-checking between researchers (Rose & Johnson, 2020). Initially, the codes of the search equation were established, to then move on to those that were built up to the saturation limit of the collected data. A high degree of agreement emerged (92%), denoting consensual agreements (Pegalajar Palomino, 2021), especially in the analysis of the methodology and the discussion of the selected studies.

The standardization of the codes and categories made it easier for the research team to analyze the information continuously and accurately. Table 3 shows the codes for each defined category (nodes), along with the descriptors that characterize it, and the frequency of occurrence. Over the course of the analysis, the data were reduced until they reached the main and trending components of the topic (Hernández-Sampieri & Mendoza, 2018).

Table 3

Categories that make up the subject of analysis

Code	Category	Descriptors	Frequency
ME	Sample of the Study	1. Students with disabilities in HE 2. Teachers training students with disabilities	34
HTP	Teacher ICT tools	Tools teachers use in their classes	19
HTE	Student ICT tools	Tools that students use in their daily lives	14
PP	Pedagogical practices	Teaching-Learning Methodologies Didactic Strategies Pedagogical Approaches to Teaching-Learning	84
AE	Student attitudes	Positive or negative in the teaching-learning process	52
AP	Teacher attitudes	Positive or negative in the teaching-learning process	76

Code	Category	Descriptors	Frequency
AA	Application alternatives	Innovative alternatives to apply inclusive pedagogy Interpreters and guides to evaluate Didactic innovation	91
FO	Failures and barriers to adaptation	Inclusion barriers Gaps that prevent learning Quality of resources, tools and programs	108
AS	Alternative solutions	Plans to apply inclusive pedagogy with the use of ICT in HE	95

Results

Overview of literature found

The relationship between the teaching-learning process and the implementation of methodologies and techniques with the use of ICT was specifically found in 14 documents. Appendix 1 contain the following detailed description of each publication: title, authors, participants, objectives and scopes, technology strategies. The information collected with specific elements of inclusive pedagogy corresponds to 24 publications (Appendix 2 includes authors, title, publication year, and journal).

The authors' countries of affiliation are shown in Figure 2. Spain is the country with the largest number of researchers who have addressed the topic of interest (10 authors), followed by Mexico, Australia, and South Africa. This indicates that a significant number of studies are distributed among the five continents, which shows that the topics of analysis have wide relevance in the global scientific environment.

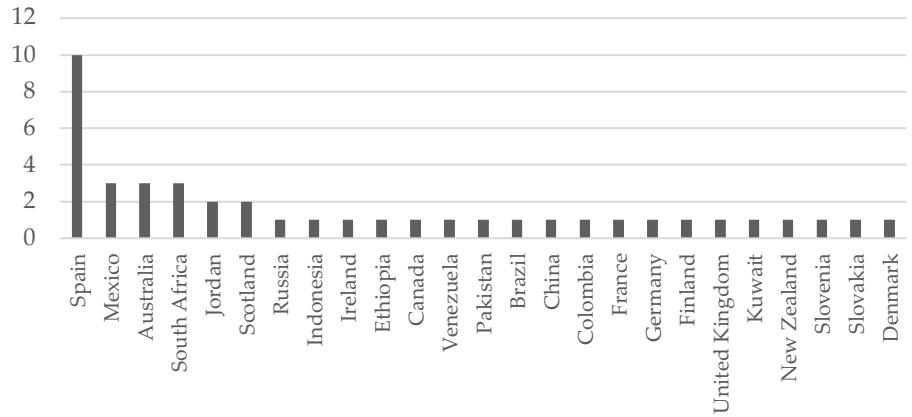

Figure 2. Authors' countries of affiliation

Of the 38 papers that were included in the review, the journals that stand out with two or more publications are: International Journal of Inclusive Education, Innovation-The European Journal of Social Science Research, International Journal of Disability, Development and Education, Disability & Society of the United Kingdom. Sustainability from Switzerland and Advances in Intelligent Systems and Computing from Germany. The congruence of the journals with the search in databases is evident, as they agree with the topic of interest from different approaches and perspectives.

Technological tools in the teaching-learning process

The participants of the studies correspond to university students and/or professors/staff of undergraduate, postgraduate or both types of programs. The sample gathers students with visual impairment (Akbar et al., 2022; Pacheco et al., 2018; Suherman et al., 2022), visual or auditory impairment (Baguma & Wolters, 2021), visual, auditory or physical disabilities (Ndlovu, 2021). The research by Cinquin et al. (2021) focuses on cognitive disability and the study by Zorec et al. (2022) included students with more than one type of disability.

Regarding HE faculty members, the participation of teachers who implement inclusive practices and who were selected as a sample, specifically by their students with disabilities, is described (Cotán et al., 2021b; Perera et al., 2021; Sánchez-Díaz & Morgado, 2023). In relation to work teams that contribute to the construction of projects or programs for inclusive education, specialists in multimedia learning, disability, accessibility, and assistive technologies are mentioned (Cinquin et al., 2021; Ndlovu, 2021; Zorec et al., 2022). The study by Pearson et al. (2019), included STEM (Science, Technology, Engineering and Mathematics) academics, digital content creators and researchers.

Regarding the ICT tools used by teachers in classrooms, by students to advance in their studies and the innovation projects developed by universities, different types of technologies were found.

Teachers regularly use virtual learning platforms or LMS, such as Moodle and Blackboard (Baguma & Wolters, 2021; Lebenicnik & Istenic Starcic, 2018; Perera et al., 2021). Additionally, Sánchez-Díaz & Morgado (2023) found that educators implement online texts, digital presentations, audiovisual resources, social networks, educational blogs, and electronic devices. Cotán et al. (2021b) identified that only one of the participants in their study (4.2%) opted for the use and application of virtual reality in the classroom.

Students were found to commonly use assistive technology devices such as computers with JAWS or Dragon, braille machines, magnifiers, tablets (Kindle), and eye tracking (Ndlovu, 2021; Pacheco et al., 2018; Suherman et al., 2022; Zorec et al., 2022). Like teachers, they access resources from the aforementioned virtual classrooms, including Echo 360 and the university's own websites (Kent et al., 2018).

We found that Massive Open Online Courses (MOOC), for access to educational programs by people with disabilities were implemented (Cinquin et al., 2021). At the German university TU Dortmund, the Division of Disability and Studies known as DoBuS was established, which offers a workspace where students with disabilities can work scientifically with assisted technology on computers equipped for their needs

(Wilkens et al., 2021). Similarly, the IncSTEM project emerge from the partnership of three HE institutions in the UK, using inclusive approaches to teaching, learning and supporting STEM students (Pearson et al., 2019).

