ADAPTATION AND VALIDATION OF AN INSTRUMENT FOR ASSESSING THE DIGITAL COMPETENCE OF SPECIAL EDUCATION TEACHERS

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Abstract

The instruments for the evaluation of teachers' digital competence are abundant, however, there is still a lack of instruments oriented to the context of Special Education. In this sense, this study presents the validation process of an instrument that aims to determine the level of knowledge and digital competence of Special Education teachers with respect to the use of Information and Communication Technologies (ICT) for the care of students with educational needs. Being an adapted instrument, it was subjected to content validation by means of "expert judgement" in order to determine the coherence, relevance and clarity of the items. The redesigned questionnaire was subjected to a reliability analysis, using Cronbach's alpha and McDonald's omega, and the value obtained was considered to indicate that the instrument has an excellent level of reliability, giving scientific validity to the instrument designed to assess the level of digital competence of Special Education teachers to attend to students with educational needs.

Keywords: *teachers, digital competence, special education, questionnaire, instrument validation, expert judgement*

Introduction

The arrival of Information and Communication Technologies (ICT) in education has promoted the improvement of teaching-learning processes, as well as innovation in different educational contexts, from which, fortunately, students with educational needs can also benefit (Gallardo Montes et al., 2020). Thus, implementing ICT in the context of Special Education implies, therefore, incorporating technologies according to the educational needs and individual characteristics of the students, in order to obtain the maximum benefit that these tools can offer.

Along these lines, Special Education teachers must have an adequate level of digital knowledge in order to be able to incorporate technologies into the curriculum for students with educational needs (Capperucci & Franceschini, 2020). Several studies have emphasised the need to train Special Education teachers in the use of technology to support students with educational needs (Altinay & Altinay, 2015; Tello Díaz-Maroto & Cascales Martínez, 2015). Digital training for special education teachers is essential as the success of ICT depends, to some extent, on the ability to adapt resources to the needs of students (UNESCO, 2018).

Including technologies in Special Education classrooms therefore implies knowing the needs of students and respecting their differences, favouring the holistic development of all students, in order to achieve educational success and provide quality education (Vladimirovna & Sergeevna, 2015). In addition, the teacher must be able to work with differences and have sufficient competences to use digital resources with these students to achieve the desired outcome.

The quickest method usually used to assess teacher-related aspects is the use of questionnaires, however, in order to guarantee the meaning of the data obtained, not just any question will do, but this questionnaire must be well designed and meet quality criteria such as validity and reliability (Lacave Rodero et al., 2015). Although there are a multitude of questionnaires already validated and accepted by the scientific community on digital competence in teaching, in the case of the field of education they are much scarcer. This fact has motivated us to describe the validation process of the questionnaire.

Therefore, and given the importance of digital training for Special Education teachers, this study focuses on the validation of the contents of an instrument designed to measure the level of digital competence of Special Education teachers, using expert judgement as part of the process of methodological rigour to ensure the reliability of the contents.

Given that the level of digital competence of teachers influences the use of technologies in the educational environment and, therefore, the quality of the teaching-learning process, this research work pursues the following objective: to provide the scientific and teaching community with a useful and low-cost evaluation tool to determine the level of digital knowledge of Special Education teachers. This will allow the design of specific digital training plans for Special Education teachers, which will undoubtedly have an impact on improving the educational quality of students with educational needs.

The research presented here is part of a broader study entitled "Digital Teaching Competence as a support for students with educational needs. A study of Special Education teachers in Andalusia", which aims to find out the level of training and technological knowledge of special education teachers in Andalusia, in order to design a digital training plan adapted to the needs of these teachers. Thus, the first step was the construction of a questionnaire to detect their level of digital competence. Once designed and adapted, the instrument was validated. The validation process is presented in this research.

Digital competence of special needs teachers

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The assessment of the digital competence of special needs teachers is a topic of great interest in educational research, as the importance of including Information and Communication Technologies (ICT) in the teaching-learning process of pupils with special educational needs is recognised.

Teachers' digital competence is defined as the ability of teachers to integrate digital technologies into their educational practice in an effective and meaningful way (European Commission, 2018). In the field of special education, this digital competence is particularly important due to the need to adapt technologies to the needs of learners with educational needs and to create inclusive learning environments (UNESCO, 2020).

