ORIGINAL ARTICLE

SCALE FOR THE ASSESSMENT OF DIGITAL COMPETENCES OF DISTANCE EDUCATION GRADUATE: DEVELOPMENT AND VALIDATION OF THE INSTRUMENT FOR TEACHERS

Gleice Assunção da Silva[1]
Daniela Karine Ramos[2]

ABSTRACT

This study describes the process of validating a scale developed to assess the digital skills of teachers trained in distance education. The methodology included a questionnaire for validation with expert judges and the application of the scale with teachers graduating from degree courses at two public institutions in Santa Catarina linked to the Open University of Brazil (UAB). Content validation involved 10 experts who analyzed the scale and answered a questionnaire. In the second procedure, the validated scale was applied to 252 graduate teachers and the internal consistency was analyzed using Cronbach's alpha. The analysis considered the set of items that generated the indicators for assessing teachers' digital competence. This study confirms the need for policies to monitor graduates as a factor in the quality of undergraduate courses, reaffirming the importance of higher education assessment systems listening to graduates in order to improve teacher training and the acquisition of the skills needed to work in different contexts.

Keywords: evaluation scale; instrument validation; digital skills of graduates.

1. Federal Institute of Santa Catarina – IFSC, Lages, SC, Brazil. https://orcid.org/0000-0002-6276-3797, gleiceprojetos@gmail.com

2. Federal University of Santa Catarina – UFSC, Graduate Program in Education, Florianópolis, SC, Brazil. https://orcid.org/0000-0001-9833-310X, dadaniela@gmail.com

ESCALA PARA AVALIAÇÃO DAS COMPETÊNCIAS DIGITAIS DE EGRESSOS DA EDUCAÇÃO A DISTÂNCIA: DESENVOLVIMENTO E VALIDAÇÃO DE UM INSTRUMENTO PARA PROFESSORES

RESUMO

Este estudo descreve o processo de validação de uma escala desenvolvida para avaliar as competências digitais de professores formados na modalidade de educação a distância. A metodologia incluiu um questionário para validação com juízes especialistas e a aplicação da escala com professores egressos de cursos de licenciatura de duas instituições públicas de Santa Catarina vinculadas à Universidade Aberta do Brasil (UAB). A validação do conteúdo envolveu 10 especialistas que analisaram a escala e responderam a um questionário. No segundo procedimento, aplicou-se a escala validada a 252 professores egressos e procedeu-se à análise da consistência interna por meio do alfa de Cronbach. A análise considerou o conjunto de itens elaborados que geraram os indicadores para avaliação da competência digital de professores. Ratifica-se neste estudo a necessidade de políticas de acompanhamento de egressos como fator de qualidade dos cursos de graduação, reafirmando a relevância de que os sistemas de avaliação da educação superior prezem pela escuta dos egressos a fim de qualificar a formação de professores e a aquisição das competências necessárias para a atuação em contextos diversos.

Palavras-chave: escala de avaliação; validação de instrumento; competências digitais de egressos.

ESCALA DE EVALUACIÓN DE LAS COMPETENCIAS DIGITALES DE LOS TITULADOS EN EDUCACIÓN A DISTANCIA: DESARROLLO Y VALIDACIÓN DEL INSTRUMENTO PARA PROFESORES

RESUMEN

Este estudio describe el proceso de validación de una escala desarrollada para evaluar las competencias digitales de profesores formados en educación a distancia. La metodología incluyó un cuestionario de validación con jueces expertos y la aplicación de la escala con profesores egresados de cursos de grado de dos instituciones públicas de Santa Catarina vinculadas a la Universidad Abierta de Brasil (UAB). En la validación de contenido participaron 10 expertos que analizaron la escala y respondieron a un cuestionario. En el segundo procedimiento, la escala validada se aplicó a 252 profesores graduados y se analizó la consistencia interna mediante el alfa de Cronbach. El análisis

consideró el conjunto de ítems que generaron los indicadores para evaluar la competencia digital de los profesores. Este estudio confirma la necesidad de políticas de seguimiento de los egresados como factor de calidad de los programas de grado, reafirmando la importancia de que los sistemas de evaluación de la enseñanza superior escuchen a los egresados para mejorar la formación de los profesores y la adquisición de las competencias necesarias para trabajar en diferentes contextos.

Palabras clave: escala de evaluación; validación del instrumento; competencias digitales de los titulados.

