Digital Teaching Competence and Educational Inclusion in Higher Education. A Systematic Review

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Abstract: This article presents a systematic review of the literature with the aim of providing an updated framework for the scientific production developed in the field of digital competence and inclusive education in Higher Education, as indexed in the Web of Science (WoS) and SCOPUS databases. Twenty-one scientific articles published between 2016-2023 were included and analyzed, with no temporal cohort established. The search matches yielded a first document of the topic of study in 2016 in the Social Sciences Citation Index. The results obtained on the conceptual structure of the analyzed documents were carried out through a multiple correspondence analysis (MCA) observing the existence of two dimensions composed of three clusters. Cluster one was composed of studies on digital competence, virtual learning environments, digital divide, and functional diversity, among others. Cluster two comprised studies carried out on digital tools and competencies, inclusive education, educational processes, and digital strategies; while cluster three was made up of educational inclusion related to interculturality and digital competence. Among its limitations, there were aspects related to the heterogeneity of the studies, which make it difficult to compare the data, and the sample and size of the study, which makes the results obtained and the generated data have a lower percentage of generalization compare to studies that use larger simples. This study has implications for researchers and Higher Education institutions interested in research on digital competence for inclusive education, with the possibilities of digital competence for inclusive education being established from the studied variables, allowing teachers to adapt and personalize learning to meet individual student needs. All of this is in line with the goals of the 2030 Agenda, concerning the empowerment of citizens and the digitization of public services to ensure the population's access to such services via the internet.

Keywords: Digital competencies, Inclusive education, Digital divide, Interculturality, Universal design for learning, 2030 Agenda

1. Introduction

The development of digital teaching competencies in the use of Information and Communication Technologies (ICT) to enhance educational inclusion in the university context is multidimensional, heterogeneous, and complex (Kerexeta-brazal et al., 2022). Therefore, it must be addressed from different perspectives. On one hand, it requires the education system to create new policies, regulations, and provisions that highlight and create conditions for its development. On the other hand, it involves universities in providing resources and regulations to ensure the safe and efficient access and use of virtual devices and resources by both teachers and students (World Health Organization and World Bank, 2011). Additionally, it calls for teachers and students to engage in training in both educational technologies and inclusive education (Ainscow, 2020).

Various frameworks for the development of digital teaching competence share significant similarities in defining it as the acquisition and development of knowledge, skills, and abilities in technology use to equip the educational population with tools enabling them to harness digital technologies and participate in the new society of the 21st century (INTEF, 2017; ISTE ORG, 2022; UNESCO, 2019). The absence of digital competence in teachers and students can be a barrier to access quality education and sustainable educational inclusion, widening the digital gap for populations already disadvantaged by various conditions (United Nations). The post-COVID-19 era has underscored the challenge and crucial need for the training of teachers and students to use technologies (UNESCO, 2020) to prevent limited or complete exclusion from participation in various societal systems.

Addressing the use of ICT as a key element for educational inclusion in the university classroom requires educational institutions to eliminate not only architectural barriers, access barriers to virtual spaces and resources, and attitudinal barriers (Lapierre et al., 2022) but also those related to implicit pedagogical understandings in educational models based on limiting beliefs (Ainscow and Echeita, 2011). Although the definition of the concept of educational inclusion is multifaceted (Tomlinson, 2023) and linked to actions transforming educational practices into opportunities for meaningful and flexible learning (CAST, 2018).

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In this regard, others research has demonstrated the need to update and innovate the education system by incorporating digital resources to adapt teaching processes for the benefit of learning and the participation of all students (Hoogerwerf et al., 2017; Bong and Chen, 2021). Teachers must have adequate digital competence to meet the educational demands imposed on them, ensuring quality education based on inclusive education. This is evident in research results on digital competence in higher education (Cabero et al., 2020; Calderón, Gustems and Carrera, 2020; Guillén and Mayorga, 2020). The incorporation of ICT into educational processes as pedagogical strategies suitable for the age groups of students, with adjustments to the discipline under study and the skills to be developed (Borgobello et al., 2019; Cateriano et al., 2021; Quota et al., 2022), has been possible when teachers know how to use technologies based on the discipline and pedagogical criteria (Mishra and Koehler, 2006).

Furthermore, the 2030 Agenda for Sustainable Development defines global challenges, and specifically, Goal 4 refers to inclusive and equitable quality education that aims to "ensure quality and inclusive education, promoting lifelong learning opportunities for all people" (UNESCO, 2020, p. 17). One of the main tasks for developing inclusive education (Ainscow, 2007) is to identify barriers hindering the learning and participation of all students to eradicate inequality and establish educational equity. In light of this, various studies emphasize the urgent need for teachers and students to have domains and skills for the use of digital resources, which are increasingly vast (Cabero et al. 2022; Cateriano et al., 2021).

To achieve an inclusive environment, teachers must teach all students regardless of their intrinsic, structural, or cultural abilities and capacities (Juárez and Comboni, 2016). This substantial shift in knowledge transmission requires a teacher with competencies built by educational technology, truly enabling inclusive education for all students with or without disabilities (Batanero, Cabero and López, 2019). Therefore, it is essential for teachers to have program designs for training based on universal design for learning and the necessary resources to attend to all students, as well as specific technological and pedagogical training (Cabero et al., 2020).

Systematizing evidence from research and experiences with an emphasis on the use of educational technology for educational inclusion in the university serves as a reliable resource for decision-making at different levels. This strategic commitment is crucial because studies in this field at the university level are more limited and relatively recent.

2. Method

2.1 Objectives

This research advocates for digital competence as a basis for the development of inclusive education that values diversity as an enriching element of the teaching-learning process and as an enabler of human development. The goal of education in the current context of the 2030 Agenda is to overcome the digital divide that poses a challenge for those who cannot access technology, resulting in feeling excluded from global society. The aim is to facilitate accessibility of the population and eliminate barriers and obstacles on an equal footing, particularly for the most vulnerable groups. Taking this challenge as the focus of study, the objective of this article is to provide an updated overview of studies conducted on digital citizenship competence in inclusive contexts, investigating the type of research design, instruments and analysis used, as well as the results obtained after their application, their implications and limitations.

This research is directed through the following research questions:

RQ1: What is the international scientific production regarding the relationship between digital competence and inclusive education?

RQ2: What are the research methods used in studies conducted on digital competence and educational inclusion?

RQ3: What are the results obtained in studies developed on digital competence and educational inclusion?

RQ4: What are the limitations arising from research on digital competence in inclusive contexts?

Therefore, the objective of this research is to provide an updated framework of scientific production on the relationship between digital competence and inclusive education. This involves exploring the type of research design, instruments, and analyses employed, as well as the results obtained following their application, along with their implications and limitations. The aim is to parameterize this data and offer relevant information to researchers regarding scientific publications that link digital competence and educational inclusion.

2.2 Design

The methodology used in this research responds to a systematic literature review, characterized by: a) being systematic, with scientific rigor and non-arbitrary; b) being comprehensive, including all scientifically rigorous productions related to a specific topic; c) being explicit, detailing the procedure for locating sources and the criteria considered; d) being reproducible, allowing other researchers to verify the process (Onwuegbuzie and Frels, 2015).

This study conducts a systematic literature review using the Web of Science (WoS) and SCOPUS databases. It is noteworthy that a specific time range was not selected; instead, all search matches in the database were considered. The first publication record in the WoS database dates back to 2016, while in SCOPUS, it is from 2019. These databases were chosen for their global recognition and prestige in the field of science, ensuring strict criteria for scientific quality. The review has been limited to analysing the most recent documents on the research problem. Additionally, it has been found that prior to 2015, international research on digital competence and inclusive education was non-existent. While scientific and academic documents related to disability and impairment linked to the use of ICT appear before 2015, the concepts of inclusive education and digital competence surpass the established notions to date. Therefore, the scientific production within this emerging trend is quite recent. The search and selection of publications included in this study were conducted by three independent researchers, experts in conducting systematic review research, and whose lines of research are related to the area of Inclusive Education and Educational Technology. In this research, we followed the quality standards established in the PRISMA statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) to ensure the internal consistency of the systematic review (Thanasi-Boçe and Kulakli, 2023; Urrútia and Bonfill, 2010), which include: description of eligibility criteria, sources of information and publication search; selection process of works; procedure for data extraction and synthesis of results obtained.