Currently, there are several instruments designed and validated to assess teachers' digital competence. In this context, it is relevant to take as a reference some efforts made from Europe for the promotion of Digital Competence, which have been translated into the development of the European Framework of Digital Competence for Educators (DigCompEdu) (Redecker, 2017), however, it is not specifically designed for the field of special education. Therefore, there is a need to design and validate new instruments that address specific needs in the field of inclusive education.

If we focus on the results of the scientific literature, both nationally and internationally, it is indicated that the level of digital competence expressed by special education teachers is not up to the pedagogical requirements (Muñoz Pérez & Cubo Delgado, 2016). Gaps in their training can be addressed by including technology for inclusive education in in-service teacher training programmes (Ketharpal, 2014). However, good teacher training requires designing reliable and valid tools, or adapting existing ones, to specific educational contexts in order to understand their diagnosis, for several reasons:

Firstly, the digital competence of special education teachers is an area in constant evolution and development, due to the rapid emergence of new technologies and the need to adapt them to the needs of students with disabilities (Toledo Morales & Llorente Cejudo, 2016). Therefore, existing instruments may become obsolete or may not cover all the skills needed to assess the digital competence of special needs teachers in a specific context.

Secondly, the assessment of the digital competence of special education teachers may require specific tools for each educational context (Fernández Batanero et al., 2016). For example, the use of digital technologies in special education may vary according to the type of disability the student presents, age, educational level, among other factors. Therefore, designing new instruments or adapting existing ones may allow for a more accurate and appropriate assessment of the digital competence of special education teachers in each educational context.

Finally, designing new instruments or adapting existing ones may allow for a more comprehensive assessment of special needs teachers' digital competence, including specific skills and knowledge that are not covered by existing instruments (Cabero et al., 2018). Furthermore, the use of different instruments to assess the digital competence of special education teachers in different educational contexts can enrich research and knowledge in this area, which can lead to continuous improvement of educational practice in special education.

Thus, this study aims to develop a reliable instrument for diagnosing the level of digital competence of special education teachers in the incorporation and use of ICT with students with different types of disabilities. Based on this, the research question pursued

by the study is: Is the adapted measurement instrument valid and reliable for assessing the digital competence of special education teachers?

Method

In order to have a measurement instrument whose content was relevant to respond to the research problem, an evaluation instrument was developed, based on the questionnaire proposed by Fernández Batanero, Tadeu & Cabero Almenara (2018), which was examined by applying the expert judgement technique to verify its reliability (Escobar-Pérez & Cuervo-Martínez, 2008). The information collected will make it possible to determine whether the instrument determines the degree of knowledge of Special Education teachers (Pérez Juste et al., 2009).

Therefore, this study used a descriptive cross-sectional design to present the content validation procedure of an ad hoc questionnaire, based on one previously developed for other research, but aimed in this study to determine the levels of digital competence of Special Education teachers using expert judgement and a pre-test. All research participants were duly informed and voluntarily agreed to participate in the study by signing the corresponding informed consent form, referring to the ethical principles of the Declaration of Helsinki. To this end, the following phases were carried out:

Step 1. Literature review of existing questionnaires and determination of dimensions to be measured.

With regard to the first phase, the design and construction of the instrument was based on an instrument previously developed in another research project on the digital competence of primary education teachers (DIFOTICYD EDU2016 75232-P).

To do so, a literature review was conducted focusing on the analysis of scientific articles published in peer-reviewed journals that included the following characteristics: theoretical studies on ICT and disability, research on the use of ICT with students with disabilities, and research on the mastery of teachers' digital competences for attention to diversity (Montenegro Rueda & Fernández Batanero, 2022), in order to determine the key dimensions to be addressed in the current study.

The identified studies were carefully reviewed by the authors to understand their design, structure and the dimensions that have been assessed. This review allowed to determine the effectiveness of existing studies in relation to the study topic and how they can be adapted and improved, as well as to determine the key dimensions to be addressed in the current study. Once the literature review was completed, the researchers developed a first version of the instrument.Its design and construction was based on another instrument previously developed in another research project in the context of primary education (DIFOTICYD EDU2016 75232-P). Likewise, the various dimensions and items were adapted and extended to the context of Special Education. To this end, a literature review was conducted focusing on the analysis of scientific articles published in peer-reviewed journals that addressed the degree of ICT training and skills of Special Education teachers (Montenegro Rueda & Fernández Batanero, 2022). Once the review of the literature related to the subject had been carried out, the questionnaire was adapted by incorporating two more dimensions and the adaptation of various items. The final questionnaire consisted of 44 items divided into 8 dimensions (General, Visual, Auditory, Physical, Intellectual, Autistic Spectrum Disorder, Severe Behavioural Disorder and Attention deficit hyperactivity disorder).