INTRODUÇÃO

In Brazil, since the 1980s, a series of instruments has been developed to regulate and assess higher education in the public sector. The state, therefore, supervises and regulates higher education in order to plan and ensure the quality of the system. To achieve this, it must establish its policy in a clear and democratic manner and, to implement it, requires a normative framework for control and oversight, as well as a definition of the means to carry them out.

The National Higher Education Assessment System (Sinaes) was created by Law No. 10,861, on April 14, 2004 (Brazil, 2004), and includes the evaluation of institutions, courses, and student performance. This law established the regulatory role of quality control in higher education for both public and private institutions, with the accreditation and re-accreditation of courses and institutions subject to this System. Sinaes consists of three components: the evaluation of higher education institutions, the evaluation of undergraduate courses, and the assessment of student performance. Among the system's main objectives is the improvement of the quality of higher education, the guidance of expansion efforts, and the promotion of social responsibility and respect for institutional identity (Brazil, 2004).

Constant adjustments and reforms to the assessment tools are necessary, as well as the creation of specific supplementary laws aimed at regulating new processes, metrics, and procedures. According to Dantas et al. (2023), it is evident that the functionality of Sinaes lies in its remarkable ability to reformulate itself, which is put into practice through the improvement of its tools and indicators geared toward adaptability. This characteristic, by prioritizing the enhancement of its tools and indicators, serves as a foundation for the planning of policies focused on higher education.

Another relevant factor concerns the importance of reconsidering tools aimed at graduates of Higher Education Institutions (HEIs), as there has been an increasing recognition of the importance of involving them in the evaluation processes. According to Simon, Arnoni, and Pacheco (2017), the assessment of graduates is essential for HEIs to measure the impact of the education provided on the lives of their students and to guide their management actions, aligning them with the profile and interests of their target audience. Furthermore, according to the authors (Simon; Arnoni; Pacheco, 2017), the opinions of graduates began to be valued with greater emphasis in Brazilian HEIs starting in the 1990s, alongside the expansion of higher education. With the creation of Sinaes, the inclusion of graduates as participants in the evaluation process of education was then regulated, promoting

policies and systems for graduate follow-up.

Considering the importance of higher education assessment, the relevance of instruments that may be used, the role of graduates in measuring the impact of initial training, and the current relevance of digital competencies, this article presents a scale and its validation process for assessing digital competencies in the initial teacher training. To this end, the process of constructing, validating, and applying the aforementioned scale is described. It is expected that the results of this study will guide future teacher training programs regarding the development and assessment of digital competencies, as well as contribute to diagnostic actions that could inform public policies and initiatives in this area.

1 DIGITAL COMPETENCIES IN TEACHER TRAINING

Currently, there are many competencies required for the initial training of teachers, and studies with graduates have enabled a broader understanding of the real needs of teaching practice. It is argued that the training of future teachers should be situated in a formative environment that brings them closer to digital technologies and increasingly stimulates reflection on them and their relationship with humanity, so that they are understood as tools and cultural products of contemporary society (Modelski; Giraffa; Casartelli, 2021; Silverstone, 2011). It is essential for teachers to become aware of the need for reflections on their formative processes in pursuit of training that anticipates the competencies necessary to engage with the complexities of school contexts (Martín-Barbero, 2014).

This study focused on the importance of researching the digital competencies of graduates from public distance higher education institutions, given the scarcity of studies on digital competencies in this mode of teaching. This assertion was confirmed after the systematic literature review conducted by Silva and Ramos (2023), which aimed to survey published experiences from 2010 to 2020 in the context of initial teacher training for the integration of digital technologies. The study found that, in terms of teaching modalities, 90% (n=36) of the articles examined referred to initial teacher training in face-to-face formats, while only 5% (n=2) addressed experiences in the distance education mode, and another 5% (n=2) referred to blended learning experiences.

The emergence of research on digital technologies in the school context is something that cannot be ignored by teachers, and its integration should also be a focus for educational institutions. In this regard, there is an emphasis on the importance of formative spaces that strengthen teachers' socialization and interaction with technologies (Silva Júnior; Costa, 2020).