Inclusive Pedagogy and the use of ICT in Higher Education

Cotán et al. (2021b) found that teachers recognized the pedagogical potential represented by digital tools inside and outside the classroom. Perera et al. (2021) define inclusive pedagogical practice as characterized by three essential elements: (i) material and tools which are accessible to students with and without disabilities, (ii) an environment for the differentiated performance of face-to-face teacher activities that facilitate the development of digital educational processes, and (iii) materials adapted for students with disabilities that allow interaction with learning objects.

Grimes et al. (2021) and Lopez-Gavira et al. (2021) reported that teachers implemented inclusive pedagogies through different teaching methodologies: peer tutoring, collaborative learning, project-based learning, flipped classroom, gamification, and interactive lessons. Likewise, the priority of using technologies with a didactic approach that allow adjusting to the educational needs of students was evidenced (Perera et al., 2021; Vidal-Alegría et al., 2021; Wilkens et al., 2021). Didactic strategies include the following: developing practical and applied content, exploring students' previous ideas, retrieving and synthesizing content addressed at the beginning of each lesson, making summaries at the end of classes with different types of materials and activities (Cotán et al., 2021a).

The study by Suherman et al. (2022) presents a learning model based on digital literacy, applied in a context of students from rural environments with visual disabilities and who have never accessed ICT. An innovation laboratory known as "Braille Corner" of the Department of Special Education was created at Universitas Pendidikan in Indonesia. Each Saturday they hold discussion forums and training sessions that also involve the parents of the students. In the future they plan to convert digital content to Braille and hope that their initiatives will be useful to provide equal opportunities in the era of digital transformation.

In addition to the pedagogical potential of ICT, it is important to respond to the diversity of needs and realities of each student with disabilities (Sánchez-Díaz & Morgado, 2023). In this regard, Cinquin et al. (2021) developed alternative designs to meet the needs of MOOC users, in terms of functionalities to improve access to multimedia content. Using a collaborative design approach, study participants provided proposals for interface sketches with their specificities. Regarding the IncSTEM project, Pearson et al. (2019) seek to address inclusion through staff perceptions and skills, student communication, curriculum design, practical online work, and group work.

Cotán et al. (2021a) highlight the fact that inclusive pedagogy is focused on ensuring the academic success of all students, through participation and recognition of individual differences. However, a significant number of researchers concluded that one of the factors that prevents the adaptation of inclusive pedagogy in classrooms is associated with the lack of training of teachers, university administrative staff and students, in aspects related to disability, inclusive education, use of ICT for people with disabili-

ties and learning with Universal Design (Alsalem & Doush, 2018; Bong & Chen, 2021; Cotán et al., 2021a; Díaz & Morgado, 2022; Román-Graván & Fernández-Cerero, 2022; Liu et al., 2017; Lopez-Gavira et al., 2021; Pena-Becerril et al., 2021; Sánchez-Díaz & Morgado, 2022; Silletti et al., 2021; von Below et al., 2021; Zambrano-Steensma, 2022; Zongozzi, 2022).

In proportion to the weak technological skills of teachers and the poor technological investment to facilitate or encourage the teaching-learning process, Grimes et al. (2019) revealed that several students with disabilities prefer not to disclose their condition, as they consider this disclosure useless and unproductive for the development of their university studies.

On the other hand, the results highlight the influence of attitudes and emotions that teachers and university staff transfer to their students with disabilities, in their attempts to use ICT in the teaching-learning process with inclusive pedagogy (Bong & Chen, 2021; Cotán et al., 2021b; Grimes et al., 2021; (Ntombela, 2020; Pena-Becerril et al., 2021; Sánchez-Díaz & Morgado, 2022; von Below et al., 2021). Hence, elements alluding to the exclusive instrumental use of digital tools (Cotán et al., 2021b), inadequate implementation of virtual platforms (Lopez-Gavira et al., 2021), deficiencies in the adjustments of the material to students with visual disabilities (Aguirre et al., 2021) and important weaknesses in the implementation of specialized technologies (hardware and software) (Akbar et al., 2022) are displayed.

As a consequence of the lack of technological tools and limitations in access to digital resources in some universities, students with disabilities have chosen to seek different digital alternatives to advance in their teaching-learning process, mainly when there are deficiencies in the availability of equipment (keyboards with large letters, large screens, visual and mobility supports) and assisted technology (Algolaylat et al., 2023; Alsalem & Doush, 2018). For example, students with visual impairments regularly resort to videotaping class sessions and sharing them in the virtual classroom with their peers (Cotán et al., 2021b); they also exchange digital content for instant messaging applications, while they state that their university's Braille books are old and computers do not work (Beyene et al., 2023).

In some of the studies found, the researchers analyze and/or propose alternatives to implement inclusive pedagogy in students with disabilities, based on the use of ICT. Seale et al. (2022) compare and evaluate the different alternatives applied to the Universal Design model, including: (i) holistic accessibility model for online learning applications, (ii) VIVID (visual impairment through the virtual discovery of Technological Information) for e-learning applications, (iii) composite practice model for the provision of assisted intelligence services, (iv) staff development model, (v) accessibility service provision model for students with disabilities in HE, (vi) contextualized model of accessible online learning practices, (vii) the EU4ALL (European Unified Approach for Accessible Lifelong Learning) framework and (viii) accessibility professionalism model.

Vidal-Alegría et al. (2021) propose a methodological guide to Evaluate Digital Educational Resources focused on students with hearing disabilities. The evaluation criteria focus on four factors: content, pedagogy, accessibility, and usability. In their research, they concluded that the digital resource was not designed for this type of population due to deficiencies in accessibility and usability. Similarly, Zambrano-Steensma (2022)

investigated the adaptation process of the Virtual Learning Environment designed by a teacher as a didactic innovation proposal for students with hearing disabilities. The author found that the work of interpreters is essential for developing digital content.

Distance Learning is one of the modalities that favor inclusive education. However, Silletti et al. (2021) highlight that students with sensory disabilities usually have difficulties with this type of learning, as they commonly need support to log in to the devices. In this type of scenario, Pena-Becerril et al. (2021) exemplify that the results achieved by students with disabilities in a mathematics course should not depend on motor skills for writing. Conversely, assessments and workshops can be solved with thinking and reasoning skills. Liu et al. (2017) propose accompanying oral presentations with visual material and mathematical content with contextual learning methods that facilitate understanding.