Step 2. Elaboration and design of the first version of the questionnaire.

Studies, both in the international and national context, determine that teachers' level of digital competence is limited, however, there are no studies that determine whether there are significant differences according to the type of disability students have. Once these dimensions and items had been specified, the first version of the questionnaire entitled "Digital competence of special education teachers", hereafter referred to as CDPEE, was drawn up. Thus, the questionnaire adopted the following structure:

- Section 1. Socio-demographic, educational and professional data (8 items). In this section, in addition to collecting information on socio-demographic variables, an attempt is made to investigate the training and professional experience of the study population.
- Section 2: Degree of agreement or disagreement (44 items) on digital training for the attention to diversity linked to the eight established dimensions of the questionnaire (General, Visual Impairment, Hearing Impairment, Physical Impairment, Intellectual Impairment, Autistic Spectrum Disorders, Severe Behavioural Disorders, Attention-deficit hyperactivity disorder).

Step 3. Expert panel validation process.

Once the instrument had been developed, we proceeded to assess the degree to which the instrument can measure the level of digital competence of Special Education teachers, taking into account its "coherence", "relevance" and "clarity" with respect to each of the items included in the questionnaire, through the validity of its content by means of an expert judgement (Ding & Hershberger, 2002).

The relevance and pertinence of this technique depends on two aspects: the process followed, and the relevance of the experts selected to the subject matter to be analysed (García-Abreu & Fernández García, 2008). A two-fold process was followed for their selection in this research. Firstly, the individuals had to meet the criteria: a) professional experience (both in teaching and research) in the field of ICT and special education; b) have scientific publications in the form of articles on technologies and special education; c) work in an educational institution related to special education or at university level; d) seriousness, impartiality, and professionalism; and d) availability and motivation to participate (Skjong & Wentworth, 2000). Since different researchers propose that the number of experts needed for its application ranges between 15-25 (Malla & Zabala, 1978; Witkin & Altschuld, 1995), a personalised invitation letter was sent by e-mail to 60 potential experts, to which 35 teachers responded affirmatively. Secondly, the coefficient of expert competence (CCE), also known as the "K coefficient", was applied to these 35 teachers for their final selection (Cabero & Llorente, 2014; Fernández Batanero, Tadeu & Cabero, 2018). This coefficient, which allows us to obtain the most qualified experts on the subject, is obtained from the opinion shown by the expert on their level of knowledge about the research problem (Cruz & Martínez, 2020). For this purpose, the questions presented in Annex 1 (Dobrov & Smirnov, 1972) were sent to them by e-mail.

This coefficient K is obtained by applying the formula: $K = ½ (Kc + Ka)$ (Cabero-Almenara & Barroso-Osuna, 2013). Where, Kc is equal to the coefficient of knowledge or information obtained from the expert's own self-assessment in question A of the annex, and Ka is the coefficient of argumentation or substantiation of the expert's criteria, which is obtained through the options specified by the expert in the table of question B of the annex. The above formula allows us to obtain a score between 0 and 1 and it is adopted as a criterion that those people who do not obtain a score higher than 0.8 are not considered experts in the research, which led us to be left with 21 (60%) expert evaluators in the area of knowledge who were willing to participate in the present study and had obtained a value of ≥ 0.8, which is considered a high value of expert competence

(Gutiérrez-Castillo et al., 2023). Once the experts had been selected, they were sent the questionnaire to be validated by e-mail, together with a personalised letter of invitation, explaining the main objective of the study, as well as the informed consent and our guarantee that their data would be kept confidential. All of them voluntarily agreed to participate in the study by informed consent. The experts had one month to evaluate and score all items. After this time, they returned their assessments and their signed informed consent form by email. Our expert judgement was carried out using the technique known as individual aggregation, in which information is obtained from each of the experts individually, without them being in contact with each other, anonymously and confidentially (Cabero & Llorente, 2013). The initial questionnaire was administered to the 21 judges, so that each one could indicate their "coherence", "relevance" and "clarity" with respect to the items using a Likert-type scale from 0 to 4, adapted from those proposed by Escobar & Cuervo (2008). The category coherence refers to the item having a logical relationship with the dimension it is measuring, relevance indicates that the item is essential or important, i.e. it should be included, and clarity refers to the item being easily understood, i.e. its syntax and semantics are adequate. In addition, each dimension had an open field for observations (Appendix 2), in order to obtain the Content Validity Ratio (CVR) of the Lawshe (1975) model, as modified by Tristán-López (2008), as well as the Content Validity Index (CVI).