In the Brazilian context, attempts to discuss the encouragement of digital technology integration into innovative pedagogical practices can be observed. These discussions have been formalized, for instance, in the National Policy for the Training of Basic Education Professionals, which aims to promote and update theoretical-methodological approaches in the training processes of basic education professionals, in accordance with Objective IX of Article 3 of Decree No. 8,752 (Brazil, 2016). Similarly, these premises are also mentioned in the National Education Plan (Brazil, 2014)

in Goals 5 and 7; in the National Common Base for the Initial Training of Basic Education Teachers (BNC-Formação); in the National Curriculum Guidelines for Initial and Continuing Education of Basic Education Teaching Professionals, according to Resolution CNE/CP No. 2, December 20, 2019 (Brazil, 2019); and in numerous studies, particularly those conducted by the Center for Innovation in Brazilian Education (CIEB). Some of these studies, for example, refer to the Digital Competencies Matrix related to teaching work and the development of curricular components related to digital technologies that can be integrated either transversally or in specific subjects in the initial teacher training.

In this regard, the importance of further studies on teachers' digital competencies emerges, which in this study are understood as the mobilization of knowledge, attitudes, practices, values, and behaviors that educators need in order to use digital technologies in a way that fosters critical, collaborative, and creative learning with students (Center for Innovation in Brazilian Education, 2019). In complementarity, Silva and Behar (2019) note that this is a complex concept involving a set of knowledge, skills, and attitudes that must be mobilized, aiming for the individual to act through technologies. According to the authors, what is expected from a digitally competent individual is that they have a sufficient understanding of technological means, being capable of utilizing information, being critical, and communicating by integrating a variety of tools.

It is therefore understood that the definition of teachers' digital competencies is a concept that goes beyond the digital literacy of this professional, seeking to explore and understand competencies both in the formative process and in the pedagogical practice of graduates. To this end, it is necessary to reflect on some dimensions that are part of the pedagogical practice for integrating digital technologies in education and that may be present in the initial teacher training, such as the: pedagogical dimension, citizenship dimension, and professional dimension (Center for Innovation in Brazilian Education, 2019). The pedagogical dimension includes digital competencies for pedagogical practice, such as assessment, personalized learning, curation, and creation. The citizenship dimension reflects on technological competencies for the safe, responsible, critical, and inclusive integration of digital technologies. The professional dimension reflects on digital competencies related to self-development, self-assessment, sharing, and communication (Center for Innovation in Brazilian Education, 2019).

Theoretical frameworks for digital competencies are important for the development of assessment instruments. It is important to emphasize that there are various assessment instruments for digital competencies, both at the national and international levels, such as: the DigCompEdu CheckIn (Redecker; Punie, 2017), the MCompDigEAD (Silva et al., 2023), and the E-Digcompedu (Santos, 2023).

In the context of distance education assessment instruments, Silva et al. (2020), when conducting a literature review on the scales used in this mode of teaching, identified 30 instruments that are classified into 9 categories: emotion, self-efficacy, autonomy, social presence, self-regulation, satisfaction, evaluation, barriers, and teacher attitude. It is observed that none of the scales focus on assessing digital competencies or target graduates of distance courses.

Another literature review on the topic highlights the need to deepen the evaluation of digital competencies, considering ethical aspects, inclusivity, and the validity of assessment instruments, as well as exploring innovative approaches for the development of these competencies in Distance Education (Silva Filho, 2023).

It is worth highlighting that, in the European context, there is a common reference framework for the development of educators' digital competencies, called DigCompEdu. This framework aims to assist member states in promoting the digital competence of their citizens and driving innovation in education (Lucas; Moreira, 2018). While the potential and contributions of DigCompEdu regarding the topic are recognized, this study opted to use the digital competencies matrix for teachers proposed by CIEB as the theoretical framework for the development of the instrument, as it respects the different contexts in which it was created and that continue to be developed.

In this regard, the process of constructing a scale to assess the digital competencies of graduates began, with the aim of supporting the investigation of their initial teacher training in the distance education modality in two formative contexts: a) the Open University of Brazil (UAB) at the Federal University of Santa Catarina (UFSC); b) UAB at the State University of Santa Catarina (UDESC). The goal of this scale was to assess, through the graduates' perceptions, how the distance initial training they received contributed to the development of their digital competencies and the integration of digital technologies into their current pedagogical practices.

The methodology of this study is then presented, describing the expert validation process (first stage) and the application of the scale with the graduates, as well as the verification of internal consistency analysis (second stage).

