~~Digital competence~~Digital Competence of university students with disabilities and factors that determine it. A descriptive, inferential and multivariate study

ABSTRACT

Taking into account that 15% of the world population suffers from some type of disability, few investigations have been concerned with knowing the level of ~~digital competence~~Digital Competence that students with functional diversity have. This research is based on an initial sample of 17,301 newly enrolled university students from the Andrés Bello University (Chile), of which 650 are selected for having some type of disability. Its main objective is to know the level of self-perception in the ~~digital competence~~Digital Competence of university students with disabilities and the variables that explain it. To do this, an evaluation instrument consisting of 6 dimensions (technological literacy, information search and processing, critical thinking, problem solving and decision making, communication and collaboration, digital citizenship, and communication and collaboration) is designed and applied. To calculate the validity of the instrument, the partial least squares (PLS) method is applied through structural equation modeling. Next, data is provided regarding the level of ~~Digital Competence~~Digital Competence of the students and if there are differences between the types of disability. Finally, the data is subjected to a logistic regression to estimate the relationship between the dependent variable (~~digital competence~~Digital Competence) and a set of independent variables (sociodemographic variables). The results reveal that the instrument used shows high levels of reliability, which guarantees its use in students with disabilities. Likewise, the average level of ~~digital competence~~Digital Competence is medium low. ~~Finally, t~~The factors that affect this variable are discussed and the necessary structuring of digital literacy plans is highlighted. Finally, this paper discusses new techniques for diagnosing students' digital skills.

KEYWORDS

~~Digital competence~~Digital Competence, disability, Higher Education, Educational Technology, Linear Regression

1. Introduction

Information and Communication Technologies (ICT) are progressively having a strong impact in favoring inclusive education and the incorporation of people with some type of disability into the knowledge society (Cullen & Alber-Morgan, 2015; CEPAL, 2015; Fernández-Batanero et al., 2018; Ullmann et al., 2018; Cabero-Almenara & Valencia, 2019). The possibilities they offer for these people are diverse: favoring the autonomy of the person (Güldenpfennig et al., 2019), expanding the possibilities of communication with synchronous and asynchronous tools (Light et al., 2019), saving time in the acquisition of skills and abilities and facilitates social and labor insertion (Manzoor & Vimarlund , 2018), as well as fosters rapprochement with the academic and scientific world and favors the reduction of the sense of academic failure (Unesco, 2016).

However, in the face of all the possibilities that ICTs offer us and the positive perceptions that teachers have regarding them (Vega-Gea et al., 2021), the reality is that their presence is not as massive as it should be. Among other reasons, due to the training that teacher have for their incorporation into educational practice (Tello & Cascales, 2015; Pegalajar, 2017; Martínez et al., 2018; Cabero-Almenara, et al., 2022; Fernández-Batanero et al., 2022). A lack of training and knowledge regarding the different types of technologies that can be used with people with functional diversity, the possibilities they offer, and the functions for which they can be used (Díaz-Maroto & Martínez, 2015). Perhaps due to the lack of educational policies in their initial and permanent training (Casal-Otero et al., 2021; Rodríguez-Hoyos et

al., 2021), although other authors relate it to both lack of financial support (Silva & Austillo, 2012), as well as time and attitude (Fernández et al., 2018).

In addition, the incorporation of ICTs into educational practice not only influences the training and digital skills that teachers have, but also the digital skills that students possess (Arnao & Gamonal, 2016). In the latter case, a multitude of investigations have been carried out on the levels of digital skills that students possess, carried out at different educational levels: secondary and high school (Basilotta et al., 2020) and university (Moreno et al., 2018; Marín-Gutiérrez et al., 2019; Flores & Roig, 2019; Humanante-Ramos, et al., 2019; Sánchez-Caballé et al., 2019; Ordóñez et al., 2021). These studies show that students are not as competent as the imaginary of "digital natives and emigrants" has led us to believe (Cabero et al., 2020). However, most of these studies have focused on students without any type of functional diversity.