The final expert participants selected for the study were all Spanish. Of the 21, 14 were men (66.66%) and 7 were women (33.33%). Regarding the qualifications of the participants, 17 were doctors (80.95%) and 4 had a master's degree (19.05%). The vast majority of them worked in university centres (f=18, 85.71%) compared to those who worked in special education centres (f=3, 14.28%). In terms of years of teaching experience, the majority had between 15 and 25 years (f=17, 80.95%), followed by those with between 10 and 15 years (f=3, 14.28%). Only one participant had more than 25 years of teaching experience (f=1, 4.76%). In terms of age, participants were between 45 and 55 years old (f=16, 76.2%) or between 55 and 65 years old (f=5, 23.8%).

Step 4. Analysis of results after the panel of experts and redrafting of the final questionnaire.

The quantitative analysis of the experts' ratings and the level of agreement between the data provided by each of the 21 selected experts was carried out using the Content Validity Ratio (CVR). The statistical analysis was carried out with the help of IBM SPSS Statistics, version 26 for Windows, in order to calculate the values achieved in each of the items in relation to coherence, relevance and clarity, in order to determine the degree of agreement among the experts. Once the CVR of all the items had been calculated, those with a value higher than the minimum proposed by Tristán López (2008): 0.58 were accepted. The Content Validity Index (CVI) was also analysed, with the aim of assessing which items should be maintained, eliminated, or modified for the next version of the questionnaire. Judges' suggestions for each dimension were analysed through content analysis.

To assess the internal consistency reliability of the instrument's items, understood as the precision in the measurement of a characteristic or attribute, it was estimated with Cronbach's alpha coefficient and with McDonald's omega method (Rodríguez-Rodríguez & Reguant-Álvarez, 2019). Once the reliability of the instrument has been calculated using both coefficients, meaning must be given to that value. Based on this, reliability is expressed by a positive decimal number ranging from 0.00 to 1.00, from no reliability to perfect reliability (Castañeda et al., 2010). Studies such as Barrios and Cosculluela (2013) conclude that adequate reliability ranges between 0.70 and 0.95; and point out that values

very close to 1 may imply redundant items that do not provide relevant information about the attributes they are trying to measure. Data were processed using the SPSS statistical package, version 26, for Windows.

Results

Twenty-one experts in the field participated in the expert judgement. All of them were teachers and researchers, with master's and doctoral degrees, and all of them dedicated to teaching with more than 10 years of experience. Of the 21 experts, 14 were men and 7 were women, aged between 45 and 65.

The questionnaire was administered to the 21 judges so that each of them could indicate their "coherence", "relevance", and "clarity" with respect to the different items included in the instrument and their appropriateness in the dimension included, using a 4-point Likert-type scale. The four-point Likert-type scale ranged from 1=Very low, 2=Low, 3=High and 4=Very high.

Table 1. Data on the Content Validity Ratio (CVR) and Content Validity Indices (CVI) for each item.