2 METODOLOGIA

This study validates a scale, here referred to as the Scale for the Evaluation of Digital Competencies of Distance Education Graduates, for assessing the digital competencies of graduates from distance education undergraduate courses. The process of instrument validation in research aims to identify existing flaws, ensure greater consistency and coherence, and provide guidance regarding the ordering and number of items, among other aspects (Gil, 2019; Hermida, 2005; Lakatos; Marconi, 2009; Ollaik; Ziller, 2012). Therefore, for the validation of the instrument, various aspects were considered, such as content validity (Gliner; Morgan, 2011), construct validity (DeVellis, 2017), and criterion validity (Cohen; Manion; Morrison, 2018), in addition to verifying the instrument's reliability (Field, 2013), paying particular attention to specific frameworks on questionnaire and scale validation, such as those by Pasquali (2010) and Stevens (2009).

After the construction of the instrument, the first step was the validation by experts; the second step involved applying the instrument to graduates for the analysis of the instrument's reliability.

2.1 First Stage: Expert Validation

Participants

The inclusion criteria for selecting the experts were as follows: having experience as a teacher in distance higher education; having completed or currently pursuing graduate studies in the area of distance education; possessing scientific publications and participation in distance education training courses. These criteria were based on the goal of seeking a profile that could have a closer methodological alignment with the universe under investigation. In this regard, 10 experts were invited to carry out the validation of the scale.

Regarding the profile of the expert participants, it is noteworthy that the average age ranged from 31 to 57 years, with 4 men and 6 women. The experts assessed and judged the items of the scale as either relevant or not to the research objectives, with the possibility of suggesting improvements. Content validation aimed to provide an in-depth analysis of the proposed items on the scale, with the goal of assessing whether these questions represented a sample of what was intended to be explored.

Instrument Validation Procedures

The validation process aimed to ensure the coherence of the methodological procedures and the consistency of its results. Content validation of an instrument refers to a judgment process composed of two parts: the first involves the development of the instrument, and the second consists of its evaluation (Polit; Beck, 2019).

In the first stage of validation, the term "expert" was used as a synonym for "evaluator." The expert evaluation involved both qualitative and quantitative procedures (Gliner; Morgan, 2011; Burns; Grove, 1997; Tilden; Nelson; May, 1990) and was developed through a process that included a pilot test of the instrument and, subsequently, a content validation phase.

Content validation's role is to propose a thorough analysis of the instrument's contents, aiming to assess whether such questions represent a sample of what is intended to be explored. For this, experts on the subject are invited to analyze the instrument and suggest modifications (Hermida, 2005).

It is emphasized that, to achieve its objectives, assessment must adhere to certain requirements to be considered of good quality, such as validity and reliability. In situations where more than one evaluator participates in an evaluative process, strategies are employed to understand the degree of agreement in order to verify if there is a minimum level of agreement between them. Thus, the importance lies in clarifying the reliability of the evaluative process, meaning that if two or more experts significantly disagree in an assessment, it may indicate a lack of reliability in the research results (Matos, 2014).

The experts received instructions within the validation questionnaire on how to assess the items of the instrument. Initially, aiming to identify and characterize the profile of the experts, the instrument included 6 multiple-choice questions. Subsequently, each item was individually

evaluated concerning: a) clarity and objectivity and b) content adequacy, as suggested by Grant and Davis (1997). The evaluation of the items by the experts was conducted using a 5-point Likert scale (strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree). Also, as suggested by Rubio et al. (2003) and Tilden, Nelson, and May (1990), the validation questionnaire included an open-ended question for the experts to record observations, suggestions, or comments regarding the instrument.

The validation questionnaire was created using a Google Forms survey. Below (Table 1), an example of a question regarding the criteria for clarity and objectivity and content adequacy can be observed.

Table 1 - Example of Question Validation from the Instrument Questionnaire Regarding the Criteria of Clarity and Objectivity and Content Adequacy

Clarity and Objectivity	Strongly Disagreeente	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
The use of digital technologies in the initial training process contributed to my integration of digital technologies into my pedagogical practice.					
Content Adequacy	Strongly Disagreeente	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I frequently integrate digital technologies into my pedagogical practice by incorporating digital resources into my planning and teaching strategies.					

Source: Author's own elaboration.