3. Procedure

The process of systematic analysis of literature requires an initial search of publications in the selected database. Thus, the preliminary analysis for the search of documents is carried out according to the search equation based on the key descriptors that are part of this work: "Digital Competence", "Inclusive Education", "Higher Education". These terms have been used in both Spanish and English, in the title, abstract and keywords sections in the database, complemented through Boolean operators AND and OR. From these terms and the use of different Boolean operators, the following search equation was designed: "inclusive education AND digital competence AND higher education OR educación inclusiva AND competencia digital AND educación superior".

The second phase includes filtering the results based on the inclusion and exclusion criteria for publications, which are described in Table 1:

Table 1: Criteria for inclusion and exclusion of publications

Inclusion criteria	Exclusion criteria
Articles published in high-quality scientific journals that undergo peer-review process. Publications written in Spanish or English. Publications related to the fields of Social Sciences and Educational Research. Documents published between 2017-2022, inclusive. Open-access publications available for consultation.	Articles not related to the general objective of this study. Publications related to other educational professionals. Publications with restricted access. Books or book chapters, conference proceedings, doctoral or master's theses, final papers, etc. Duplicate publications in both databases.

In the third phase, the quality of each publication was evaluated by reading the full text to ensure its affinity and relevance to the general objective of this research. This evaluation resulted in 21 primary data sources out of the 134 publications. Figure 1 shows the process followed for searching, selecting, and reviewing publications until establishing the final sample.

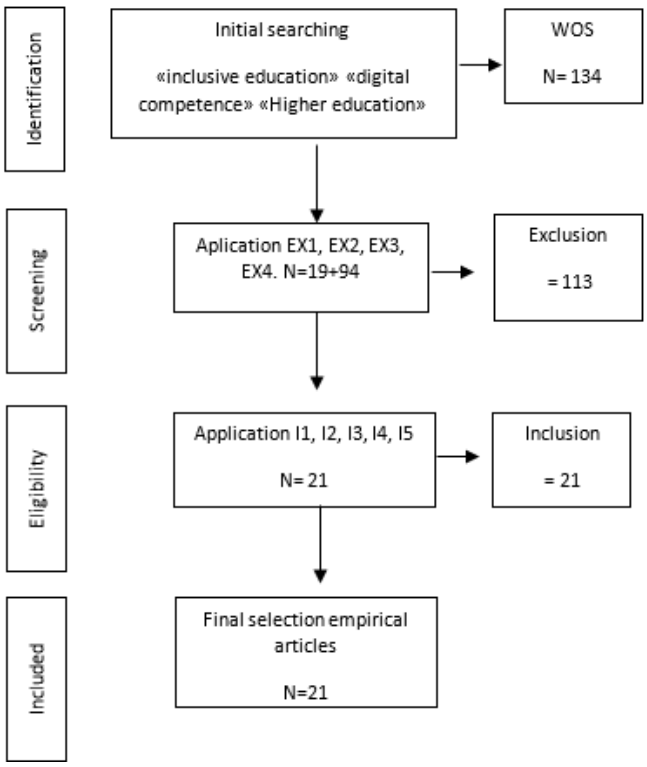

Figure 1: Flowchart of the sample search and selection process

The twenty-one studies that met the inclusion criteria were independently examined in depth. The studies recorded information related to general aspects (authors, year of publication and topics), participants (sample size, educational level), method/methodology (qualitative, quantitative, systematic review), and the main results and conclusions obtained in each study (Appendix 1)

The findings showed that research on digital competence and inclusive education was first studied in 2016 and that the highest number of articles appeared in 2021. Digital competence in inclusive contexts in higher education is examined from a global perspective in this study, suggesting the direction for in-depth research as well as future lines of investigation.

4. Results

At the outset, the quality of the chosen documents for the systematic review was appraised using the AMSTAR 2 tool (Shea *et al*., 2017), and the outcomes are depicted in Figure 2.

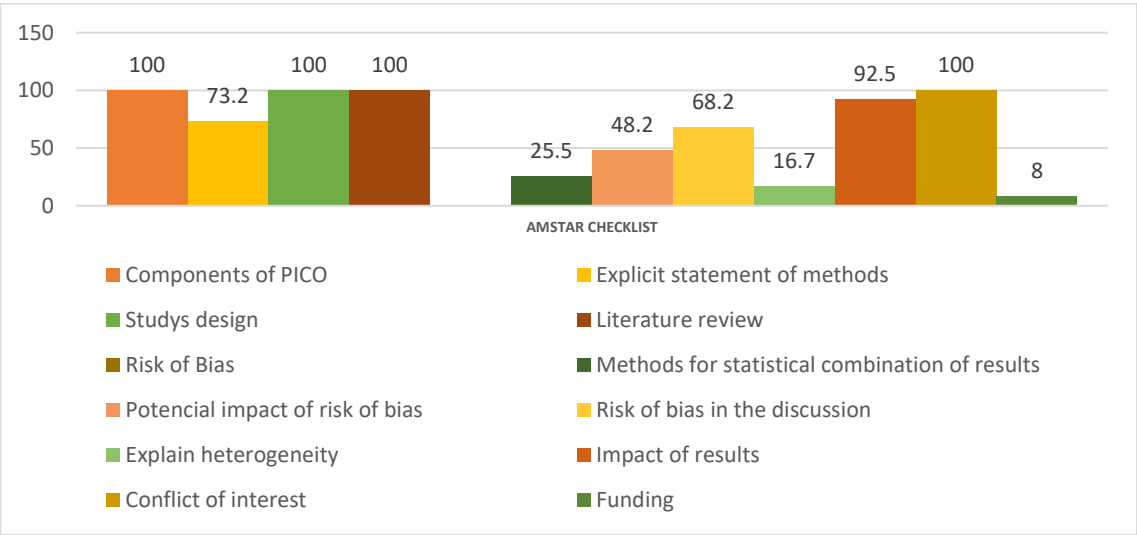

Figure 2: Results of AMSTAR 2 Checklist. Own elaboration

The annual scientific production on publications related to digital competence and educational inclusion in Higher Education has had a really important growth in the year 2022 (Figure.3). It should be noted that the term educational inclusion is relatively recent, traditionally scientific research in educational technology has been related to disability, attention to diversity, and special education, among others. It is now, from 2022, when the educational field is directing its efforts towards conducting studies related to educational inclusion and digital competence in Higher Education. Thus, we find a growing trend that began in 2018, reaching a peak of 5 publications in 2020, 3 in 2021 and a total of 13 in 2022. These results can be related to the onset of the COVID19 pandemic and the needs and challenges that have become apparent regarding the integration and use of technology as an essential element to decrease and mitigate the negative effects of exclusion of the most vulnerable groups. The trend persists in SCOPUS, where the number of documents continues to grow since 2021.

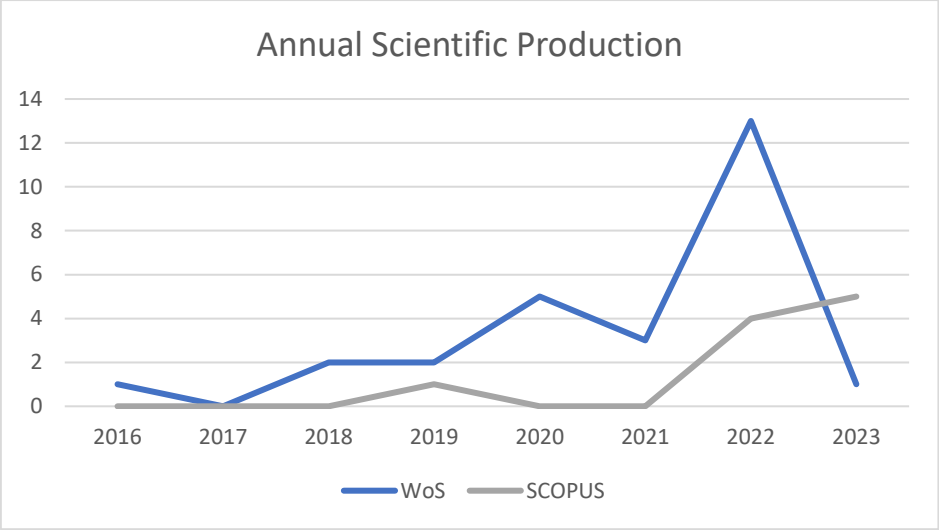

Figure 3: Annual scientific production in WoS and SCOPUS in reference to the search area.