This study is considered important for several reasons. In the first place, because despite the fact that the line of research on digital skills has been developing for decades, today there are very few studies focused especially on students who have some type of functional diversity. Furthermore, Nhlapo et al. (2018) states that 15% of the world population suffers from some type of functional diversity, so it is necessary to focus on this group that has a wide range of cases. A second reason is due to social aspects, where processes of discrimination and social exclusion in students with functional diversity are the order of the day. To counteract this, Aguilera & Cuenca (2022) declare that the use of ICT can help in the access and development of learning environments, new methodologies and teaching strategies, taking into account the heterogeneity of the student body, and betting, therefore, on an inclusive education (Cuartero 2021; Hersh, 2017). Inclusive education as "a permanent process, whose objective is to offer quality education for all, respecting diversity and the different needs and aptitudes, characteristics and learning expectations of students and communities, eliminating all forms of discrimination" (UNESCO, 2009, p.3) Lastly, the identification of factors related to sociodemographic and digital aspects can help to increase the digital literacy of students, thus favoring a possible reduction of their limitations.

In addition, some research has implied that digital technologies can both increase the performance of students with functional diversity, specifically with visual diversity (Kamali et al., 2021), as well as improve the participation and communication they carry out within the school community. (Douglas, 2001). An interesting study in this field was carried out by Arslantas & Gul (2022), who explored the digital literacy skills of 60 visually impaired university students from Turkey. The results showed that daily Internet use had a significant positive effect on ~~digital competence~~Digital Competence scores, and that there was a negative correlation between ~~digital competence~~Digital Competence and age. With similar results, Heiman et al. (2017) examined students' ICT knowledge and accessibility. The sample included 1,272 students from Canada and Israel, where 307 students had been diagnosed with ADHD (attention deficit-hyperactivity disorder) or some learning difficulty. The findings indicated that students without disabilities have better access and use of ICT compared to students with some type of functional diversity, being necessary to increase the knowledge of this type of students to help them with their academic problems. In addition, it was shown that gender was a significant predictor in the use and skills of students, where male students had more positive attitudes about Internet use than females. With similar results in relation to the use of ICT, authors like Okonji et al. (2020) and Ashraf et al. (2016) have revealed that people with visual diversity can perform basic computer skills, such as preparing documents, searching for information on the Internet, as well as sending emails and communicating with friends, the use of ICTs helping the teaching-learning process.

Park (2020) analyzed the ~~digital competence~~Digital Competence of students with some type of disability, specifically on their use and behavior when using the Internet through Smartphones and laptops. This was

carried out with 9,200 students with and without disabilities through a non-stratified sample, from South Korea. The results of this study revealed significantly lower levels among people with disabilities compared to the non-disabled population. What's more, they found that even if they have Internet-enabled devices, they are less likely to engage in activities such as email, social networking, information production, or networking. Along the same lines, Wu et al. (2014) examined whether there was a digital divide between Primary Education students with and without learning disabilities. For this, the authors used 234 students from Taiwan. The results indicated that there was no significant difference in opportunities for access to computers and the Internet at home and at school between children with and without disabilities. However, a significant difference was found in ICT skills between children without and with disabilities, being lower for the latter group.

Although the literature shows that students with disabilities have less ~~digital competence~~Digital Competence, Adam & Tatnall (2017) showed that ICTs improve the learning attitude of students with learning difficulties and facilitate significant achievement in academic skills and knowledge. In this context, Kwon (2021) analyzed the progression made by students with disabilities in relation to their ~~digital competence~~Digital Competence, using a mobile device as technology. They used students with disabilities between the ages of 18 and 21 from Tuscaloosa, Alabama. The main result found was the use of mobile devices improved the academic skills of students with disabilities, as well as potential benefits in inclusive education.

Taking into consideration the contribution of this study in relation to what has been previously investigated in the scientific literature, the objectives of this study are the following:

- O1. Know the level of the level of self-perception in the d~~D~~igital Competence of university students with disabilities.
- O2. Know if there are differences regarding the type of disability (hearing, physical, intellectual, mental, visceral and visual) of university students in relation to their level of ~~Digital Competence~~Digital Competence.
- O3. Identify academic and demographic variables that significantly explain the development of ~~Digital Competence~~Digital Competence in university students with disabilities.

3. Method

3.1. Design

To carry it out, a cross-sectional research design with a descriptive and predictive approach has been proposed that takes into account the participation of the students of the AIEP of the Andrés Bello University of Santiago de Chile (Chile).