Data Analysis

As previously described, the validation questionnaire of the scale was composed of items in the form of statements and utilized a five-point Likert scale. The analysis involved both qualitative and quantitative procedures and developed through a process that initially functioned as a pilot test of the instrument and, subsequently, a phase of content validation. To determine the percentage of agreement, the sum of the evaluations marked by the experts as "strongly agree" and "agree" was calculated. The analysis considered the agreement index of the experts concerning each statement related to Clarity and Objectivity (C.O) and Content Adequacy (C.A).

For the data analysis, the method used to calculate the agreement index was the so-called absolute percentage of agreement, which involved calculating the number of times the experts agreed with the statement, multiplying by 100, and dividing by the total number of evaluations (i.e., ranging from 0 to 100%), with the minimum acceptable agreement being 75% (Stemler, 2004).

2.2 Second Stage: Application of the Validated Scale with Graduates and Internal Consistency Analysis

Participants

This procedure was carried out by applying the instrument validated in the first stage to a sample of 252 graduates from distance education undergraduate courses offered by two public institutions in Santa Catarina, which provided courses linked to the UAB (Universidade Aberta do Brasil). Below (Table 1), the profile of the sample is characterized.

Table 1 - Characterization of the Sample by Context

	UAB/UDESC	UAB/UFSC
Participants (n)	84	168
Age	26 to 59 years old	24 to 54 years old
Gender Female Male	91,6% (n=77) 7,1% (n=6)	71,4% (n=120) 28,6% (n=48)

Teaching Performance		
Early Childhood Education	30,9% (n=26)	5,4% (n=9)
Elementary Education - Initial	32,1% (n=27)	11,9% (n=20)
Elementary Education - Final	7,1% (n=6)	30,4% (n=51)
High School - Professional Formation	7,1% (n=6)	37,5% (n=63)
Technical and Adult Education	11,9% (n=10)	14% (n=23)
Do not work today but have worked before	9,5% (n=8)	13% (n=21)
Have never worked in education	5,9% (n=5)	8% (n=14)
Academic Qualification		
Bachelor's Degree	40,4% (n=34)	23,8% (n=40)
Specialization	53,5% (n=45)	48,2% (n=81)
Master's Degree	4,7% (n=4)	23,8% (n=40)
Doctorate	0	0,3% (n=05)
Post-Doctorate	0	0,6% (n=01)

Source: Author's own elaboration.

As observed above (Table 1), the study with graduates from the Pedagogy undergraduate programs at UAB/UDESC and UAB/UFSC revealed that the majority of participants are female (91.6% and 71.4%, respectively). The educational background of the graduates varies, with a notable prevalence of lato sensu postgraduate qualifications in both groups. The areas of professional activity are diverse, primarily in basic education and technical-administrative positions, although some participants have not worked in education. The years of experience as teachers vary widely, and the majority work in the face-to-face modality.

Procedures for the Application of the Evaluation Scale with Graduates

The questionnaire was administered online with the support of the participating institutions in the research. Graduates from the distance education undergraduate programs at UAB/UFSC and UAB/UDESC were contacted via email and invited to respond to the evaluation instrument.

The questionnaire was sent to participants during the second semester of 2019 and in the months of January and February of 2020. The purpose of the questionnaire was to map the profile of the respondents and included the items validated and reformulated by the specialists.

Data Analysis

The analysis of the data obtained from the responses of graduates from the distance education undergraduate programs was based on Cronbach's alpha coefficient, which calculates the average correlations between the items of a scale and considers that, the less the items vary, the greater the consistency of the instrument (Gil, 2019; Souza, Alexandre, Guirardello, 2017). Thus, the use of Cronbach's alpha is an alternative for assessing the internal consistency of scales.

The analysis of the results resulted in a coefficient, which was interpreted according to the following parameters: greater than 0.90 indicates that the instrument is very highly reliable; between

0.80 and 0.90, the instrument is highly reliable; between 0.70 and 0.79, the instrument is reliable; between 0.60 and 0.69, it is considered minimally reliable; and when the value is less than 0.60, the reliability is low (Mattar, Ramos, 2021).

3 RESULTS

3.1 Results of the First Stage: Validation of the Scale by Experts

The result containing the agreement index of the experts regarding each of the statements of the scale concerning Clarity and Objectivity (C.O) and Content Adequacy (C.A) can be observed below (Table 2), which shows the result of the validation process, including the agreement index of the experts concerning the statements of the initially validated scale.