Dimension	Item	Acceptable	Coherence	Relevance	Clarity	CVR
General	1	Yes	.938	.938	.969	.948
	2	Yes	.906	.813	.875	.864
	3	Yes	.835	.813	.750	.799
	4	Yes	.875	.875	.813	.854
	5	Yes	.938	.875	.906	.906
	6	Yes	.906	.844	.906	.885
	7	Yes	.906	.813	.781	.833
	8	Yes	.875	.875	.750	.833
	9	Yes	.813	.750	.844	.802
	10	Yes	.906	.875	.875	.885
Visual impairment	11	Yes	.906	.906	.906	.906
	12	Yes	.844	.813	.844	.833
	13	Yes	.906	.844	.813	.854
	14	Yes	.938	.938	.969	.948
	15	Yes	.781	.875	.844	.833
	16	Yes	.844	.906	.875	.875
Hearing impairment	17	Yes	.896	.938	.781	.871
	18	Yes	.844	.875	.969	.896
	19	Yes	.844	.844	.781	.823
	20	Yes	.844	.813	.906	.854
	21	Yes	.813	.906	.844	.854
	22	Yes	.813	.875	.844	.844
Physical disability	23	Yes	.875	.875	.844	.864
	24	Yes	.844	.844	.938	.875
	25	Yes	.906	.969	.938	.937
	26	Yes	.906	.875	.844	875
	27	Yes	.844	.750	.844	812
	28	Yes	.875	.906	.969	.916
Intellectual disability	29	Yes	.813	.844	.906	854
	30	Yes	.719	.781	.813	.771
	31	Yes	.938	.844	.813	.865

	32	Yes	.906	.906	.844	.885
	33	Yes	.906	.844	.781	.843
	34	Yes	.906	.781	.750	.812
Autistic Spectrum Disorder (ASD)	35	Yes	.875	.906	.875	.885
	36	Yes	.813	.813	.906	.844
	37	Yes	.844	.844	.813	.833
	38	Yes	.719	.875	.906	.833
Severe Behavioural Disorder	39	Yes	.844	.781	813	.812
	40	Yes	.781	.844	.781	.802
	41	Yes	.781	.750	.875	.802
Attention-deficit hyperactivity disorder (ADHD)	42	Yes	.719	.688	.813	.740
	43	Yes	.813	.750	.781	.781
	44	Yes	.781	.719	.875	.791
CVI			**.854**	**.845**	**.853**	**.850**

Thus, the calculation of the CVR and, therefore, of the CVI for a total of 21 experts, is 0.85. Therefore, and following Tristán's (2008) proposal to eliminate those items that did not have an ICV equal to or higher than 0.65, no item was eliminated. The result of the Content Validity Ratio for each dimension is presented in Table 2.

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Table 2. Content Validity Ratio (CVR) data for each dimension.

Dimension	Coherence	Relevance	Clarity	Average
General	.889	.847	.846	.860
Visual impairment	.869	.880	.875	.874
Hearing impairment	.842	.875	.854	.857
Physical disability	.875	.869	.896	.879
Intellectual disability	.864	.833	.817	.838
Autistic Spectrum Disorder (ASD)	.812	.859	.875	.848
Severe Behavioural Disorder	.802	.791	.823	.805
Attention-deficit hyperactivity disorder (ADHD)	.771	.719	.823	.770

With the data obtained, we also proceeded to the calculation of Gwett's AC Coefficient. In our case, we obtained a percentage of agreement of 92.59%, i.e. 0.90 according to Gwett's CA coefficient. Therefore, the items that make up our adapted questionnaire after this assessment meet the criteria of validity in terms of coherence, relevance and clarity. This data was very useful, as it allowed us to determine the degree of coherence, relevance and clarity of each item, and its appropriateness within the dimension. As we can see, this version obtained a fairly high score from the experts. Therefore, after evaluation of the results, it was decided that all items should be kept in the questionnaire.

Judges or experts were asked to assess the significance of the different items to be incorporated in the instrument developed and their appropriateness to the dimension in which they were incorporated. According to a scale of six intervals ranging from: (1) MN=Very negative to (6) MP=Strongly agree. Table 3 shows the mean and standard deviation obtained.

Table 3. Means and standard deviations obtained in each of the different items.

ITEMS CDPEE	M.	S.T.