To respond to the first research objective (O1), the means (M) and standard deviations (SD) of the questionnaire items, dimensions and total value are presented. In addition, for the second objective (O2), the non-parametric Kruskal-Wallis H contrast test is applied. Finally, to reach the third objective (O3), a logistic regression is performed. According to Peláez (2016), the "Logistic Regression" is a multivariate statistical technique that allows us to estimate the relationship between a dependent variable (~~digital competence~~Digital Competence), and a set of independent variables (sociodemographic variables). This analysis technique is the most appropriate to find out if a set of variables explains the level of the level of self-perception in the ~~digital competence~~Digital Competence and has been used in other related research in

the field of Educational Technology showing its potential to achieve the objectives proposed in the studies (Cabero-Almenara et al., 2021a, 2021b, 2022).

In parallel, it has been verified that the data maintain a distribution different from the normal one. This has been done using kurtosis analysis. Together, the KS test yields a p=.000 value (non-normal distribution).

2.3. Sample

It is based on a total sample of close to 20,000 people who answer the questionnaire that is developed in the following section. Data collection was carried out during the first semester of the 2021/22 academic year. After eliminating the atypical and lost cases, the resulting database has 17,301 new students from the AIEP of the Andrés Bello University of Santiago de Chile. Of them, 607 (3.5%) have some type of disability. Therefore, the sample under study is made up of 420 women (69.19%) and 187 men (30.81%) with disabilities and an average age of 27 years (±2.43). In relation to the type of disability, the results are broken down in Table 1. It should be noted that the classification used for the subjects with disabilities was auditory, physical, intellectual, mental, visceral and visual. Being the subjects with physical or motor disabilities, those who present some type of limitation produced as a consequence of the decrease or elimination of motor or physical capacities; the sensory ones, those that present some type of deficiency in the senses of sight or hearing; intellectuals, those who present some limitation of intellectual functioning that makes it difficult for them to participate socially or have a lack of autonomy for work or educational actions; the visceral ones, when the subject presents a deficiency in some internal organ (cardiac, respiratory...); and psychic, which suggests an alteration of behavioral type and adaptive behavior (Albrecht, 2005).

Table 1. Type of disability presented by the sample under study

Type of disability	N
Auditory	52
Physical	92
Intellectual	19
psychic	75
Visceral	7
Visual	362

As can be seen, the vast majority (59.64%) have visual disability followed by physical (15.16%) and psychiatric (12.36%). The least common cases are those with visceral disability (1.15%).

Table 2 presents some sociodemographic variables related to the level of technological equipment to face the university career of the sample.

Table 2. Technological equipment according to the type of disability

Equipment	Available	Auditory	Physical	Intellectual	psychiatric	Visceral	Visual
Desktop computer	No	45	81	17	70	7	321
	Yes	7	11	2	5	0	41
Netbook	No	46	73	14	68	4	330
	Yes	6	19	5	7	3	32
Laptop	No	13	38	10	27	4	130

	Yes	39	54	9	48	3	232
SmartTV	No	44	77	16	65	7	322
	Yes	8	15	3	10	0	40
Tablet	No	49	83	17	70	6	329
	Yes	3	9	2	5	1	33
Smartphone	No	22	28	7	22	2	129
	Yes	30	64	12	53	5	233
Webcam	No	38	65	17	56	6	282
	Yes	14	27	2	19	1	80
Speakers/headphones	No	35	51	14	45	3	256
	Yes	17	41	5	30	4	106
Microphone	No	38	65	17	54	6	277
	Yes	14	27	2	21	1	85

As can be seen, in all cases the technologies available in the institution for students with certain disabilities are rather limited. It is also seen in some cases, such as smartphones and notebooks, which are the ones with the greatest presence, they are possibly resources of the students themselves and that are adapted to their needs and characteristics.

2.4. Instrument

To measure the level of self-perception in the ~~digital competence~~Digital Competence of university students, a system of dimensions and items was used, supported by the contributions of Gutiérrez-Castillo & Cabero-Almenara (2016), Gutiérrez-Castillo et al. (2017) and Cabero-Almenara et al. (2020) Note that the questionnaire was adapted to the Chilean cultural and linguistic context.