Pacheco et al. (2018) link Transition 2.0 with the changes faced by students with disabilities as they enter HE, specifically by incorporating ICT for learning. In this sense, they identified that the use of digital tools must be adapted to the particular needs and experience of each student in the midst of the transition. In a systematic review, Khalil et al. (2023) describe that Analytical Learning has the potential to facilitate the design and implementation of appropriate learning pedagogies, identify factors that affect student success, and support course design to meet their individual needs. However, it is broadly limited in the areas of disability and inclusion.

Discussion

The results obtained allowed for the analysis of the technological tools used in different university contexts at a global level for the teaching-learning process, together with the methodologies and models implemented in inclusive pedagogy for the elimination of digital and educational gaps in students with disabilities who access HE. Therefore, it is essential to specify the importance that ICT have acquired during and after the Covid-19 pandemic, especially in the educational context. From then on, the transition to virtual study was encouraged, while the pandemic and post-pandemic process acted as a catalyst for the efforts of universities to include digital resources and advance their prioritization (Khalil et al., 2023; Wilkens et al., 2021).

The hypothesis on the tendency to state that if professors who participate in the education process of students with disabilities in higher education at universities, at global level, provide electronic devices to students with disabilities, and use digital tools in the classroom, then they are applying inclusive pedagogy with the use of ICT in HE was confirmed. The results obtained demonstrate that, for example, the fact of providing a computer with a JAWS screen reader does not imply that the device is permanently functional, nor that the student with disabilities fully adapts to the challenges of university education.

Despite the efforts of universities, students with disabilities, teachers and administrative staff, there were different weaknesses in access to technological tools in the teaching-learning process and in the implementation of inclusive pedagogy in the classroom. The results demonstrate the variety of existing barriers, which may be

related to the different types of disabilities and their singularities, as well as the specific modifications that are required to provide optimal services (Alsalem & Doush, 2018).

In several studies, reference was made to teachers' awareness of the particular needs of their students with disabilities and the modifications they must make to their programmatic contents. Despite this, in accordance with Román-Graván & Fernández-Cerero, (2022), it can be concluded that there is a long way to go to consolidate an inclusive education based on meeting the needs of students with disabilities. One of the barriers is linked to poverty as a limiting factor, since insufficient access to ICT generates dependence in students, decreases the possibility of obtaining electronic resources and reduces their performance in their studies (Beyene et al., 2023).

Another obstacle is related to the countless challenges faced by students with disabilities when using ICT, due to the poor definition that teachers and administrative staff have regarding inclusive education and their insufficient professional training (Algolaylat et al., 2023). Therefore, the Universal Design models analyzed and evaluated by Seale et al. (2022), turned out to be remotely known by academics and have been weakly expanded in the classrooms of HE programs.

Consequently, some alternative solutions are needed to breach digital and educational gaps in the teaching-learning process. Regarding one of the most practical solutions, the training of teachers and administrative staff stands out, in issues related to: disability and how to develop teaching practices based on inclusive pedagogy (Díaz & Morgado, 2022), techno-pedagogical skills (Sánchez-Díaz & Morgado, 2023), appropriate use of virtual platforms (Liu et al., 2017; Lopez-Gavira et al., 2021), and assisted technology (Bong & Chen, 2021). To achieve this, it is proposed to grant flexible time and schedules to teachers and administrative staff and encourage their participation (Bong & Chen, 2021; Gravan & Cerero, 2022), through a program or project that promotes constant interaction between the teacher and the student to build teaching methods aligned to their needs (von Below et al., 2021).

Curriculum modification in accordance with the special needs of students with disabilities is a fundamental element (Grimes et al., 2019; Liu et al., 2017; Ntombela, 2020; Pena-Becerril et al., 2021; Zambrano-Steensma, 2022), as is the priority of promoting their learning (Khalil et al., 2023). On the other hand, the construction of inclusive policies that trans-form the pedagogical processes of teaching and learning and the use of ICT in HE is proposed (Akbar et al., 2022; Baguma & Wolters, 2021; Sánchez-Díaz & Morgado, 2022). According to Pena-Becerril et al. (2021), to build inclusive policies and protocols, it is essential to document and communicate to academic peers the experiences of interaction in teaching-learning settings aimed at students with disabilities; in turn, to promote participation in the classroom that facilitates constant dialogue.

In the studies analyzed, there was no record of innovative strategies developed by universities or by teachers themselves. According to Sánchez-Díaz & Morgado (2023), it is important to make use of emerging technologies (augmented reality, virtual intelligence, 3D printing), in accordance with the scientific advances of the digital era and learning with Universal Design. Therefore, it is essential to understand that to design an inclusive and innovative strategy, it is necessary to deeply analyze each type of

disability and its differentiating elements, along with the costs and human talent necessary for the construction of digital resources (Vidal-Alegría et al., 2021).

In short, making inclusive teachers visible as advisors in the knowledge construction process of students with disabilities is required, considering the transformative role they have in their own academic process (Cotán et al., 2021a). In turn, it is important to emphasize the impact of building training plans that involve the entire university community, through awareness of the scope of meeting the needs of the population with disabilities. For example, through a teaching approach focused on design-based research (Jönsson, 2017) or experiential and challenge-based learning (Garay-Rondero et al., 2020).

Conclusion

Throughout the systematic review, the technological tools used in different university contexts at global level in the teaching-learning process were identified, together with the methodologies and models implemented in inclusive pedagogy to breach digital and educational gaps among students with disabilities in Higher Education. Based on the results obtained when analyzing the two research objectives, it was revealed that at global level, basic actions are being executed which do not fully respond to the specific needs of disabled students.

This explains the impact of the result of the interdisciplinary research work conducted in the areas of education (pedagogy/disability) and engineering (technological innovation) regarding pedagogical and technological challenges presented in educational plans, through Universal Design and economic investment in technological tools that facilitate the teacher-learning process among students with disabilities in undergraduate and graduate studies levels.

This study explored different strategies to implement inclusive pedagogy, and to encourage researchers, university professors and higher education institutions to eliminate traditional educational structures and recognize the rights of students with disabilities; the scope of technologies in education; public policies to finance the development of teaching-learning for students with disabilities; and the construction of transforming experiences.