Table 2 presents crucial information obtained from the preliminary analysis of the selected documents, following the application of inclusion and exclusion criteria. The total sample for the study comprised 21 articles, out of the initial 134. In this context, the temporal scope was defined between the years 2016 and 2023, with an annual growth rate of 100% in WoS and 49.53% in SCOPUS. The average document lifespan exceeds a year and a half, signifying that the field of study has been explored more intensively over the last five years. Concerning authorship and co-authorship, it is evident that the majority of research has involved collaboration among multiple authors, with only four instances of a single author. The average co-authorship per document is close to 3. It is noteworthy that co-authorship among researchers from different countries is non-existent in WoS and reaches a rate of 30% in SCOPUS.

Table 2: Main information about the data

Description	Results WoS	Results SCOPUS
Timespan	2016:2023	2016:2023
Sources (Journals, Books, etc)	14	7
Documents	14	7
Annual Growth Rate %	100	49.53
Document Average Age	1,69	0.8
Average citations per doc	7	2.6
References	734	655
DOCUMENT CONTENTS		
Keywords Plus (ID)	29	41
Author's Keywords (DE)	65	57
AUTHORS		
Authors	39	28

Description	Results WoS	Results SCOPUS
Authors of single-authored docs	3	1
AUTHORS COLLABORATION		
Single-authored docs	3	1
Co-Authors per Doc	2,79	2.8
International co-authorships %	0	30
DOCUMENT TYPES		
article	13	7
article; early access	2	0

Note: Biblioshiny output for Bibliometrix. Own Elaboration.

Figure 4 displays the links between the institution where authors are affiliated (AU_UN), the countries (AU_CO), and the keywords of the documents (DE) regarding the WoS database. Spain has the highest scientific production regarding the object of study, with the universities of Seville, Malaga, Almeria, and the Basque Country, and Cordoba standing out. This is followed by South Africa, with the University of Johannesburg, and Norway, with its University of Science and Technology. Thus, research from Spanish universities focuses on ICT, interculturality, inclusion, and accessibility in higher education (Portillo et al., 2020; Rodríguez, Calvo and Martín, 2020; Medina-García et al., 2021; Batanero et al., 2022; Cabero et al., 2022; Leiva et al., 2022), while South African universities also focus on ICT, active methodologies, and hybrid environments to promote inclusion (Azionya and Nhedzi, 2021). On the other hand, Nordic universities focus on higher education and digital competence for the development of holistic and inclusive training programs (Begnum, Pettersen and Sørum, 2019; Joshi, 2021); and Australian universities focus on digital divides and accessibility as key factors for educational inclusion (Nguyen et al., 2022). Lastly, Russian universities focus on the consequences of the COVID-19 pandemic on educational inclusion in higher education (Belenkova, Skudnyakova and Bosov, 2022), while Ukrainian universities study the potential of self-regulation and technology integration in the training of future special education teachers (Mytsyk and Pryshliak, 2022).

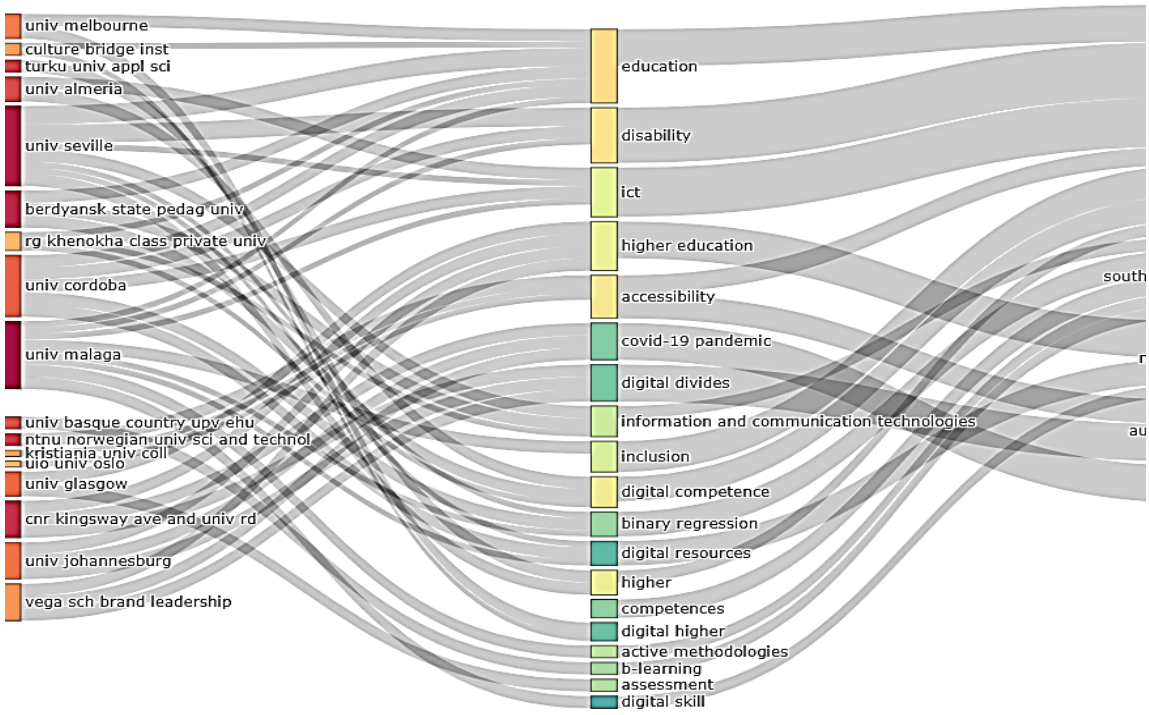

Figure 4: Biblioshiny output for Bibliometrix: Relationship between countries, affiliations, and keywords

Similar to WoS, Figure 5 illustrates the results obtained from the analysis of scientific production in SCOPUS. In this context, the trend observed in the previous database continues, with Spanish universities (University of Granada and Autonomous University of Madrid) (Barroso, Rayón, and García, 2023). Their research focuses on

the design and creation of a MOOC based on UDL for training in inclusive education and digital competence in Latin America (University of the Atlantic). The results were positive, proposing future enhancements, such as including a sign language interpreter and opening access to the global community (Herrera, Crisol, and Montes, 2019). Conversely, Barroso, Rayón, and García (2023) analysed the influence of social platforms in education, using data mining techniques to conclude that influential groups play a crucial role in raising awareness and sensitivity towards inclusive education. This analysis was based on examining over 40,000 posts on Twitter and Instagram. Researchers from the University of Zaragoza (Blasco, Bitrián, and Coma, 2022) investigated the impact of the Flipped Classroom model on promoting inclusive education in the classroom. The results indicate that using videos in the classroom enhances student performance and addresses diversity by presenting information in different formats or codes. Furthermore, several literature reviews from universities in Southeast Asia (Choudhary and Bansal, 2022; Kahanurak, Dibyamandala, and Mangkhang, 2022) and Poland (Kochanowicz, 2023) are associated with the development of digital competence and interculturality for the advancement of inclusive education. Additionally, quantitative studies (Bong and Chua, 2023) have been conducted to validate an instrument for advising teaching practices focused on the development of inclusive education.