The questionnaire has 30 items divided into the following 6 dimensions:

- Technological Literacy (D.A) with 6 items: implies the ability to use, manage, evaluate and understand technology in an educational setting (Rush & Renguette , 2017).
- Search and treatment of information (D.B) with 5 items: includes the ability to search for information from digital sources and evaluate its usefulness, relevance and reliability of information, as well as manage digital information (van Laar et al., 2020, 2019) .
- Critical thinking, problem solving and decision making (D.C) with 3 items: it involves learning to reflect critically and adequately contextualize technologies that have enormous implications at the educational, domestic and work levels (Pötzsch , 2019).
- Communication and collaboration (D.D) with 5 items: involves the use of digital resources to plan, organize and carry out learning processes with peers, as well as being able to communicate the learning acquired (Midtlund et al., 2021; Casillas-Martin , et al., 2022).
- Digital Citizenship (D.E) with 5 items: implies the ethical, safe and responsible use of Internet technologies (Mattson, 2017).
- Creativity and innovation (D.F) with 6 items: it implies continuing with social progress and the formation of new knowledge, where innovation in the classroom with educational technology can be a significant factor (Henriksen et al., 2018; Genlott et al., 2019).

The measurement scale was ordinal (Likert scale of 10 points) where the value 1 referred to "very low level of competence", while the value 10 referred to "very high level of competence". The questionnaire was administered via the Internet and in some cases the students needed the help of the administrators for its correct interpretation and completion.

Additionally, the instrument incorporates questions referring to different sociodemographic variables such as gender, age, if he/she has ever repeated a course, degree of preparation to face the university career, maximum academic level of the father and maximum academic level of the mother.

The instrument has been subjected to rigorous reliability and validation processes that confirmed its reliability (Alpha and Omega) and validity (PLS) according to the study by Cabero-Almenara et al. (2022).

First, Convergent Validity (Mean Variance Extracted-AVE) and Discriminant Validity (Fornell-Larcker) data are provided (Table 3). As can be seen, the values yield excellent results in terms of convergent and discriminant validity. In the case of the AVE, all dimensions have a value greater than .5. This implies a high level of validity according to the specialized literature (Bagozzi & Yi, 1988).

Table 3. Discriminant and convergent validity

		D.A	D.B	D.C	D.D	D.E	D.F
Discriminant validity	D.A. Technological literacy	0.7843					
	D.B. Search and processing of information	0.7476	0.8574				
	D.C. Critical thinking, problem solving and decision making	0.5956	0.7220	0.8994			
	D.D. Communication and collaboration	0.6816	0.7422	0.6935	0.8392		
	D.E. Digital citizenship	0.5520	0.6497	0.6804	0.6532	0.8956	
	D.F. Creativity and innovation	0.6173	0.7075	0.7390	0.7372	0.8084	0.893
Convergent validity		0.6151	0.7351	0.8090	0.7043	0.8026	0.798

The structural equation model was made with the Smart PLS software. In addition, the reliability of the selected items is examined through Cronbach's Alpha (α=.974) and McDonald's Omega coefficient (Ω=.982), for each of the instrument's scales. Both coefficients obtain very satisfactory values (O'Dwyer & Bernauer, 2014; Lisawadi et al., 2019; Vaske et al., 2017). Furthermore, the reliability for each dimension of the instrument, as well as its total, is presented in Table 4. The results corroborate high reliability indices.

Table 4. Dimension reliability

	Alpha
D.A. Technological literacy	0.8750
D.B. Search and processing of information	0.9089
D.C. Critical thinking, problem solving and decision making	0.8807
D.D. Communication and collaboration	0.8945
D.E. Digital citizenship	0.9379
D.F. Creativity and innovation	0.9482

Finally, the general predictive power of the model is evaluated through various coefficients. Hu and Bentler (1999) determined that the SRMR (normalized residual root mean square) coefficient should be less than 0.08, on the scale it is 0.049. Lohmöller (1989) states that the NFI coefficient (Normed fit Index) must be greater than or equal to 0.90, and in our case it is 0.903. Therefore, the model is fully validated.

3. Results

The results are presented according to the proposed research objectives: The first section aims to know the level self-perception in the Digital Competence of university students with disabilities; the second section deals with knowing if there are differences regarding the type of disability (hearing, physical, intellectual, mental, visceral and visual) of university students in relation to their level of Digital

Competence; finally, the last section identifies academic and demographic variables that significantly explain the development of Digital Competence in university students with disabilities.