The possibility of making visible and interpreting the discrepancies and concordances of the subject of study around the five continents, allows us to conclude that in everyday life students with disabilities must learn defense mechanisms to advance their studies with the reduced or no technological tools they have at their disposal. In contrast, during the transition to HE, some students decide to cancel or abandon their studies, due to the impossibility of adapting to digital resources that are inconsistent with their specific access and employability needs.

For future research, the approach of transdisciplinary projects with this type of analytical and techno-pedagogical perspective in educational practice is suggested. At the same time, it is important to enter the field of postgraduate studies, especially due to the level of science and expertise in ICT that the student with disabilities requires to develop in their teaching-learning process, from an inclusive perspective.

References

Aguirre, A., Carballo, R., & Lopez-Gavira, R. (2021). Improving the academic experience of students with disabilities in higher education: faculty members of Social Sciences and Law speak out. *Innovation: The European Journal of Social Science Research*, *34*(3), 305–320. https://doi.org/10.1080/13511610.2020.1828047

Akbar, A., Jabbar, A., Saleem, Q. U. I. A., & Ashiq, M. (2022). Access and Use of Digital Information Resources by Students with Vision Impairment: Challenges, Prospects and Expected Role of Libraries. *International Journal of Disability, Development and Education, 71*(2), 189-207. https://doi.org/10.1080/1034912X.2022.2095356

Algolaylat, A. S., Alodat, A. M., Muhidat, M. A., & Almakanin, H. A. (2023). Perspectives of Students with Disabilities on Inclusive Education Challenges in Higher Education: A Case Study of a Jordanian University. *TEM Journal-Technology Education Management Informatics*, *12*(1), 406–413. https://doi.org/10.18421/TEM121-50

Alsalem, G. M., & Doush, I. A. (2018). Access education: What is needed to have accessible higher education for students with disabilities in Jordan? *International Journal of Special Education*, *33*(3), 541–561. https://files.eric.ed.gov/fulltext/EJ1196695.pdf

Amor, A. M., Hagiwara, M., Shogren, K. A., Thompson, J. R., Verdugo, M. Á., Burke, K. M., & Aguayo, V. (2019). International perspectives and trends in research on inclusive education: a systematic review. *International Journal of Inclusive Education*, *23*(12), 1277–1295. https://doi.org/10.1080/13603116.2018.1445304

Andrade, S., Tapia, M., & Tituana, F. (2020). Aprendizaje mediante el uso de Herramientas Tecnológicas en la Educación inclusiva y el fortalecimiento de la enseñanza. *Revista Scientific*, *5*(17), 350–369. https://doi.org/10.29394/Scientific.issn.2542-2987.2020.5.17.19.350-369

Arteaga, Y. (2023). Infopedagogía en el aula: Potenciando el aprendizaje a través de la integración de tecnología y pedagogía en Ecuador. *Dominio De Las Ciencias*, *9*(2), 1795–1812. http://190.57.147.202:90/xmlui/handle/123456789/3488

Baguma, R., & Wolters, M. K. (2021). Making Virtual Learning Environments Accessible to People with Disabilities in Universities in Uganda. *Frontiers in Computer Science*, *3*, 638275. https://doi.org/10.3389/fcomp.2021.638275

Beyene, W. M., Mekonnen, A. T., & Giannoumis, G. A. (2023). Inclusion, access, and accessibility of educational resources in higher education institutions: exploring the Ethiopian context. *International Journal of Inclusive Education*, *27*(1), 18–34. https://doi.org/10.1080/13603116.2020.1817580

Bong, W. K., & Chen, W. (2021). Increasing faculty's competence in digital accessibility for inclusive education: a systematic literature review. *International Journal of Inclusive Education*, *28*(2), 197-213. https://doi.org/10.1080/13603116.2021.1937344

Buitrago, L. M., Laverde, G. M., Amaya, L. Y., & Hernández, S. I. (2022). Pensamiento computacional y educación STEM: reflexiones para una educación inclusiva desde las prácticas pedagógicas. *Panorama*, *16*(30), 199–223. https://www.redalyc.org/articulo.oa?id=343969897012

Cinquin, P.-A., Guitton, P., & Sauzéon, H. (2021). Designing accessible MOOCs to expand educational opportunities for persons with cognitive impairments. *Behaviour & Information Technology*, *40*(11), 1101–1119. https://doi.org/10.1080/0144929X.2020.1742381

Clavijo, R., & Bautista-Cerro, M. (2020). La educación inclusiva. Análisis y reflexiones en la educación superior ecuatoriana. *Alteridad*, *Revista de Educación, 15*(1), 113–124. https://doi.org/10.17163/alt.v15n1.2020.09

Cotán, A., Aguirre, A., Morgado, B., & Melero, N. (2021a). Methodological Strategies of Faculty Members: Moving toward Inclusive Pedagogy in Higher Education. *Sustainability*, *13*(6), 3031. https://doi.org/10.3390/su13063031

Cotán, A., Carballo, R., & Spinola-Elias, Y. (2021b). Giving a voice to the best faculty members: benefits of digital resources for the inclusion of all students in Arts and Humanities. *International Journal of Inclusive Education, 28*(7), 1240-1257. https://doi.org/10.1080/13603116.2021.1991492

Cruz-Picón, P., & Hernández-Correa, L. (2022). Una reflexión en torno a la educación inclusiva en el aula. *Revista Investigium IRE Ciencias Sociales y Humanas*, *13*(1), 57–70. https://doi.org/10.15658/INVESTIGIUMIRE.221301.05

Díaz, M. N. , & Morgado, B. (2022). "With arms wide open". Inclusive pedagogy in higher education in Spain. *Disability & Society, 39*(7), 1800-1820. https://doi.org/10.1080/09687599.2022.2162858

Espínola, A. (2020). Educación inclusiva e igualdad de las personas con discapacidad en la transformación digital. *Revista Jurídica Valenciana*, *35*, 1–13.