I know the possibilities and advantages offered by ICT for learners with educational needs.	4.90	.831
I am aware of the limitations and disadvantages that may condition the use of ICT for learners with educational needs.	5.19	.750
I am able to select specific ICT according to the characteristics and educational needs of the pupils.	4.76	1.024
I am familiar with different documents and/or resources that analyse the possibilities of ICT for learners with educational needs.	5.05	1.054
I consider myself competent in locating educational materials for learners with educational needs on the Internet.	4.76	1.002
I am familiar with applications for mobiles or tablets that can be used with learners with educational needs.	4.86	.750
In general. I feel prepared to help learners with educational needs in the use of ICT.	4.86	.768
I know how to design activities with educational software for learners with educational needs.	5.10	.864
I consider ICT to be a support resource for pupils with educational needs.	5.00	.864
I think that we should continue to innovate in the use of ICT for pupils with educational needs.	5.00	.768
I am familiar with the possibilities offered by ICT for pupils with visual impairments.	4.86	.837
I am familiar with different computer programmes specifically designed for visually impaired people.	5.10	1.014
I am familiar with different screen magnifier programmes to facilitate access to computers for visually impaired learners.	5.10	1.034
I am familiar with different screen reader software such as JAWS, Tiflowin, etc...	5.10	1.54
I know different websites where educational resources for visually impaired people can be found.	5.05	1.024
I am able to apply teaching strategies and curricular adaptations supported by ICT to facilitate the inclusion of students with visual impairment.	5.43	1.202
I am familiar with the possibilities offered by ICT for hearing impaired learners.	5.38	.965
I am familiar with different educational computer programmes that stimulate language and the acquisition and development of oral and written language skills.	5.52	.831
I am able to express a message through a typewriter in Braille.	3.71	1.030
I am able to identify different computer resources for speech and voice enhancement.	5.19	.768
I am able to identify different websites where educational resources for people with hearing impairment can be found.	5.29	.854
I am able to apply teaching strategies and curricular adaptations supported by ICT to facilitate the inclusion of hearing-impaired learners.	5.14	.512
I am familiar with the possibilities offered by ICT for learners with motor disabilities.	4.48	.507

I am familiar with the uses of switches, switches keyboards and pointers.	4.10	.750
I am familiar with computer programmes that control the computer by voice.	5.43	.964
I am familiar with the basics of alternative augmentative software systems to facilitate communication for people with physical disabilities.	4.48	.750
I can locate websites containing educational resources for learners with physical disabilities.	4.48	.784
I am able to apply ICT-supported teaching strategies to facilitate the inclusion of learners with motor impairments.	4.43	.964
I am familiar with the possibilities offered by ICT for learners with intellectual disabilities.	4.52	1.030
I can cite some educational programmes used for the rehabilitation of cognitive skills.	4.90	.700
I can use specific software to create materials for a concept keyboard.	4.57	.902
I am able to apply didactic strategies and curricular adaptations supported by ICT to facilitate the inclusion of learners with intellectual disabilities.	5.19	.854
I am able to describe the main limitations that multimedia materials may contain for use with people with intellectual disabilities.	4.90	.865
I can locate websites containing educational resources for people with intellectual disabilities.	4.57	.512
I am familiar with the possibilities offered by ICT for learners with autism.	4.38	.512
I am able to describe the main limitations that multimedia materials may contain for use with people with autism.	4.90	.483
I am able to apply teaching strategies and curricular adaptations supported by ICT to facilitate the inclusion of learners with ASD.	4.71	.507
I can locate websites containing educational resources for learners with autism.	5.48	1.044
I am familiar with the possibilities offered by ICT for pupils with behavioural problems.	4.95	.928
I am able to apply teaching strategies and curricular adaptations supported by ICT to facilitate the inclusion of learners with behavioural disorders.	5.19	1.024
I can locate websites containing educational resources for learners with behavioural problems.	4.43	.995
I am familiar with the possibilities offered by ICT for learners with ADHD.	4.90	1.056
I am able to apply teaching strategies and curricular adaptations supported by ICT to facilitate the inclusion of learners with ADHD.	5.29	.602
I can locate websites containing educational resources for learners with ADHD.	5.43	.805

The results obtained allow us to obtain a series of aspects: a) the mean scores obtained were in all cases higher than the value "4", which indicated that all items were rated "Positive/Strongly Agree", which indicated the adequacy of each item with the assigned dimension, therefore, we adopted the decision not to eliminate any item or

change it from the originally assigned dimension and b) we found some elevation in the standard deviations obtained in some of the items, which suggests a certain dispersion of data. Additionally, we wanted to test the internal consistency reliability of the items of the instrument, which was obtained through two coefficients, Cronbach's alpha (α) and McDonald's omega (Ω) (Cohen & Manion, 2002; Ventura-León & Caycho-Rodríguez, 2017), the values obtained are presented in Table 4.

Table 4. Reliability index.