3.1. Level of Digital Competence of university students with disabilities (O1)

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Regarding the first research objective (O1), the means and standard deviations achieved in each of the items, as well as in the different dimensions analyzed of the instrument and the total level of ~~Digital Competence~~Digital Competence are presented in Table 5~~3~~.

Table 5~~3~~. Mean and standard deviation of the level of ~~digital competence~~Digital Competence of university students with disabilities

	M	SD
D.A. Technological literacy	**8.35**	**1.56**
A1. I am able to use different mobile devices (Smartphone, Tablet, IPad, others).	8.64	1.91
A2. I am able to surf the Internet with different browsers (Google Chrome, Internet Explorer, Mozilla Firefox, others).	8.87	1.79
A3. I can communicate with other people using synchronous communication tools (in real time) via the Web (Chat, WhatsApp, Zoom, Meet , Skype, others).	9.01	1.64
A4. I am able to communicate with other people using asynchronous communication tools (in deferred time) via the Web (forums, social networks, distribution lists, tweets, others).	8.01	2.34
~~TO~~ A5. I effectively use the virtual classroom used in my Institute (Blackboard) as support for teleclassroom and online teaching.	7.98	2.26
A6. I feel competent to use the virtual services (virtual SAE, Library services, student Intranet, others) of my Institute.	7.61	2.31
D.B. Search and processing of information	**7.66**	**1.90**
B1. I am able to locate information through different sources and databases available on the internet.	8.35	2.03
B2. Relevant information will be identified by evaluating different sources and their origin.	7.75	2.22
B3. I am able to organize, analyze and ethically use information from a variety of sources and media.	7.77	2.18
B4. I synthesize the appropriately selected information for the construction and assimilation of new content, through tables, graphs or diagrams.	6.89	2.53
B5. I plan information searches to solve problems that arise.	7.57	2.31
D.C. Critical thinking, problem solving and decision making	**6.54**	**2.41**
C1. I am able to identify and define problems and/or research questions using ICT.	6.25	2.86
C2. I use digital resources and tools to explore current world issues and solve real problems, attending to personal, social, and/or professional needs.	7.41	2.42
C3. The capabilities and limitations of ICT resources will be analyzed.	5.96	2.81
D.D. Communication and collaboration	**7.28**	**2.14**
D1. I share information of interest with my colleagues using a variety of platforms and digital media.	7.21	2.61
D2. I effectively communicate information and ideas to multiple audiences, using a variety of media and formats.	6.88	2.58
D3. I am able to develop cultural understanding and global awareness through communication with other students and professionals from other cultures.	7.21	2.47
D4. I am able to coordinate group activities using the tools and means of the Internet.	7.47	2.47
D5. I interact with other colleagues and users using social networks (Facebook, Twitter, others...) and communication channels (Blog, YouTube channel , others...) based on ICT.	7.63	2.65
D.E. Digital citizenship	**7.13**	**2.39**
E1. I assume an ethical commitment in the use of digital information and ICT, including respect for copyright, intellectual property and the proper reference of sources.	7.16	2.74
E2. I promote and practice the safe, legal and responsible use of information and ICT.	7.18	2.68
E3. I demonstrate personal responsibility for lifelong learning using ICT.	7.24	2.64
E4. I consider myself competent to make constructive criticism, judging and making contributions to the ICT work developed by my colleagues.	6.86	2.71

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E5. I exhibit a positive attitude towards the use of ICT to support collaboration, learning and productivity.	7.23	2.60
D.F. Creativity and innovation	**6.84**	**2.35**
F1. I have the ability to conceive original, novel and useful ideas using ICT.	6.82	2.63
F2. I am able to create original works using traditional and emerging ICT resources.	6.87	2.68
F3. I identify new trends visualizing the possibilities of use that ICTs offer me.	6.63	2.65
F4. I use models and simulations to explore complex systems and issues using ICT.	6.19	2.79
F5. I develop jobs where I use ICT in a creative way, to support the construction of my knowledge.	6.67	2.74
F6. I am able to adapt to new situations and technological environments.	7.86	2.37
Total ~~Digital Competence~~Digital Competence	**7.30**	**1.83**

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First of all, it should be noted that the average score achieved by the students in the instrument as a whole can be considered truly acceptable, with an average score of 7.30 out of 10.