Fasting, R. B., & Breilid, N. (2023). Cross-professional collaboration to improve inclusive education. *Scandinavian Journal of Educational Research, 68*(4), 661-676. https://doi.org/10.1080/00313831.2023.2175248

Ferede, B., Elen, J., van Petegem, W., Hunde, A. B., & Goeman, K. (2022). Instructors' educational ICT use in higher education in developing countries: evidence from three Ethiopian Universities. *Journal of Computing in Higher Education*, *34*(3), 658–678. https://doi.org/10.1007/s12528-022-09316-3

France, E. F., Cunningham, M., Ring, N., Uny, I., Duncan, E. A. S., Jepson, R. G., Maxwell, M., Roberts, R. J., Turley, R. L., Booth, A., Britten, N., Flemming, K., Gallagher, I., Garside, R., Hannes, K., Lewin, S., Noblit, G. W., Pope, C., Thomas, J., […] Noyes, J. (2019). Improving reporting of meta-ethnography: the eMERGe reporting guidance. *BMC Medical Research Methodology*, *19*(1), 25. https://doi.org/10.1186/s12874-018-0600-0

Garay-Rondero, C. L., Salinas-Navarro, D. E., & Calvo, E. Z. R. (2020). Design for Inclusion and Diversity: Developing Social Competencies in Engineering Education. In *Advances in Industrial Design: Proceedings of the AHFE 2020 Virtual Conferences on Design for Inclusion, Affective and Pleasurable Design, Interdisciplinary Practice in Industrial Design, Kansei Engineering, and Human Factors for Apparel and Textile Engineering: July 16–20, 2020,* (pp. 85-92). Springer International Publishing. https://doi.org/10.1007/978-3-030-51194-4_12

González, G., Rodríguez, M., Campoverde, M., & Bustamante, J. (2023). Brechas en la inclusión de estudiantes universitarios con discapacidad sensorial en la educación superior: Revisión sistemática de la literatura. *Pentaciencias*, *Revista Científica Arbitrada Multidisciplinaria*, *5*(1), 119–134. https://editorialalema.org/index.php/pentaciencias/article/view/421

Grier-Reed, T., & Williams-Wengerd, A. (2018). Integrating Universal Design, Culturally Sustaining Practices, and Constructivism to Advance Inclusive Pedagogy in the Undergraduate Classroom. *Education Sciences*, *8*(4), 167. https://doi.org/10.3390/educsci8040167

Grimes, S., Southgate, E., Scevak, J., & Buchanan, R. (2019). University student perspectives on institutional non-disclosure of disability and learning challenges: reasons for staying invisible. *International Journal of Inclusive Education*, *23*(6), 639–655. https://doi.org/10.1080/13603116.2018.1442507

Grimes, S., Southgate, E., Scevak, J., & Buchanan, R. (2021). Learning impacts reported by students living with learning challenges/disability. *Studies in Higher Education*, *46*(6), 1146–1158. https://doi.org/10.1080/03075079.2019.1661986

Hackett, J., Kruzich, J., Goulter, A., & Battista, M. (2021). Tearing down the invisible walls: Designing, implementing, and theorizing psychologically safer co-teaching for inclusion. *Journal of Educational Change*, *22*(1), 103–130. https://doi.org/10.1007/s10833-020-09401-3

Hernández-Sampieri, R., & Mendoza, C. (2018). *Metodología de la Investigación* (6th ed.). McGraw-Hill.

Jönsson, L. (2017). Learning by designing interview methods in special education. In *Interactivity, Game Creation, Design, Learning, and Innovation: 5th International Conference, ArtsIT 2016, and First International Conference, May 2–3, 2016,* (pp. 272-279). Springer International Publishing. https://doi.org/10.1007/978-3-319-55834-9_32

Kent, M., Ellis, K., & Giles, M. (2018). Students with Disabilities and eLearning in Australia: Experiences of Accessibility and Disclosure at Curtin University. *TechTrends*, *62*(6), 654–663. https://doi.org/10.1007/s11528-018-0337-y

Khalil, M., Slade, S., & Prinsloo, P. (2023). Learning analytics in support of inclusiveness and disabled students: a systematic review. *Journal of Computing in Higher Education, 36*, 202-219. https://doi.org/10.1007/s12528-023-09363-4

Lebenicnik, M., & Istenic Starcic, A. (2018). Factors related to the use of online learning resources: The perception of environmental and contextual barriers of students with special educational needs and their peers. In *In Innovative Technologies and Learning: First International Conference, ICITL 2018: August 27–30, 2018,* (pp. 329-336). https://doi.org/10.1007/978-3-319-99737-7_35

Liu, J., Utemov, V. V, & Kalimullin, A. M. (2017). Teaching Mathematical Subjects to Students with Musculoskeletal Disabilities: Public and Peer Discussions. *EURASIA Journal of Mathematics Science and Technology Education*, *13*(6), 2111–2131. https://doi.org/10.12973/eurasia.2017.01217a

Lopez-Gavira, R., Moriña, A., & Morgado, B. (2021). Challenges to inclusive education at the university: the perspective of students and disability support service staff. *Innovation: The European Journal of Social Science Research*, *34*(3), 292–304. https://doi.org/10.1080/13511610.2019.1578198

Lyner-Cleophas, M. (2019). Assistive technology enables inclusion in higher education: The role of Higher and Further Education Disability Services Association. *African Journal of Disability*, *8*(1), 1-6. https://doi.org/10.4102/ajod.v8i0.558

Mejía-Caguana, D., Riveros-Villareal, V., & Cevallos, J. (2021). Los ambientes virtuales de aprendizaje en la educación inclusiva. *Polo Del Conocimiento*, *6*(3), 591–604. https://dialnet.unirioja.es/descarga/articulo/7926881.pdf

Mendoza, M., & Heymann, J. (2022). Implementation of Inclusive Education: A Systematic Review of Studies of Inclusive Education Interventions in Low- and Lower-Middle-Income Countries. *International Journal of Disability, Development and Education, 71*(3), 299-316. https://doi.org/10.1080/1034912X.2022.2095359

Mintz, J., & Wyse, D. (2015). Inclusive pedagogy and knowledge in special education: addressing the tension. *International Journal of Inclusive Education*, *19*(11), 1161–1171. https://doi.org/10.1080/13603116.2015.1044203

Montoya-González, A. (2021). Educación inclusiva. ¿Cómo estamos? *Revista Innova Educación*, *3*(3), 33–52. https://doi.org/10.35622/j.rie.2021.03.002

Moriña, A. (2022). Faculty members who engage in inclusive pedagogy: methodological and affective strategies for teaching. *Teaching in Higher Education*, *27*(3), 371–386. https://doi.org/10.1080/13562517.2020.1724938