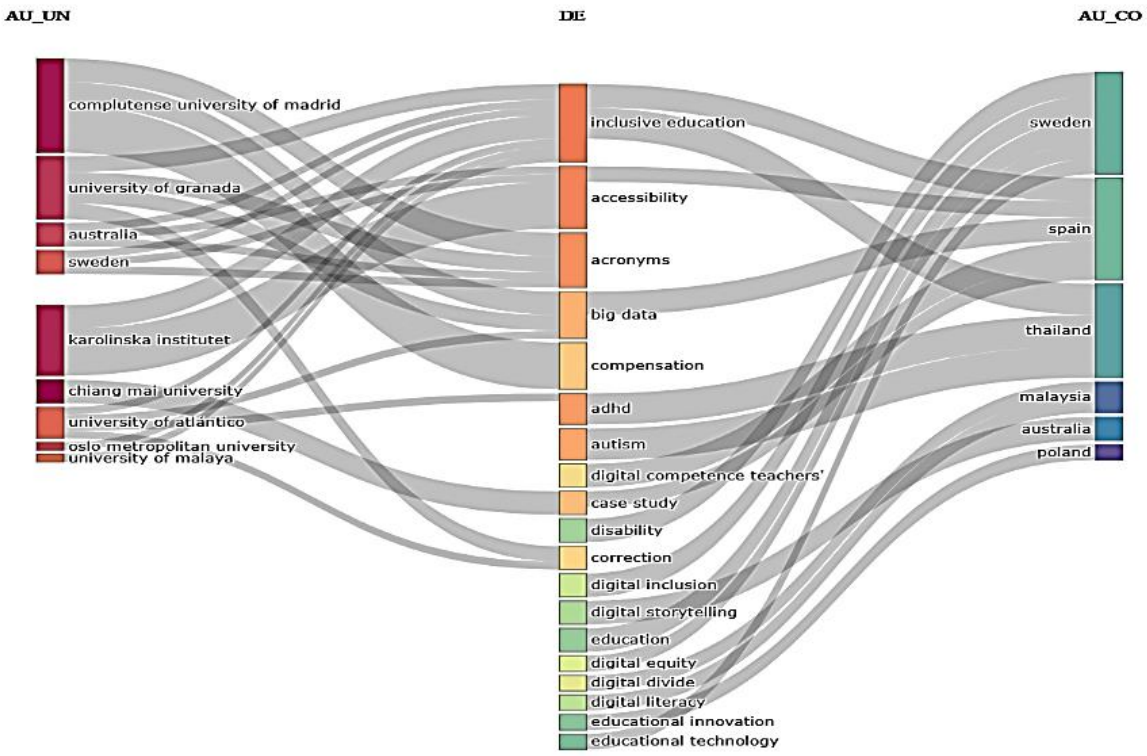

Figure 5: Biblioshiny output for Bibliometrix: Relationship between countries, affiliations, and keywords. SCOPUS

In Figure 6 and 7, the evolution over time of the topics that have generated and continue to generate the most interest in the scientific community is shown, both in WoS and in SCOPUS. It can be observed that there is an upward trend in research related to digital competence, with a significant increase between 2021 and 2022. Similarly, research on digital gaps increased in 2020 and 2021, maintaining its relevance in the last year. Additionally, there has been an increase in interest in studies related to the training of specialist teachers in special education and the principles of universal design for learning since 2021.

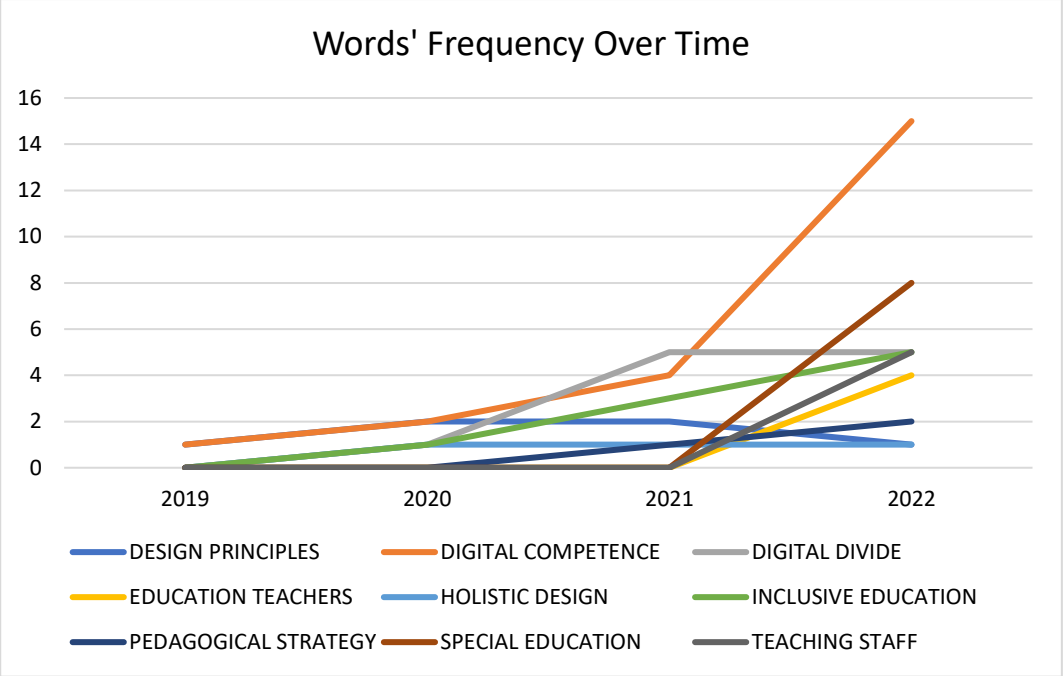

Figure 6: Biblioshiny output for Bibliometrix: Evolution of the topics of interest in the studies analyzed (2019–2023)

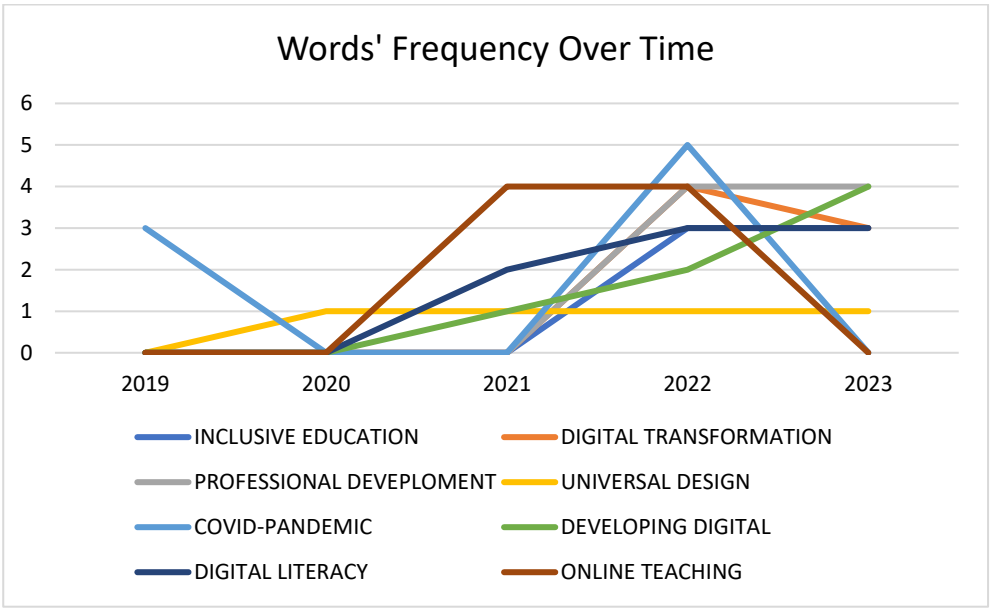

Figure 7: Biblioshiny output for Bibliometrix: Evolution of the topics of interest in the studies analyzed in SCOPUS (2016–2023)

Table 3 presents the results obtained on the conceptual structure of the studied documents. Multiple Correspondence Analysis (MCA) was carried out on the abstracts, as they are a section that all articles have and where more information can be extracted. After the MCA analysis, the existence of two dimensions composed of three clusters is observed, in relation to WoS database. Cluster 1 is formed by the articles of Rodríguez, Calvo and Martín (2020) with 28.21%, followed by Cabero et al. (2022) with 27.03%; Portillo et al. (2020) obtain 21.93%, while Hand (2023), Guo-Brennan (2022), Joshi (2021), and Medina-García et al. (2021) oscillate between 1% and 5%. Regarding cluster 2, it is formed by the articles of Mytsyk and Pryshliak (2022) and Batanero et al. (2022), with 29.32% and 19.74%, respectively. Finally, cluster 3 is composed of Leiva et al. (2022) with 44.35%, Azionya and Nhedzi (2021) with 12.07%, and Nguyen et al. (2022) with 6.48%. With respect to the documents in SCOPUS, we observe that two dimensions have been extracted, each composed of a single cluster where the

document making the most significant contribution is that of Blasco, Bitrián, and Coma (2022), followed by Kochanowicz (2023) and Choudhary and Bansal (2022). The remaining documents contribute between 14-18%.