With regard to the means achieved in the different dimensions that made up the instrument, ordered from lowest to highest, the relationship obtained was as follows:

- Critical thinking, problem solving and decision making (6.54).
- Creativity and innovation (6.84).
- Digital citizenship (7.13).
- Communication and collaboration (7.28).
- Information search and treatment (7.66).
- Technological literacy (8.35).

As regards the items, it should be noted that between the item with the lowest score and the one with the maximum there is a difference in the means of 4.05 points. On the other hand, that in the standard deviations, except in two items, in the rest the scores exceed two points, thus indicating the strong dispersion.

The five items with the lowest score were:

- C3. The capabilities and limitations of ICT resources will be analyzed (5.96).
- F4. I use models and simulations to explore complex systems and issues using ICT (6.19).
- C1. I am able to identify and define problems and/or research questions using ICT (6.25).
- F3. I identify new trends visualizing the possibilities of use that ICTs offer me (6.63).
- F5. I develop jobs where I use ICT creatively, to support the construction of my knowledge (6.67).

As can be seen, the vast majority of the items were in the "Creativity and innovation" dimension.

The five items with the highest score were:

- A4. I am able to communicate with other people using asynchronous communication tools (in deferred time) via the Web (forums, social networks, distribution lists, tweets, others) (8.01).
- B1. I am able to locate information through different sources and databases available on the internet (8.35).
- A1. I am able to use different mobile devices (Smartphone, Tablet, IPad, others) (8.64).
- A2. I am able to browse the Internet with different browsers (Google Chrome, Internet Explorer, Mozilla Firefox, others) (8.87).

- A3. I can communicate with other people using synchronous communication tools (in real time) via the Web (Chat, WhatsApp, Zoom, Meet , Skype, others) (9.01).

In this case, the vast majority belonged to the "Technological Literacy" dimension.

The students considered themselves to have less digital skills for "Critical thinking, problem solving and decision making" and if they considered themselves to have very adequate levels of training in terms of "technological literacy" for ICT management. Remember that this last dimension involved the ability to use, manage, evaluate and understand technology in an educational setting. It should be noted that the size of the standard deviations found suggested a strong disparity between the data offered by the different students.

To complement the above information, a description is made by dimensions and total grouped by type of disability. The results can be seen in Table 64.

Table 64. Mean and standard deviation of the level of ~~digital competence~~Digital Competence of university students by type of disability

	Auditory		Physical		Intellectual		Psychic		Visceral		Visual	
	M	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
D.A	8.26	1.59	8.39	1.47	7.96	2.51	8.62	1.34	7.17	2.79	8.35	1.53
D.B	7.49	1.90	7.53	2.11	6.58	2.63	7.93	1.86	6.57	2.35	7.75	1.78
D.C	6.79	2.24	6.25	2.36	5.18	3.14	6.79	2.46	6.05	3.00	6.61	2.36
D.D	7.31	1.83	7.17	2.18	6.77	2.91	7.36	2.33	6.14	3.10	7.34	2.06
D.C	7.59	2.07	7.18	2.38	5.60	2.95	7.22	2.54	7.34	2.16	7.12	2.36
D.E	7.12	2.15	6.69	2.51	5.58	2.86	6.68	2.48	6.52	2.97	6.94	2.25
Total	7.43	1.75	7.20	1.88	6.28	2.57	7.43	1.81	6.63	2.50	7.35	1.76

Note: D.A Technological literacy; D.B Search and processing of information; D.C Critical thinking, problem solving and decision-making; D.D Communication and collaboration; D.E Digital Citizenship; D.F Creativity and innovation.

It should be noted that the greatest domains of digital skills were found in subjects with hearing and mental disabilities (7.43), followed at a very short distance by subjects with visual impairments (7.35). By dimensions, the highest and lowest mean scores were found in the case of "Technological Literacy" in the mentally disabled (8.62) and visceral (7.17); in the dimension referring to the "Search and treatment of information", in the psychic (7.93) and intellectual (6.58) and psychic (6.57); in the dimension of "Critical thinking, problem solving and decision making", psychic and auditory (6.79) and intellectual 5.18); regarding “Communication and collaboration”, psychic (7.36) and visceral (6.14); in the one focused on "Digital Citizenship", auditory (7.59) and intellectual (5.60); and finally in the one concerning "Creativity and innovation", auditory (7.12) and intellectual (5.58).