Dimension	α	Ω
General	0.978	0.971
Visual impairment	0.967	0.979
Hearing impairment	0.973	0.970
Physical disability	0.965	0.978
Intellectual disability	0.959	0.982
Autistic Spectrum Disorder (ASD)	0.967	0.960
Severe Behavioural Disorder	0.976	0.958
Attention-deficit hyperactivity disorder (ADHD)	0.992	0.997
Global	0.968	0.998

According to O'Dwyer & Bernauer (2014), all the values obtained indicate that the instrument has an excellent level of reliability, both for the instrument as a whole and for its different dimensions, since, when estimating responses, they are accepted as long as they are above 0.7. It should be mentioned that the total item correlation was carried out to see if the elimination of any item increased the reliability of the instrument, which did not occur.

Once the results were obtained, we proceeded to determine the final version of the questionnaire, with which we obtained the reliability index, which can be consulted at: [Authors] and is made up of 44 items that are distributed among the eight dimensions as follows: General Aspects (10 items), Visual Disability (6 items), Hearing Disability (6 items), Physical Disability (6 items), Intellectual Disability (6 items), Autism Spectrum Disorder (4 items), Severe Behavioural Disorder (3 items), Attention Deficit Hyperactivity Disorder (3 items).

Discussion

The assessment of teachers' digital skills is essential in today's world, where technology and digital tools are increasingly important in the world of education (Prada Núñez et al., 2022). Thus, the main objective of this study is to adapt and validate a questionnaire designed to assess the digital competence of special education teachers in the incorporation and use of ICT with students with educational needs. The validation of the questionnaire has allowed us to answer the research question "Is the adapted measurement instrument valid and reliable for assessing the digital competence of special needs teachers?

The validation process of the questionnaire was carried out using the technique of "expert judgement", which allowed us to analyse the coherence, relevance and clarity of the items (Escobar Pérez & Cuervo Martínez, 2008). Submitting the instrument to expert judgement must offer two quality criteria: validity and reliability (Robles Garrote & Carmen Rojas, 2015). In this sense, the validation of this instrument allowed us to answer the research question posed by demonstrating that the adapted questionnaire has an excellent level of reliability. The high score obtained by the experts is a positive indicator of the quality of the questionnaire (O'Dwyer & Bernauer, 2014). Having a reliable and

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validated instrument to assess the level of digital competence of special education teachers is essential as it allows:

1. Assessment of the digital skills of special needs teachers. Having a reliable and validated questionnaire allows for an objective assessment of the level of digital competence of special education teachers (Muñoz Pérez & Cubo Delgado, 2019).

2. Identification of the training needs of teachers. The use of the questionnaire allows for the identification of teachers' strengths and weaknesses in terms of their digital competence. The identification of these factors is essential to propose initiatives to improve the effectiveness of such training (Cabero Almenara et al., 2020).

3. Design of specific training plans. The information obtained through the questionnaire can be used by decision-makers to improve the planning and organisation of teacher digital competence training (Gisbert & Lázaro, 2015).

4. Improving the quality of special education. Digitally competent teachers can use technology and digital tools to improve the quality of education in the classroom, especially for students with special needs. A reliable and validated questionnaire to assess the level of teachers' digital competence can help to ensure that teachers are prepared to make the most of these tools and technologies, as well as to generate scientific knowledge with a valid level of accuracy for the improvement of educational quality (Cabero Almenara et al., 2020).

For these reasons, this tool may be suitable for establishing a solid, evidence-based basis that can guide educational policies in special education, serve as a template as a tool for the assessment of the digital competence of special education teachers and create a common reference point for discussion and exchange of ideas about teachers in different national and international contexts.

However, despite the validity and reliability of the adapted questionnaire, there are some limitations to be considered when using the questionnaire. Firstly, the questionnaire is based on teachers' self-assessments, which could generate response biases due to social desirability or lack of awareness about its limitations (De Campos & Marín Rueda, 2017), meaning that participants may answer more favourably in order to make a good impression, not providing an objective assessment of digital competence. Therefore, in the near future, the results of the questionnaire should be complemented with other forms of assessment, such as observation of teaching practice or assessment of the performance of the student with educational needs.

In short, the questionnaire presented in this article is a valuable instrument for assessing the digital competence of special education teachers in the incorporation and use of ICT with students with special educational needs. However, the limitations should be considered, and the results of the questionnaire should be complemented with other forms of assessment to obtain a more complete and accurate assessment of the digital competence of special education teachers.