Table 3: Abstract: Concept structure map. MCA method

Data Base WoS					
Documents	**dim1**	**dim2**	**contrib**	**TC**	**Clúster**
portillo j, 2020, sustainability	0,25	-0,67	21,93	64	1
cabero-almenara j, 2023, br j educ technol	0,81	-0,13	27,03	21	1
azionya cm, 2021, turk online j distance educ	-0,33	-0,42	12,07	7	3
medina-garcia m, 2021, int j environ res public health	0	-0,02	0,01	3	1
joshi ms, 2022, int j educ manag	0,01	-0,17	1,32	1	1
leiva jj, 2022, reice-rev iberoam calid efic cambio educ	-1	0,31	44,35	0	3
mytsyk hm, 2022, inf technol learn tools	-0,02	0,82	29,32	0	2
garcia rodriguez y, 2020, j learn styles	0,71	0,42	28,21	0	1
maria fernandez-batanero j, 2022, rev interuniv form profr-rifop	0,07	0,67	19,74	0	2
ha nguyen hn, 2022, j acad lang learn	-0,35	-0,18	6,48	0	3
hand cj, na, j appl res high educ	-0,14	-0,31	5,08	0	1
guo-brennan l, 2022, j teach learn	0	-0,32	4,46	0	1
Data Base SCOPUS					
blasco ac, 2022, edutec	0,83	0,51	52,8	5	1
choudhary h, 2022, digit educ rev	-0,24	0,62	25,35	3	1
barroso-moreno c, 2023, comunicar	0,57	0,02	18,11	1	1
kochanowicz am, 2023, prz socjologii jakosciowej	0,29	-0,64	28,42	0	1
kahanurak s, 2023, j curric teach	-0,54	0,08	16,43	0	1
bong wk, 2023, educ sci	-0,4	-0,34	15,34	0	1
herrera cr, 2019, aus j educ tech	-0,41	0,31	14,99	0	1

Note: Biblioshiny output for Bibliometrix. Own elaboration.

In Figure 8, concerning the MCA of WoS documents, we can see how cluster 1 was composed of studies on digital competence, virtual learning environments, digital divide, and functional diversity, among others. Cluster 2 comprised studies conducted on digital tools and competencies, inclusive education, educational processes, and digital strategies. Lastly, cluster 3 is composed of educational inclusion related to interculturality and digital competence.

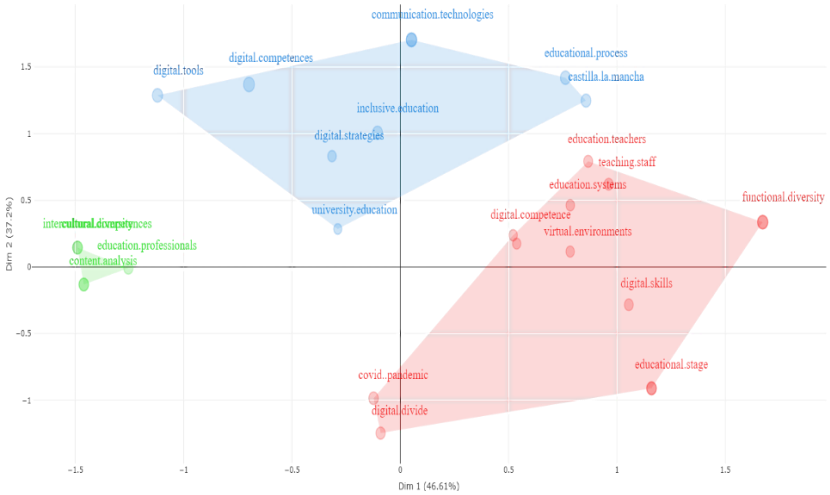

Figure 8: Concept structure graph using multiple correspondence analysis of abstracts

In conclusion, regarding the intellectual structure and social structure, Figure 9 show the co-citation network and the collaboration network among the authors and the institutions they belong to. We can see the co-citation between European and Anglo-Saxon publications, highlighting British Journal of Educational Technology, Computer and Education, Comunicar, Sustainability, Pixel-Bit, Journal of Teaching and Learning, and Information Technologies and Learning Tools.

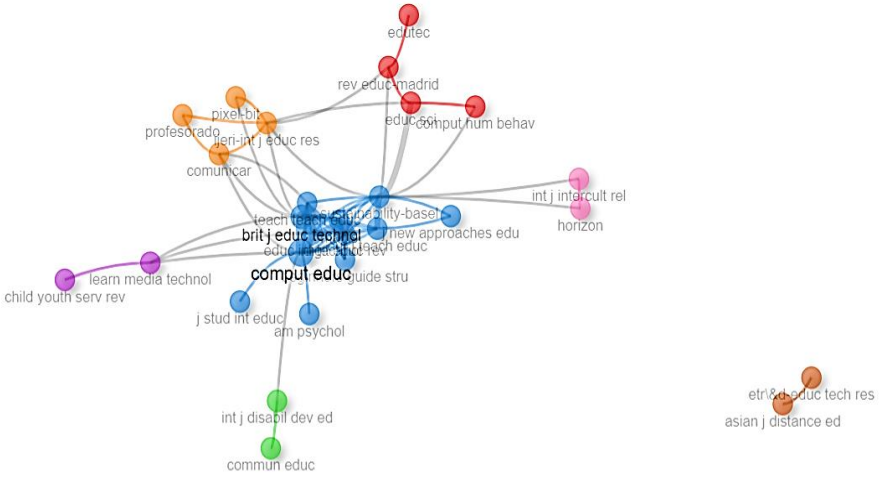

Figure 9: Intellectual structure graph for the source's co-citation network

Finally, regarding the intellectual structure of sources in SCOPUS, based on the co-occurrence network analysis, where terms are considered dependent when their joint usage is prevalent, Figure 10 illustrates how various global common lexical units are interrelated: inclusive, education, learning, digital, teaching, and students. These are interconnected by smaller units such as technologies, content, competence, skills, and improvement, among others.

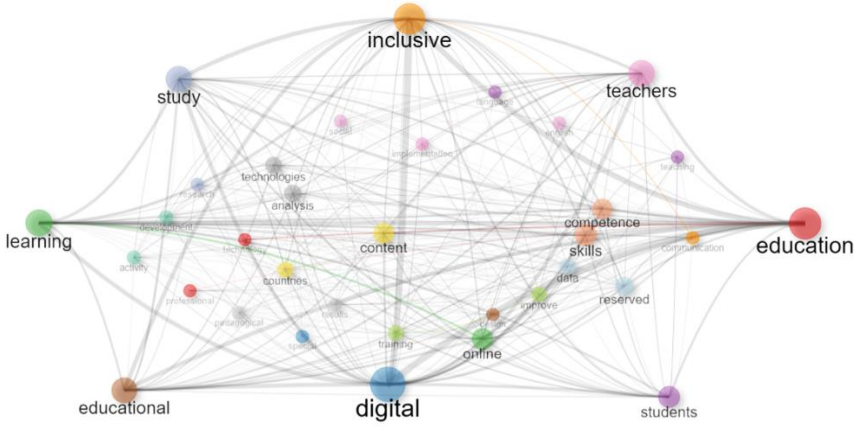

Figure 10: Intellectual structure graph for the sources cocitation network (WoS)

5. Discussion

The international scientific production on digital competence and inclusive education in Higher Education has become prolific in recent years, where there is an increase in the trend of research developed in this regard, both with teachers and students and in reference to the evaluation of training programs implemented in Higher Education institutions. In fact, this coincides with the relevance that the Sustainable Development Goals (SDGs) of Agenda 2030 have taken, specifically with SDG 4, which deals with universalization and education for all (De la Rosa Ruiz, Giménez and De la Calle, 2019).