3.2. Differences regarding the type of disability (O2)

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After that and, to respond to the second objective (O2), we proceed to analyze the possible differences in the level of ~~Digital Competence~~Digital Competence by type of disability. For this, the non-parametric Kruskal-Wallis H contrast test is used. The results are presented in Table 75.

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Table 75 Kruskal-Wallis H contrast test by type of disability with respect to the level of total ~~Digital Competence~~Digital Competence

	D.A	D.B	D.C	D.D	D.E	D.F	Total DC
Kruskal–Wallis H	2,889	6,949	7,438	1960	7,033	5,406	4,647
df	5	5	5	5	5	5	5
Asymptotic sig.	.717	.224	.190	.855	.218	.368	.460

Note: D.A Technological literacy; D.B Search and processing of information; D.C Critical thinking, problem solving and decision-making; D.D Communication and collaboration; D.E Digital Citizenship; D.F Creativity and innovation.

The results reveal that there are no statistically significant differences in the level of ~~Digital Competence~~Digital Competence by type of disability (p>0.5). These results are applicable both for the dimensions of the questionnaire and for the level of total ~~Digital Competence~~Digital Competence.

3.3. Identification of variables that explain the development of Digital Competence (O3)

~~Next~~Finally, it is intended to respond to the third research objective (O3), related to identifying variables that significantly explain the level of ~~Digital Competence~~Digital Competence of university students with disabilities. To do this, prior to carrying out the logistic regression, the assumptions that allow the logistic regression to be carried out (verification tests) were verified. The assumption of Independence of the observations was not significant (sig. = 0.259), so the observations are independent of each other. The Hosmer and Lemeshow test (assumption of Monotony) fitted the data correctly (sig.= 0.975).

The Omnibus test verified a correct and significant estimation of the proposed model (p.<0.05), between the independent variables (gender, age, grade repetition, degree of preparation to face the career, maximum academic level of the father, maximum academic level of the mother) and the dependent variable (level of ~~digital competence~~Digital Competence). The independent variables have been measured as follows:

- Gender: male/female
- Age: scale variable
- Level of preparation: 7-point likert scale (little prepared-very prepared)
- Repetition rate: yes/no
- Father's level: likert scale 10 points (without studies- PhD)
- Mother's level: likert scale 10 points (without studies-PhD)

The goodness of fit of the model was carried out through the regression coefficients of Nagelkerke (0.325) and Cox and Snell (0.299), it is inferred that the model explains approximately between 28 and 49% of the total variability. Likewise, it was obtained that it was able to predict correctly in 75.86% of the cases, so the model was acceptable. In addition, the specificity and sensitivity of the model was verified (Table ~~8~~6), finding very satisfactory percentages.

Table ~~8~~6. Multiple linear regression model

Model	Non-standardized coefficients		Standardized coefficients	t	Sig.
	B.	dev . Mistake	Beta		
(Constant)	3,579	.308		11.89	.0010
Gender	.158	.091	.034	1.58	.119
Age	.031	.069	.014	.51	.568
Preparation	.128	.031	.782	3.48	.0010
Repetition	.101	.032	.775	3.32	.0010
Father level	.449	.112	.621	3.08	.0010
Mother level	.489	.132	.601	3.02	.0010

The first thing to point out is that the significant value found in the constant tells us that the variables that later find significant values are the ones that determine the model. For this reason and as can be seen in the table, the model reveals that the degree of preparation to face the race, if no course has been repeated and the maximum academic level of both the father and the mother are variables capable of explaining the level of ~~digital competence~~Digital Competence (Sig.=.0010). On the other hand, the results show that the gender and age variables are not relevant to predict the level of ~~digital competence~~Digital Competence.

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Taking into consideration the standardized coefficients for each significant predictor (variable), the success rate on the level of Digital Competence of the teacher will be calculated through its corresponding equation line:

$Y_{\hat{p}}$= 3.579 + 0.782 * (Preparation) + 0.775 * (Repetition) + 0.621 * (Father level) + 0.601 * (Mother level).

Con formato: Subíndice

4. Discussions and Conclusions

The discussions and conclusions of our work go in different directions. First, it should be noted that the instrument used has shown high levels of reliability, which guarantees its use. At the same time, and as found in other research (Cabero-Almenara et al., 2021a, 2021b, 2022), the "Logistic Regression" technique has been shown to be suitable for analyzing the set of variables that explains the level of competition students digital.