Table 2 - Result of the Scale Validation Process

Statements	C.O	C.A.
The integration of digital technologies in the initial teacher training process contributed to my ability to use digital technologies in my pedagogical practice.	88,89%	88,89%
Learning through Information and Communication Technologies (ICTs) during my undergraduate studies contributed to my ability to use technologies more effectively for teaching.	90,00%	88,89%
While studying remotely, I had the opportunity to explore different digital resources and experiment with them throughout my training process.	90,00%	88,89%
Engaging in various activities in the virtual environment provided opportunities to experiment with and reflect on teaching and learning processes mediated by technology.	80,00%	88,89%
The quality of the content and instructional materials provided in the virtual learning environment influenced my perceptions about the possibilities of integrating digital technologies in the teaching and learning process.	100,00%	77,78%
I believe that the integration of digital technologies in activities and discussions about their pedagogical integration influenced how I later incorporated these resources into my pedagogical practice.	88,89%	88,89%
The activities and interactions proposed during the training addressed practical issues related to the integration of digital technologies in education.	87,50%	77,78%

During my internships, I was able to use digital technologies in my pedagogical practices with knowledge and confidence.	80,00%	77,78%
I frequently use digital technologies in my pedagogical practice, incorporating digital resources into my planning and teaching strategies.	77,78%	77,78%
I incorporate digital technologies into my teaching practice to assess, monitor, and provide feedback to students.	75,00%	87,50%
I feel capable of using technology to create learning experiences that meet the needs of each student.	77,78%	77,78%
I develop individual and group work plans with the support of digital technologies.	77,78%	88,89%
I select digital resources that contribute to the teaching-learning processes and classroom management.	75,00%	77,78%
I create digital resources that meet pedagogical objectives and are related to curricular content.	77,78%	88,89%
I propose activities aimed at encouraging students to create digital content (e.g., videos, photos, presentations, blogs, wikis).	77,78%	88,89%
I encourage students to produce digital media (text, sound, images, video) and share them on social networks, channels, or websites.	77,78%	90,00%
I use digital technologies to encourage students' social participation, promoting digital citizenship.	90,00%	90,00%
I guide my students on the ethical and responsible integration of digital technologies, promoting discussion spaces on topics such as cyberbullying, privacy, ethics, and responsibility in the virtual space.	90,00%	90,00%
I teach students to integrate technology in a safe and responsible manner.	90,00%	90,00%
I create situations to promote the critical interpretation of information available in digital media in the classroom.	90,00%	90,00%
I promote activities where students have the opportunity to read and critically interpret the information available in digital media.	90,00%	90,00%

I use digital technologies to adapt activities for students with disabilities or any type of learning difficulty.	90,00%	90,00%
I feel capable of integrating technologies into continuous education and professional development activities.	88,89%	87,50%
I use digital technologies to participate in continuing education, seeking to apply what I learn in my teaching practices.	88,89%	88,89%
I feel capable of using technologies to assess my teaching practice and implement actions for improvement.	88,89%	87,50%
I use digital technologies to record my planning and the results of my teaching practice.	88,89%	88,89%
I seek to update myself on digital technologies and self-assess to incorporate improvements into my teaching planning.	88,89%	88,89%
I integrate technology to participate in learning communities and engage in peer exchanges.	88,89%	88,89%
I use digital technologies to communicate with the school community, integrating digital media and tools for the promotion and sharing of knowledge, content, and information.	88,89%	88,89%
I create communication channels with the families of my students to share information.	87,50%	88,89%
The support from the physical support center was crucial for me to access digital technologies.	100,00%	88,89%
The physical support center was essential for me to participate in videoconferences and interact with professors and tutors via digital technologies.	88,89%	88,89%
Attending the physical support center contributed to my motivation to carry out activities and complete the course.	90,00%	88,89%
Interaction with course peers, professors, and tutors at the physical support center contributed to the development of collaborative activities through digital technologies.	88,89%	88,89%
The physical support center was crucial for clarifying doubts and deepening topics that enhanced my learning process in integrating digital technologies.	88,89%	88,89%

The physical support center played a key role in organizing and planning the supervised internship, enabling the monitoring of pedagogical practices for the integration of digital technologies.	88,89%	88,89%
Average Agreement Index (Total)	**86,59%**	**87,14%**

Source: Author's own elaboration.