The study identifies a key barrier to genuine inclusive education: the digital divide in educational contexts, stemming from insufficient resources, infrastructure, and virtual skills. This challenge directly impacts students from disadvantaged backgrounds (Azionya and Nhedzi, 2021). Van der Merwe (2019) emphasizes the emotional well-being and development of affected students. Additionally, Blasco, Bitrián, and Coma (2022) highlight the importance of diverse resources and formats to address classroom diversity.

Portillo et al. (2020) found that post-COVID-19, university teachers faced challenges in virtual teaching due to a lack of training, although their digital competence improved. However, the digital divide and limited training hinder actions for inclusive educational contexts, especially with functionally diverse students (Barroso, Rayón and García, 2023; Batanero et al., 2022; Santana-Valencia and Chávez-Melo, 2022; Walter and Pyżalski, 2022).

Cabero-Almenara et al. (2022) and Medina-García et al. (2021) conclude that teachers, particularly in Higher Education, show medium to low digital competence with functional diversity, with variations by gender, education stage, and age. Deficiencies in teacher training, especially in content creation for diverse students, pose a priority (Belenkova, Skudnyakova and Bosov, 2022; Bong and Chua, 2023; Coker and Mercieca, 2023; Chorosova et al., 2021; Jiménez-Hernández et al., 2020; Masalimova et al., 2022).

Joshi (2021) advocates for holistic learning environment designs in Higher Education for quality inclusive education, aligned with Guo-Brennan (2022) reflecting on global spaces. Methodological changes and teacher training are linked to improved digital competence and progress toward inclusive education (Rodríguez, Calvo, and Martín, 2020; Hand, 2023). However, deficiencies persist in training programs and designing inclusive educational environments (Choudhary and Bansal, 2022; Herrera, Crisol, and Montes, 2019).

Another element to consider when dealing with diversity and heterogeneity in the classroom, and therefore, to pay attention to when discussing inclusive education, is interculturality and how the use of technologies can lead to learning that develops digital and intercultural competencies, fostering creativity, empathy, and support between teachers and students. It also facilitates a shift in focus from diversity to difference and developing intercultural sensitivity (Leiva et al., 2022; Nguyen et al., 2022). We live in a globalized world, with large migratory flows, where cultural diversity exists both in face-to-face environments and in online contexts, favoring communication and acceptance of diversity (Bauman and Portera, 2021; García-Vita et al., 2021; Kahanurak, Dibyamandala and Mangkhang, 2022; Kochanowicz, 2023).

This review has several limitations that should be considered. First, it is a systematic review and documentary analysis that involved 21 studies with great heterogeneity. Due to the small sample size, the results obtained and the data generated have a lower percentage of generalization compared to studies that use larger samples.

Second, the sample sizes in the analyzed studies varied considerably, both in the number of participants and in the type of sample, ranging from teachers and students (Medina-García et al., 2021; Batanero et al., 2022; Belenkova, Skudnyakova and Bosov, 2022; Batanero et al., 2022; Leiva et al., 2022; Hand, 2023) and the design of virtual and inclusive educational environments through universal design for learning (Begnum, Pettersen and Sørum, 2019; Joshi, 2021; Guo-Brennan, 2022), to the analysis of training programs and scientific literature (Bong and Chen, 2021; Joshi, 2021), making it difficult to determine the representativeness of the study population. Additionally, most studies did not provide information on how sample sizes were estimated within the selected population. Third, the research methodologies used in the different studies were also very heterogeneous, making data comparison difficult. Some studies used case studies and qualitative methods, while others used quantitative approaches and methods, with statistical regression and structural equation analyses, among others.

6. Conclusions

In conclusion, this study aimed to update the scientific framework in the field of digital competence and inclusive education within Higher Education, utilizing the Web of Science (WoS) and SCOPUS databases. The systematic review assessed research methodology and quality, employing established variables through a literature review on relationships between search criteria to aid decision-making. Initially analyzing 134 articles based on inclusion criteria, after a documentary review and application of exclusion criteria, the sample was narrowed down to 21 scientific articles published between 2016-2023.

The study explored the link between digital competence and inclusive education, examining variables like functional diversity, interculturality, digital divide, teacher training, universal design for learning, and the need to reformulate curricula for effective education for all. Significantly, the topic's relevance has grown in the last five years due to the COVID-19 pandemic and alignment with the goals of the European 2030 Agenda. This

approach allows researchers to identify patterns, relationships, and research gaps, providing valuable insights for future investigations and enhancing the overall understanding of the subject.

Digital competence is crucial for 21st-century life and quality inclusive education. Acquiring digital skills and using technology effectively are pivotal for success in education and the professional realm. However, true inclusive education must extend accessibility to everyone, including those facing challenges with technology access and usage. Digital technologies can serve as potent tools to foster inclusion and diversity in the classroom, aligning with EU Digital 2030 policies and empowering individuals through a human-centric approach. The Digital Decade 2021 emphasizes universal access to the internet, digital skills, digital public services, and fair working conditions for everyone.

The study implies significant considerations for stakeholders in Higher Education: institutions should revise curricula for inclusive education and adhere to universal design principles; students need digital inclusion, citizenship development, and attention to the digital divide, interculturality, and functional diversity. Faculty members require essential teacher training to proficiently integrate technology, emphasizing technical skills and understanding how to enhance learning experiences while accommodating individual student needs. Digital competence is vital for inclusive education, empowering teachers to tailor learning approaches to individual student requirements. However, despite the importance of digital competence for inclusive education, many teachers still lack the necessary skills to effectively use technologies in the classroom. Beyond this, it is essential that educational policies favour and enable inclusive education and teacher training in digital competence to address the needs and challenges of society, ensuring education for all. In conclusion, it is worth mentioning that, at the time of conducting this study, there was no evidence of scientific production in the Web of Science (WoS) and SCOPUS databases conducting a relational bibliometric analysis on digital competence and inclusive education. For this reason, this study serves as a foundation for future research.

References

Ainscow, M., 2020. Promoting inclusion and equity in education: Lessons from international experiences. *Nordic Journal of Studies in Educational Policy*, 6(1), 7-16. https://doi.org/10.1080/20020317.2020.1729587

Ainscow, M., 2007. Taking an inclusive turn', *Journal of Research in Special Educational Needs*, 7(1), pp. 3–7. https://doi.org/10.1111/j.1471-3802.2007.00075.x

Azionya, C.M. and Nhedzi, A., 2021. The digital divide and higher education challenge with emergency online learning: analysis of tweets in the wake of the covid-19 lockdown, *Turkish Online Journal of Distance Education*, 22(4), pp. 164–182. https://doi.org/10.17718/tojde.1002822

Barroso, C., Rayon, L., and García, A. B., 2023. Big Data y Business Intelligence en Twitter e Instagram para la inclusión digital. *Comunicar: Revista Científica de Comunicación y Educación*, 31(74), 49-60. https://doi.org/10.3916/C74-2023-04

Batanero, J.M.F., Román, P., Montenegro M., and Fernández, C., 2022. Conocimiento del profesorado universitario sobre el uso de recursos digitales para atender a personas con discapacidad. El caso de la Comunidad Autónoma de Castilla-La Mancha', *Revista Interuniversitaria de Formación del Profesorado. Continuación de la antigua Revista de Escuelas Normales*, 97(36.2). https://doi.org/10.47553/rifop.v98i36.2.93947

Bauman, Z. and Portera, A., 2021. *Education and Intercultural Identity: A Dialogue between Zygmunt Bauman and Agostino Portera*. Routledge.