It has also been found that few ICTs are made available to students with some type of disability from institutions. At the same time, the technologies most used by subjects with some type of disability, the subjects themselves could, perfectly well provide notebooks and smartphones. Institutions such as Save the Children or UNESCO itself have highlighted the need to provide people with disabilities with technological resources that favor inclusion and educational innovation (Mateos et al., 2022). In this sense, we must bear in mind that commitment and sacrifice are needed to make ICTs accessible to people with disabilities (Medina et al., 2021). Hence the need to raise awareness among academic authorities to have technologies adapted to the needs of people with motor disabilities, sensory, intellectual and psychic needs of students, and that teachers have the necessary training for its use with students with disabilities (Carrillo-López & Hernández-Gutiérrez, 2022; Fernández-Batanero et al., 2022). Recent studies show that regardless of the type of disability, the use of ICT tends to increase the life satisfaction of people with disabilities (Baek, et al., 2022), using their full potential in their communities and workplaces, and thus make the most of their capabilities (Ki-Moon, 2014).

It should also be noted that students are generally considered to be moderately trained in digital skills for the use of ICT, finding contradictory results in the studies by Park (2020) and Wu et al. (2014). This training stands out in the "technological literacy" dimension and is lower in "creativity and innovation" and "critical thinking, problem solving and decision making." Therefore, they are considered very competent in the ability to use, manage and understand ICTs, and not so much to reflect critically and adequately contextualize ICTs and continue with social progress and the formation of new knowledge through the use of ICTs. Regardless of the digital area, Adam & Tatnall (2017) give a plausible response to the training found in students with functional diversity, where the widespread use carried out by today's society is helping to make student learning more efficient

On the other hand, note that the greatest domains have been shown in subjects with mental and hearing disabilities, and to a lesser extent in those with intellectual disabilities. In any case, it is necessary to point out that the differences found are not statistically significant. Which suggests that training plans should be made for all students, and not for those with a specific disability.

It has also not been found that the levels of ~~of~~ self-perception in the ~~digital competence~~Digital Competence are marked by gender as predictive variables of their level of ~~digital competence~~Digital Competence. However, it is marked by the degree of preparation that the student has to face the career, if he has repeated any course and the maximum academic level of the parents. These data do not follow the line marked in the results found by other authors. For example, in the study by Heiman et al. (2017) with students who

were diagnosed with ADHD or some learning difficulty, gender was a significant predictor that affected this competence, where male students had more positive attitudes about the use of ICT.

Another result of this study has been that the age of the participants is not a significant predictor of their competence, contradictory findings to those found by Arslantas & Gul, (2022) who found a negative correlation between the ~~digital competence~~Digital Competence of students who have some type of disability and their chronological age.

Our work opens a new line of study in the field of digital skills of students, and it is focused on students with some type of disability, regarding which there are few works carried out. Therefore, it would be necessary to replicate them in other contexts different from the one used here. It would also be interesting not only to expand the sample to achieve a better extrapolation of the results to the entire population, but also for the data collection to be carried out by stratified and random sampling. Another line of action could be the preparation of digital courses through MOOCs, with which it is possible to analyze whether the students' skills are increasing over time. Finally, as future work, oral interviews could be carried out with the students of each type of disability, with the purpose of identifying in the first person, their needs, as well as what type of technologies are the ones that benefit them the most in their lives.

The work presents the limitation that it is based on the techniques of self-perception. Although the sample studied is large, it does not allow the statements made in the conclusions to be generalized. In this line, it is proposed to carry out a study with mixed methodology and random sampling. For example, oral interviews could be carried out with students to find out not only their level of Digital Competence, but also what type of resources or technologies are most effective for their learning. ~~For this reason~~Futhermore, it would be convenient to look for new techniques for diagnosing students' digital skills, such as solving problem situations by applying ICT. Finally, the level of Digital Competence could also be compared based on variables such as geographical or economic area to detect possible digital gaps.

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Data Availability. All datasets associated with this study are not publicly available as part of measures to ensure the confidentiality of the participants. However, the corresponding author may release may make the data available upon reasonable request.

Declarations. Confidence of interest. The authors declare that they have no conflict of interest.

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Código de campo cambiado

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Código de campo cambiado

Con formato: Inglés (Estados Unidos)

Con formato: Español (España)

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