Naicker, S. (2018). *Inclusive Education in South Africa and the Developing World: The Search for an Inclusive Pedagogy*. Emerald Publishing Limited https://doi.org/10.1108/9781787436909

Ndlovu, S. (2021). Provision of assistive technology for students with disabilities in South African higher education. *International Journal of Environmental Research and Public Health*, *18*(8), 3892. https://doi.org/10.3390/ijerph18083892

Ntombela, S. (2020). Teaching and learning support for students with disabilities: Issues and perspectives in open distance e-learning. *Turkish Online Journal of Distance Education*, *21*(3), 18–26. https://doi.org/10.17718/TOJDE.761919

Organization for Economic Co-operation and Development (OECD). (2020). *Making the Most of Technology for Learning and Training in Latin America*. OECD Skills Studies and OECD Publishing. https://doi.org/10.1787/ce2b1a62-en

Orozco, I., & Moriña, A. (2023). Exploring the beliefs of Spanish teachers who promote the development of inclusive pedagogy. *International Journal of Inclusive Education*, *27*(5), 620–635. https://doi.org/10.1080/13603116.2020.1866686

Pacheco, E., Lips, M., & Yoong, P. (2018). Transition 2.0: Digital technologies, higher education, and vision impairment. *The Internet and Higher Education*, *37*, 1–10. https://doi.org/10.1016/j.iheduc.2017.11.001

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021a). Declaración PRISMA 2020: una guía actualizada para la publicación de revisiones sistemáticas. *Revista Española de Cardiología*, *74*(9), 790–799. https://doi.org/10.1016/j.recesp.2021.06.016

Page, M. J., Moher, D., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … McKenzie, J. E. (2021b). PRISMA 2020 explanation and elaboration: updated guidance and exemplars for reporting systematic reviews. *BMJ*, *372*(160), 1-36. https://doi.org/10.1136/bmj.n160

Patey, M. J., Jin, Y., Ahn, B., Lee, W. I., & Yi, K. J. (2021). Engaging in inclusive pedagogy: how elementary physical and health educators understand their roles. *International Journal of Inclusive Education, 27*(4), 1659-1678. https://doi.org/10.1080/13603116.2021.1916102

Pearson, V., Lister, K., McPherson, E., Gallen, A.-M., Davies, G., Colwell, C., Bradshaw, K., Braithwaite, N., & Collins, T. (2019). Embedding and sustaining inclusive practice to support disabled students in online and blended learning. *Journal of Interactive Media in Education*, *1*, 1-10. https://doi.org/10.5334/jime.500

Pegalajar Palomino, M. del C. (2021). Implicaciones de la gamificación en Educación Superior: una revisión sistemática sobre la percepción del estudiante. *Revista de Investigación Educativa*, *39*(1), 169–188. https://doi.org/10.6018/rie.419481

Pena-Becerril, M., Camacho-Zuñiga, C., Martínez-Pena, C., & González-Balderas, J. C. (2021). Building a truly inclusive protocol for students with disabilities from an experience in STEM areas. *IEEE Global Engineering Education Conference (EDUCON)*: 21-23 April 2021 (pp. 189–193). https://doi.org/10.1109/EDUCON46332.2021.9454024

Perera, V. H., Morina, A., Sánchez-Díaz, N., & Spinola-Elias, Y. (2021). Technological Platforms for Inclusive Practice at University: A Qualitative Analysis from the Perspective of Spanish Faculty Members. *Sustainability*, *13*(9), 4755. https://doi.org/10.3390/su13094755

Reddick, R., & Taylor, Z (2018). Race, Equity, and the Learning Environment: The Global Relevance of Critical and Inclusive Pedagogies in Higher Education. *The Review of Higher Education*, *41*(3), 493–496. https://doi.org/10.1353/rhe.2018.0021

Rios Osorio, L. A., Higuita Gutierrez, L. F., & Cardona Arias, J. A. (2016). *Revisiones sistematicas de la literatura cientifica: la investigacion teorica como principio para el desarrollo de la ciencia basica y aplicada*. Fondo Editorial Universidad Cooperativa de Colombia. https://doi.org/10.16925/9789587600377

Román-Graván, P. , & Fernández-Cerero, J. (2022). Training of university teachers in ICT and disability. The case of the University of Seville. *IJERI-International JOURNAL of Educational Research and Innovation*, *17*, 135–151. https://doi.org/10.46661/ijeri.6168Rose, J.,

& Johnson, C. W. (2020). Contextualizing reliability and validity in qualitative research: toward more rigorous and trustworthy qualitative social science in leisure research. *Journal of Leisure Research*, *51*(4), 432–451. https://doi.org/10.1080/00222216.2020.1722042

Sánchez-Díaz, M. N., & Morgado, B. (2022). Moving toward the Inclusion of University Students with Disabilities: Barriers, Facilitators, and Recommendations Identified by Inclusive Faculty. *Journal of Continuing Higher Education*, *70*(3), 175–191. https://doi.org/10.1080/07377363.2021.1946635

Sánchez-Díaz, M. N., & Morgado, B. (2023). Democratizing Higher Education: The Use of Educational Technologies to Promote the Academic Success of University Students with Disabilities. *Societies*, *13*(3), 57. https://doi.org/10.3390/soc13030057

Seale, J. (2020). Improving accessible digital practices in higher education: Challenges and new practices for inclusion. In J. Sale (Ed.), *Improving Accessible Digital Practices in Higher Education: Challenges and New Practices for Inclusion*. https://doi.org/10.1007/978-3-030-37125-8

Seale, J., Burgstahler, S., & Havel, A. (2022). One model to rule them all, one model to bind them? A critique of the use of accessibility-related models in post-secondary education. *Open Learning*: *The Journal of Open, Distance and e-Learning*, *37*(1), 6–29. https://doi.org/10.1080/02680513.2020.1727320

Silletti, F., Ritella, G., Iacobellis, B., Semeraro, C., Episcopo, E., Cassibba, R., & Coppola, G. (2021). Distance learning in Higher Education during the first pandemic lockdown: The point of view of students with special educational needs. *Qwerty*, *16*(2), 30–46. https://doi.org/10.30557/QW000042

Spratt, J., & Florian, L. (2015). Inclusive pedagogy: From learning to action. Supporting each individual in the context of "everybody." *Teaching and Teacher Education*, *49*, 89–96. https://doi.org/10.1016/j.tate.2015.03.006