Begnum, M.E.N., Pettersen, L. and Sørum, H., 2019. Identifying Five Archetypes of Interaction Design Professionals and Their Universal Design Expertise, *Interacting with Computers*, 31(4), pp. 372–392. https://doi.org/10.1093/iwc/iwz023

Belenkova, L.Y., Skudnyakova, Y.V. and Bosov, D.V, 2022. Digital pedagogy in the system of inclusive higher education, *Interacción y perspectiva: Revista de Trabajo Social*, 12(1), pp. 27–42. Available at: https://dialnet.unirioja.es/servlet/articulo?codigo=8628495

Blasco, A. C., González, I. B., and Coma, T., 2022. Incorporación de las TIC en la formación inicial del profesorado mediante Flipped Classroom para potenciar la educación inclusiva. *Edutec. Revista Electrónica De Tecnología Educativa,* (79), 9-29. https://doi.org/10.21556/edutec.2022.79.2393

Bong, W.K. and Chen, W., 2021. Increasing faculty's competence in digital accessibility for inclusive education: a systematic literature review', *International Journal of Inclusive Education*, 0(0), pp. 1–17. https://doi.org/10.1080/13603116.2021.1937344.

Bong, W. K., and Chua, K. H., 2023. Assessing Teachers' Practices in Providing Inclusive Online Education: Development and Validation of an Instrument Based on Inclusive Practices among Teachers in Malaysia. *Education Sciences*, 13(9), 918. https://doi.org/10.3390/educsci13090918

Borgobello, A., Madolesi., Espinosa, A., and Sartori, M., 2019. Uso de TIC en prácticas pedagógicas de docentes de la Facultad de Psicología de una universidad pública argentina, *Revista de Psicología (PUCP)*, 37(1), pp. 279–317. https://doi.org/10.18800/psico.201901.010.

Cabero, J., Barroso, J., Rodríguez, A.P., and Llorente, C., 2020. Marcos de Competencias Digitales para docentes universitarios: su evaluación a través del coeficiente competencia experta', *Revista Electrónica Interuniversitaria de Formación del Profesorado*, 23(3). https://doi.org/10.6018/reifop.414501.

Cabero, J., Guillén, F.D., Ruiz-Palmero, J., and Palacios, A.P., 2022. Teachers' digital competence to assist students with functional diversity: Identification of factors through logistic regression methods, *British Journal of Educational Technology*, 53(1), pp. 41–57. https://doi.org/10.1111/bjet.13151.

Calderón D., Gustemsr, J. and Carrera, X., 2020. Digital technologies in music subjects on primary teacher training degrees in Spain: Teachers' habits and profiles, *International Journal of Music Education*, 38(4), pp. 613–624. https://doi.org/10.1177/0255761420954303.

CAST., 2018. *Pautas de diseño universal para el aprendizaje versión 2.2.* Available at: https://udlguidelines.cast.org/. (Accessed: 08 December 2023)

Castro Rodríguez, M., Marín Suelves, D., and Sáiz, H., 2019. Competencia digital e inclusión educativa. visiones de profesorado, alumnado y familias. *RED: Revista De Educación a Distancia*, 19(61). https://doi.org/10.6018/red/61/06

Cateriano, T.J., Rodríguez, M., Patiño, E.L., and Villalba, K., 2021. Competencias digitales, metodología y evaluación en formadores de docentes', *Campus Virtuales*, 10(1), pp. 153–162. Available at: http://uajournals.com/ojs/index.php/campusvirtuales/article/view/673/437

Choudhary, H., and Bansal, N., 2022. Barriers Affecting the Effectiveness of Digital Literacy Training Programs (DLTPs) for Marginalised Populations: A Systematic Literature Review. J*ournal of Technical Education and Training*, 14(1), pp. 110-127. https://doi.org/10.30880/jtet.2022.14.01.010

Chorosova, O.M., Gerasimova, R., Protodyakonova, G., and Gorokhova, N., 2021. Building foundational digital competencies of teachers in general and inclusive education.', *ARPHA Proceedings*, pp. 295–308. https://doi.org/10.3897/ap.5.e0295

Coker, H. and Mercieca, D., 2023. Digital Technology for Inclusive Education: Reflecting on the Role of Teachers', in S. Weuffen et al. (eds) *Inclusion, Equity, Diversity, and Social Justice in Education: A Critical Exploration of the Sustainable Development Goals*. Singapore: Springer Nature (Sustainable Development Goals Series), pp. 233–243. https://doi.org/10.1007/978-981-19-5008-7_16.

De la Rosa Ruiz, D., Giménez, P. and De la Calle, C., 2019. Educación para el desarrollo sostenible: el papel de la universidad en la Agenda 2030.' Available at: http://ddfv.ufv.es/handle/10641/1691 (Accessed: 14 April 2023).

Echeita, G., and Ainscow, M., 2010. *La educación inclusiva como derecho. marco de referencia y pautas de acción para el desarrollo de una revolución pendiente*. Available at: https://www.dgeip.edu.uy/documentos/2017/edinclusiva/materiales/EducacionInclusivaDerecho.pdf

Batanero, J.M., Cabero, J., Román, P., and Palacios, A.P., 2022. Knowledge of university teachers on the use of digital resources to assist people with disabilities. The case of Spain, *Education and Information Technologies*, 27(7), pp. 9015–9029. https://doi.org/10.1007/s10639-022-10965-1.

Batanero, J.M., Cabero, J. and López, E., 2019. Knowledge and degree of training of primary education teachers in relation to ICT taught to students with disabilities, *British Journal of Educational Technology*, 50(4), pp. 1961–1978. https://doi.org/10.1111/bjet.12675.

García-Vita, M.M., Medina, M., Polo Amashta, G.P., and Higueras, L., 2021. Socio-Educational Factors to Promote Educational Inclusion in Higher Education. A Question of Student Achievement, *Education Sciences*, 11(3), p. 123. https://doi.org/10.3390/educsci11030123.

Ghebreyesus, T. A., 2020. *Enfermedad por el coronavirus (COVID-19).* Organización Panamericana/Mundial para la Salud. Available at: https://www.paho.org/es/tag/enfermedad-por-coronavirus-covid-19. (Accessed: 03 August 2023)

Guillén, F.D. and Mayorga-, M.J., 2020. Identification of Variables that Predict Teachers' Attitudes toward ICT in Higher Education for Teaching and Research: A Study with Regression, *Sustainability*, 12(4), p. 1312. https://doi.org/10.3390/su12041312.

Guo-Brennan, L., 2022. Making Virtual Global Learning Transformative and Inclusive: A Critical Reflective Study on High-Impact Practices in Higher Education, *Journal of Teaching and Learning*, 16(2), pp. 28–49. https://doi.org/10.22329/jtl.v16i2.6947.

Hand, C.J., 2023. Neurodiverse undergraduate psychology students' experiences of presentations in education and employment, *Journal of Applied Research in Higher Education*, ahead-of-print(ahead-of-print). https://doi.org/10.1108/JARHE-03-2022-0106.

Herrera, L. B., Crisol, E., and Montes, R. A., 2019. A MOOC on universal design for learning designed based on the UDL paradigm. *Australasian Journal of Educational Technology*, 35(6), pp. 30-47. https://doi.org/10.14742/ajet.5532

Hoogerwerf, E.J., Solander, A., Mavrou, K., Traina, I., and Hersh, M., 2017. A Self-Assessment Framework for Inclusive Schools Supporting Assistive Technology Users, *Harnessing the Power of Technology to Improve Lives*, pp. 820–827. https://doi.org/10.3233/978-1-61499-798-6-820.

INTEF., 2017. *Marco común de la Competencia Digital Docente*. Madrid: Instituto Nacional de Tecnologías Educativas y del Profesorado. Available at: http://aprende.intef.es/mccdd (Accessed: 14 April 2023).