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Conclusions

In this work we have studied the quality of the CDPEE questionnaire. Taking into account the problems that arose at the beginning of this study, in relation to the lack of tools for assessing the digital competence of Special Education teachers, the results obtained have made it possible to validate a reliable instrument that makes it possible to detect the degree of digital training of this group in future research.

As a final result, the adapted and validated questionnaire, the process of which has been presented in this research, has resulted in an instrument for evaluating the digital competence of special education teachers that refers to eight dimensions relating to the diversity of students (Visual Impairment, Hearing Impairment, Physical Impairment,

Intellectual Disability, Autistic Spectrum Disorders, Severe Behavioural Disorders, Attention-deficit hyperactivity disorder). It should be pointed out that the instrument constructed not only allows us to investigate knowledge of ICT in the general field of special education, but also with regard to its use with pupils with specific educational needs, which makes it more attractive in terms of its use. In this way, it is important to point out the high levels of validity and reliability obtained in our study, both for the instrument as a whole and for the different dimensions that form part of it. All of this makes it a suitable instrument for the evaluation of the level of digital competence of Special Education teachers.

In short, we can say that there are two main conclusions, the first of which refers to the efficiency shown by the selection procedure of the experts through the coefficient of expert competence, which allows the selection process to be fine-tuned. Secondly, the assessments made by the experts and the reliability indices of the instrument are necessary to guarantee the quality of the analyses and the validity of the results obtained.

~~The strengths of our study are the inclusion of experts from both basic education and university education related to the field of technology and special education, in order to obtain different points of view. In addition, since the questionnaire includes only 44 items, it requires little time and effort by the participating teachers.~~

~~Limitations include the availability of all judges who did not respond to the request for participation in the study.~~

Limitations and future work

Validation of a measurement instrument is a complex process that must include different techniques and procedures to assess its validation. The strengths of our study are the inclusion of experts from both basic education and university education related to the field of technology and special education, in order to obtain different points of view. In addition, since the questionnaire includes only 44 items, it requires little time and effort by the participating teachers.~~s.~~

~~Limitations include the availability of all judges who did not respond to the request for participation in the study.~~

Therefore, as a limitation of this study, it is found that this study only focuses on expert opinion for the validation of the instrument and the availability of all judges who did not respond to the request for participation in the study. Therefore, as future work of the researchers, a study on the validation of the instrument through testing with the target population is to be presented, which implies the application of the instrument to a representative sample of the target population, including the performance of exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Proper validation of an instrument is essential to ensure that the construct of interest is measured accurately and reliably, and to ensure the usefulness and reliability of the instrument in different application contexts.

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Código de campo cambiado

Annex 1. Questions formulated to obtain the "Expert Competence Quotient".

1) Tick in the appropriate box the degree of knowledge you have about the following topics: Digital competence in teaching, Technology, Special Education. On a scale of 0 to 10 (0 being no knowledge at all and 10 being full knowledge of the state of the art).

Thematic	Rating scale										
	0	1	2	3	4	5	6	7	8	9	10
Digital competence in teaching											
Technology											
Special Education											

Note: The Knowledge Coefficient (Kc) is obtained from the expert's rating on a scale from 0 to 10, multiplied by 0.1.

B) Self-assess the degree of influence that each of the following sources has had on your knowledge and views on the topic of developing digital teacher education, technology and special education.

Source of argumentation	Degree of influence		
	Low	Medium	High
1. Theoretical analysis carried out by you in relation to Technology and Special Needs Education.	0,1	0,2	0,3
2. Experience you have gained in relation to Technology and Special Education	0,2	0,4	0,5
3. Review of research papers by national authors that address technology and special education.	0,05	0,05	0,05
4. Review of research by international authors that addresses technology and special education.	0,05	0,05	0,05
5. Your own knowledge of the current state of technology and special education.	0,05	0,05	0,05
6. Your intuition regarding this research	0,05	0,05	0,05

Note: The Argumentation Coefficient (Ka) is obtained by assigning a series of scores to the different sources of argumentation that the expert has been able to wield. The table shows the scores for the evaluation of the sources of argumentation.

Annex 2. Template administered to experts to assess content validity through expert judgement.

Item	Indicators												Observations
	Pertinence				Relevance				Clarity				
	1	2	3	4	1	2	3	4	1	2	3	4	
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