Stăiculescu, C., Dincă, V. M., & Gheba, A. (2022). Analysis of the Factors Influencing the Favorable Participation of Students with Special Needs in Public Tertiary Education in Romania. *Sustainability (Switzerland)*, *14*(17), 10803. https://doi.org/10.3390/su141710803

Suherman, Y., Juhanaini, J., Maryanti, R., & Rochyadi, E. (2022). Innovation of "braille corner" digital learning based on learning for the students with visual impairment in inclusion settings. *Journal of Engineering Science and Technology*, *17*(6), 4253–4265. https://jestec.taylors.edu.my/V17Issue6.htm

Tong, A., Flemming, K., McInnes, E., Oliver, S., & Craig, J. (2012). Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. *BMC Medical Research Methodology*, *12*(1), 181. https://doi.org/10.1186/1471-2288-12-181

Torán, M. M., & Sendra, C. E. (2022). Accesibilidad digital y discapacidad | Digital accessibility and disability. *Revista Española de Discapacidad*, *10*(2), 111-133. https://www.cedid.es/redis/index.php/redis/article/view/795

Tracey, D., Barker, K., Valuka, P., Baambu, W., Gene, K., Moko, E., Robert, S., Robin, G., Sowi, C., Wanis, J., Wine, D., Nelson, G., & Arifeae, P. (2021). Furthering inclusive

education in Papua New Guinea through teacher training: reflections on challenges and transformations. *International Journal of Inclusive Education, 28*(5), 525-542. https://doi.org/10.1080/13603116.2021.1941321

Veck, W. (2014). Inclusive pedagogy: ideas from the ethical philosophy of Emmanuel Levinas. *Cambridge Journal of Education*, *44*(4), 451–464. https://doi.org/10.1080/0305764X.2014.955083

Vidal-Alegría, F. A., Muñoz-Gómez, E. P., Soto-Durán, D. E., & Reyes-Gamboa, A. X. (2021). Guía metodológica para evaluar Recursos Educativos Digitales accesibles enfocados a estudiantes con discapacidad auditiva, en el Contexto Colombiano. *RISTI - Revista Iberica de Sistemas e Tecnologias de Informacao*, (E43), 213–226. https://dspace.tdea.edu.co/handle/tdea/2671

von Below, R., Spaeth, E., & Horlin, C. (2021). Autism in Higher Education: dissonance between educators' perceived knowledge and reported teaching behaviour. *International Journal of Inclusive Education, 28*(6), 940-957. https://doi.org/10.1080/13603116.2021.1988159

Wilkens, L., Haage, A., Lüttmann, F., & Bühler, C. R. (2021). Digital teaching, inclusion and students' needs: Student perspectives on participation and access in higher education. *Social Inclusion*, *9*(3), 117–129. https://doi.org/10.17645/si.v9i3.4125

Zambrano-Steensma, L. (2022). Experience and University Praxis in the Evaluation of Students with Hearing Disabilities. *Revista Electronica Educare*, *26*(2), 106-120. https://doi.org/10.15359/ree.26-2.6

Zhu, J., & Liu, W. (2020). A tale of two databases: the use of Web of Science and Scopus in academic papers. *Scientometrics*, *123*(1), 321–335. https://doi.org/10.1007/s11192-020-03387-8

Zongozzi, J. N. (2022). Accessible Quality Higher Education for Students with Disabilities in a South African Open Distance and e-Learning Institution: Challenges. *International Journal of Disability, Development and Education*, *69*(5), 1645–1657. https://doi.org/10.1080/1034912X.2020.1822518

Zorec, K., Desmond, D., Boland, T., McNicholl, A., O'Connor, A., Stafford, G., & Gallagher, P. (2022). A whole-campus approach to technology and inclusion of students with disabilities in higher education in Ireland. *Disability & Society, 39*(5), 1147-1172. https://doi.org/10.1080/09687599.2022.2114885

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Appendix

Appendix 1. Articles related to methodologies and techniques with the use of ICT

Title	Authors	Participants	Aims and Scopes	Country or institution	Tools or Technological strategies
Access and Use of Digital Information Resources by Students with Vision Impairment: Challenges, Prospects and Expected Role of Libraries	Akbar et al. (2022)	13 postgraduate students with vision impairment (SVI)	To explore various obstacles, expected services and support for SVIs from their universities, libraries, and Higher Education Commission (HEC)	Pakistan	Access to digital information resources
Making Virtual Learning Environments Accessible to People with Disabilities in Universities in Uganda	Baguma & Wolters (2021)	3 public universities and 3 private universities	To examine the extent to which Uganda's policy environment promotes making eLearning accessible	Uganda	Virtual Learning Environments (VLEs) based on Moodle and WAVE (suite of evaluation tools that can identify Web Content Accessibility Guideline errors).
Designing accessible MOOCs to expand educational opportunities for persons with cognitive impairments	Cinquin et al. (2020)	6 university students and 13 professionals from the fields of expertise	To support the development of online education content and training that are accessible to many different learners, including those with cognitive impairments to the greatest extent possible	France	MOOC – Massive Open Online Courses
Giving a voice to the best faculty members: benefits of digital resources for the inclusion of all students in Arts and Humanities	Cotán et al. 2021b	24 faculty members from five Spanish public universities	To analyse the knowledge and beliefs of inclusive faculty members about disability, and how they design and develop their teaching practice	Spain	Digital resources in university classrooms

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Students with Disabilities and eLearning in Australia: Experiences of Accessibility and Disclosure at Curtin University	Kent et al. (2018)	125 undergraduate students	To analyze experiences of eLearning at Curtin University into students with disabilities	Curtin University/ Australia	E-learning at University
Factors related to the use of online learning resources: The perception of environmental and contextual barriers of students with special educational needs and their peers	Lebenicnik & Starcic (2018)	1675 university students and 56 university students with special educational needs	To examine differences between students with SEN and their peers in perceived barriers for OLR use	University of Ljubljana and University of Primorska (Slovenia)	Online Learning Resources
Provision of assistive technology for students with disabilities in South African higher education	Ndlovu (2021)	Six undergraduate and postgraduate students	To explore the effectiveness of the provision of AT and assistive devices, in terms of enabling students with disabilities' learning.	South Africa/ Disability Rights Centre	Digital resources and devices in university classrooms
Transition 2.0: Digital technologies, higher education, and vision impairment	Pacheco et al. (2018)	19 undergraduate students	To gain in depth understanding of the way a group of students with vision impairments used digital technologies for their transition to university	New Zealand/ Victoria University of Wellington	Social media and mobile devices
Embedding and sustaining inclusive practice to support disabled students in online and blended learning	Pearson et al. (2019	262 staff members	To present data on staff perceptions and practices regarding accessibility and inclusion for disabled students	United Kingdom	Embedding and Sustaining Inclusive Practices in STEM (IncSTEM)