Jiménez-Hernández, D. *et al.,* 2020. Digital Competence of Future Secondary School Teachers: Differences According to Gender, Age, and Branch of Knowledge, *Sustainability*, 12(22), p. 9473. https://doi.org/10.3390/su12229473.

Joshi, M.S., 2021. Holistic design of online degree programmes in higher education – a case study from Finland, *International Journal of Educational Management*, 36(1), pp. 32–48. https://doi.org/10.1108/IJEM-12-2020-0588.

Juárez, J.M. and Comboni, S., 2016. Educación Inclusiva: retos y perspectivas, *Revista de Evaluación para docentes y adultos*, 1, pp. 46–61.

Kahanurak, S., Dibyamandala, J., and Mangkhang, C., 2023. Digital storytelling and intercultural communicative competence through English as foreign language for multilingual learners, *Journal of Curriculum and Teaching*, 12(1), pp. 14-26. https://doi.org/10.5430/jct.v12n1p14

Kerexeta, I., Darretxe, L., and Martínez, P. M., 2022. Competencia Digital Docente e Inclusión Educativa en la escuela. Una revisión sistemática. *Campus Virtuales*, 11(2), 63-73. Available at: https://hdl.handle.net/10272/22094

Kochanowicz, A. M., 2023. The Importance of Translating Specialist English Terms for the Development of Inclusive Education in Poland. *Przegląd Socjologii Jakościowej*, 19(3), 178-201. Available at: http://hdl.handle.net/11089/48142

Lapierre, M., Rodríguez, D., and Hernández, M., 2022. COVID-19 health emergency and inclusive higher education: Experience of college students with disabilities. *Revista Latinoamericana De Educación Inclusiva*, 16(1), 21-40. https://doi.org/10.4067/S0718-73782022000100021

Leiva, J.J., Alcalá del Olmo, M.J., Aguilera, F.J., and Santos, M.J., 2022. Promoción de Competencias Interculturales y Uso de las TIC: Hacia una Universidad Inclusiva, *REICE. Revista Iberoamericana sobre Calidad, Eficacia y Cambio en Educación*, 20(2). https://doi.org/10.15366/reice2022.20.2.003.

Masalimova, A.R., Erdyneeva, K.G., Kislyyakov, A.S., Sizova, Z., Kalashnikova, E., and Khairullina, E.R., 2022. Validation of The Scale on Pre-Service Teachers' Digital Competence to Assist Students with Functional Diversity, *Contemporary Educational Technology*, 14(4), p.382. https://doi.org/10.30935/cedtech/12301.

Medina-García, M., Higueras, L., García, M.D.M., and Dola, L., 2021. ICT, Disability, and Motivation: Validation of a Measurement Scale and Consequence Model for Inclusive Digital Knowledge, *International Journal of Environmental Research and Public Health*, 18(13), p. 6770. https://doi.org/10.3390/ijerph18136770.

Meresman, S., and Ullmann, H., 2020. *COVID-19 y las personas con discapacidad en América Latina: mitigar el impacto y proteger derechos para asegurar la inclusión hoy y mañana*. St. Louis: Federal Reserve Bank of St Louis. Available at: https://search.proquest.com/docview/2587066626

Merwe, D.V.D., 2019. Exploring the Relationship Between ICT Use, Mental Health Symptoms and Well-Being of the Historically Disadvantaged Open Distance Learning Student: A Case Study, *Turkish Online Journal of Distance Education*, 20(1), pp. 35–52. https://doi.org/10.17718/tojde.522373.

Mishra, P., and Koehler, M.J., 2006. Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge, *Teachers College Record*, 108(6), pp. 1017–1054.

Mytsyk, H.M. and Pryshliak, M.I., 2022. ВИКОРИСТАННЯ ПОТЕНЦІАЛУ СТУДЕНТСЬКОГО САМОВРЯДУВАННЯ У ФОРМУВАННІ ТА ПОГЛИБЛЕННІ ЦИФРОВОЇ КОМПЕТЕНТНОСТІ МАЙБУТНІХ ВЧИТЕЛІВ СПЕЦІАЛЬНОЇ ОСВІТИ, *Information Technologies and Learning Tools*, 91(5), pp. 145–157. https://doi.org/10.33407/itlt.v91i5.5052.

Nguyen, H., Dolan, H., Taylor, S., and Peyretti, T., 2022. Cultivating intercultural competences in digital higher education through English as an international language, *Journal of Academic Language and Learning*, 16(1), pp. 1–16.

OMS, and Mundial Bank., 2011. *Informe mundial sobre la discapacidad 2011*. Available at: http://www.who.int/iris/handle/10665/75356

Onwuegbuzie, A.J. and Frels, R.K., 2015. Using Q Methodology in the Literature Review Process: A Mixed Research Approach, *Journal of Educational Issues*, 1(2), pp. 90–109. Available at: https://doi.org/10.5296/jei.v1i2.8396.

Portillo, J., Garay, U., Tejada, E., and Bilbao, N., 2020. Self-Perception of the Digital Competence of Educators during the COVID-19 Pandemic: A Cross-Analysis of Different Educational Stages, *Sustainability*, 12(23), p. 10128. https://doi.org/10.3390/su122310128.

Quota, M., Cobo, C., Wilichowski, T., and Patil, A., 2022. Effective Teacher Professional Development Using Technology. Available at: http://hdl.handle.net/10986/37983 (Accessed: 14 April 2023).

Rodríguez, Y.G., Calvo, S.M. and Martín, V.R., 2020. Abordaje de experiencias educativas digitales ante la crisis del COVID-19 en el contexto universitario con el alumnado de diversidad funcional, *Revista de Estilos de Aprendizaje*, 13(Especial), pp. 32–42. https://doi.org/10.55777/rea.v13iEspecial.2235.

Santana-Valencia, E.V. and Chávez-Melo, G., 2022. Teachers and Digital Educational Inclusion in Times of Crisis', *IEEE Revista Iberoamericana de Tecnologias del Aprendizaje*, 17(2), pp. 110–114. https://doi.org/10.1109/RITA.2022.3166878.

Shea B.J., Reeves B.C., Wells G., Thuku M., Hamel C., Moran J., Moher D., Tugwell P., Welch V., Kristjansson E, Henry D.A.2017. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. *The BMJ,* 358. https://doi.org/10.1136/bmj.j4008

Thanasi-Boçe, M., and Kulakli, A., 2023. Dimensions and outcomes of electronic service quality in the GCC countries, *International Journal of Quality and Service Sciences*, 15(3), pp. 239-258. https://doi.org/10.1108/IJQSS-02-2023-0016]

Tomlinson, C. A., 2023. Enseñar para la equidad y la excelencia, liderazgo educativo. *Educational Leadership*, 80(8), 28-34. Available at: https://eric.ed.gov/?id=EJ1381219

United Nations., 2020. *ODS 4: Educación de calidad.* UN-ORG. Available at: https://www.un.org/es/impacto-acad%C3%A9mico/centro-de-la-unai-para-el-ods-4-educaci%C3%B3n-de-calidad

UNESCO., 2020. *Towards inclusion in education: status, trends and challenges: the UNESCO Salamanca Statement 25 years on*. Unesco Paris.

UNESCO., 2019. *Marco de competencias de los docentes en materia de TIC*. UNESCO Paris. Available at: https://unesdoc.unesco.org/ark:/48223/pf0000371024

Urrútia, G. and Bonfill, X., 2010. Declaración PRISMA: una propuesta para mejorar la publicación de revisiones sistemáticas y metaanálisis, *Medicina Clínica*, 135(11), pp. 507–511. https://doi.org/10.1016/j.medcli.2010.01.015.

Walter, N. and Pyżalski, J., 2022. Lessons Learned from COVID-19 Emergency Remote Education. Adaptation to Crisis Distance Education of Teachers by Developing New or Modified Digital Competences, in Ł. Tomczyk and L. Fedeli (eds) *Digital Literacy for Teachers*. Singapore: Springer Nature (Lecture Notes in Educational Technology), pp. 7–23. https://doi.org/10.1007/978-981-19-1738-7_2.