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Technological Platforms for Inclusive Practice at University: A Qualitative Analysis from the Perspective of Spanish Faculty Members	Perera et al. (2021)	119 faculty members from 10 Spanish public universities (the participants were selected by students with disabilities)	To explore the practices of faculty members who carry out inclusive education with technological platforms.	Spain	Technology platforms (Learning Management Systems)
Democratizing Higher Education: The Use of Educational Technologies to Promote the Academic Success of University Students with Disabilities	Sánchez-Díaz & Morgado (2023)	42 inclusive faculty members from 6 Spanish public universities	To analyze the actions of university faculty members who engage in inclusive teaching practices using educational technologies in their classrooms.	Spain	Digital resources in university classrooms
Innovation of "braille corner" digital learning based on learning for the students with visual impairment in inclusion settings	Suherman et al. (2022)	18 students with special needs, especially students with visual impairment	To develop a digital literacy-based learning innovation model "braille corner" for students with visual impairment in an inclusive education setting.	Universitas Pendidikan Indonesian	"Braille corner" digital literacy-based learning innovation model for students with visual impairment.
Digital teaching, inclusion and students' needs: Student perspectives on participation and access in higher education	Wilkens et al. (2021)	21 students participated, most of whom reported visual impairment or blindness (12 participants)	To outline barriers in current practices, especially for students with disabilities, and to figure out how principles of Universal Design and accessibility may contribute to equal participation for all students	Germany	DoBus strategy at TU Dortmund

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A whole-campus approach to technology and inclusion of students with disabilities in higher education in Ireland	Zorec et al. (2022)	18 students and 28 representatives	The study is part of a larger research project that explored the role of technology in promoting inclusive higher education in Ireland for students with disabilities.	Ireland	Educational assistive technology (e.g. screen reading, speech recognition, literacy, magnification, and note-taking technology), mobility aids, visual aids, and communication aids.

Appendix 2. Articles related to inclusive pedagogy and teaching-learning process

Authors	Title	Year	Journal
Aguirre, A. et al.	.Improving the academic experience of students with disabilities in higher education: faculty members of Social Sciences and Law speak out	2021	Innovation-The European Journal of Social Science Research
Algolaylat, A.S. et al.	Perspectives of Students with Disabilities on Inclusive Education Challenges in Higher Education: A Case Study of a Jordanian University	2023	TEM Journal-Technology Education Management Informatics
Alsalem G.M. & Doush I.A.	Access education: What is needed to have accessible higher education for students with disabilities in Jordan?	2018	International Journal of Special Education
Beyene W.M. et al.	Inclusion, access, and accessibility of educational resources in higher education institutions: exploring the Ethiopian context	2023	International Journal of Inclusive Education
Ceresnova Z. et al.	Inclusive design of educational environment for diverse people	2018	Advances in Intelligent Systems and Computing
Cotán, A. et al.	Methodological Strategies of Faculty Members: Moving toward Inclusive Pedagogy in Higher Education	2021	Sustainability
Díaz, M.N. & Morgado, B.	With arms wide open'. Inclusive pedagogy in higher education in Spain	2022	Disability & Society
Garay-Rondero C.L. et al.	Design for Inclusion and Diversity: Developing Social Competencies in Engineering Education	2020	Advances in Intelligent Systems and Computing
Gravan, P.R. & Cerero, J.F.	Training of university teachers in ICT and disability. The case of the University of Seville	2022	IJERI-International Journal of Educational Research and Innovation
Grimes, S. et al.	Learning impacts reported by students living with learning challenges/ disability	2021	Studies in Higher Education
Grimes, S. et al.	University student perspectives on institutional non-disclosure of disability and learning challenges: reasons for staying invisible	2019	International Journal of Inclusive Education
Jönsson L.	Learning by designing interview methods in special education	2017	Lecture Notes of the Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering, LNICST
Liu, J. et al.	Teaching Mathematical Subjects to Students with Musculoskeletal Disabilities: Public and Peer Discussions	2017	EURASIA Journal of Mathematics Science and Technology Education

Authors	Title	Year	Journal
Lopez-Gavira, R. et al.	Challenges to inclusive education at the university: the perspective of students and disability support service staff	2021	Innovation-The European Journal of Social Science Research
Ntombela S.	Teaching and learning support for students with disabilities: Issues and perspectives in open distance e-learning	2020	Turkish Online Journal of Distance Education
Pena-Becerril M. et al.	Building a truly inclusive protocol for students with disabilities from an experience in STEM areas	2021	IEEE Global Engineering Education Conference, EDUCON
Sánchez-Díaz, M. N. & Morgado, B.	Moving toward the Inclusion of University Students with Disabilities: Barriers, Facilitators, and Recommendations Identified by Inclusive Faculty	2022	Journal of Continuing Higher Education
Seale J. et al.	One model to rule them all, one model to bind them? A critique of the use of accessibility-related models in post-secondary education	2022	Open Learning
Silletti F. et al.	Distance learning in Higher Education during the first pandemic lockdown: The point of view of students with special educational needs	2021	Qwerty
Vidal-Alegría F.A. et al.	Methodological Guide for the Evaluation of the Process and the Product of Accessible Digital Educational Resources Focused on Students with Hearing Impairments, in the Context of Higher Education Institutions in Colombia	2021	RISTI - Revista Iberica de Sistemas e Tecnologias de Informacao
von Below, R. et al.	Autism in Higher Education: dissonance between educators' perceived knowledge and reported teaching behaviour	2021	International Journal of Inclusive Education
Wuo A.S. & Paganelli B.T.S.	Barriers and facilitators in the inclusion of persons with disabilities in higher education: The students' point of view	2022	Education Policy Analysis Archives
Zambrano-Steensma L.	Experience and University Praxis in the Evaluation of Students with Hearing Disabilities	2022	Revista Electronica Educare
Zongozzi J.N.	Accessible Quality Higher Education for Students with Disabilities in a South African Open Distance and e-Learning Institution: Challenges	2022	International Journal of Disability, Development and Education