It can be observed that both the individual evaluations of the items and the overall average resulted in a concordance index higher than 75%, which, according to Stemler (2004), is the minimum acceptable concordance value according to the method of absolute concordance percentage. In summary, the overall average of the items evaluated using the Likert scale for the criteria of Clarity and Objectivity (C.O) was 86.59%, and for Content Adequacy (A.C), it was 87.14%.

As previously mentioned, the validation questionnaire included an open-ended question for experts to record their observations, suggestions, or comments regarding the questionnaire. This question reinforced the understanding that some items should be revised in terms of length, repetition, and intrinsic characteristics, as well as the recognition that some questions should allow for the possibility of selecting more than one alternative.

The records from the evaluator through descriptive assessment noted some comments regarding the instruments (digital competence evaluation questionnaire and validation questionnaire), as well as observations made regarding the timing of the validation application.

Regarding the application, attention was drawn to the length of both questionnaires, namely the one being evaluated and the validation questionnaire. The average response time was reported as 15 minutes for the questionnaire and 20 minutes for the instrument validation. This inference suggested that the instrument became tiring, and respondents ended up answering quickly.

Concerning the questionnaire, it was noted that the questions were directed solely to teachers and/or coordinators, meaning that if a graduate responding to the instrument was not working as a teacher, they could not answer some of the questions. It was also suggested that it would be important to include a preliminary question to indicate whether digital technologies are available at the institution where the graduate works. Furthermore, it was noted that the question asking about which digital technologies the graduate usually uses in their daily life only allowed for the selection of one option. It was pointed out that questions related to ethics could be grouped together. Additionally, two words were referenced as needing spelling revisions (Skype and Polo).

In order to address the specialists' recommendations, several adaptations were made to the questionnaire instrument, including: revisions of aspects related to clarity and ease of reading the statements, changes to the spelling of certain words, exclusion of some questions, and the inclusion of multiple response options.

3.2 Second Stage: Analysis of the Internal Consistency of the Scale

The second procedure for validating the scale involved assessing reliability through the calculation of Cronbach's alpha based on its application to 252 graduates of distance education degree programs from two federal higher education institutions.

The result obtained from the analysis of the 22 items of the instrument was 0.947. According to the parameters outlined by Mattar and Ramos (2021), the instrument can be considered highly reliable, as the coefficient obtained exceeds 0.9. Therefore, it can be interpreted that the indicators used in the instrument are reliable. Below (Table 2), the detailed results by item of the scale can be observed.

Table 2 - Cronbach's Alpha Coefficient Results for the Items of the Instrument Indicating that the Indicators Used Are Reliable

Item	Cronbach's Alpha Coefficient if the Item is Excluded
1	0.944
2	0.945
3	0.946
4	0.945
5	0.944
6	0.945
7	0.943
8	0.944

9	0.944
10	0.944
11	0.944
12	0.945
13	0.944
14	0.943
15	0.945
16	0.947
17	0.944
18	0.946
19	0.946
20	0.947

21	0.944
22	0.946

Source: Author's own elaboration.

Thus, after the evaluations were conducted, the instrument was organized into 22 items, as presented below (Table 3).

Table 3 - Final Version of the Evaluation Scale

Dimension	Item	Statement
Influence of the initial training process on the use of digital technologies in pedagogical practices	1	The use of digital technologies in undergraduate education contributed to my ability to use digital technologies in my pedagogical practice.
	2	While studying at a distance, I had the opportunity to explore different digital resources and experiment with them throughout my educational process.
	3	By engaging in various activities on Moodle, I was able to experiment with and reflect on teaching practices mediated by technology.
	4	The quality of the content and teaching materials used during my undergraduate studies helped me integrate digital technologies into my lessons.
	5	Studying digital technologies during my undergraduate education influenced the way I use these resources in my pedagogical practice.
	6	The activities and interactions during my undergraduate studies presented practical issues related to the use of digital technologies in education.

Pedagogical dimension of pedagogical practices	7	I frequently use digital technologies in my pedagogical practice, incorporating them into my planning.
	8	I integrate digital technologies into my teaching practice to assess, monitor, and provide feedback to students.
	9	When necessary, I adapt and personalize individual activities (work plans) using digital technologies.
	10	I create digital resources that align with pedagogical objectives and relate to the curricular content.
	11	I propose activities aimed at encouraging students to create digital content (e.g., videos, photos, presentations, blogs, wikis).
	12	I select and evaluate digital resources that contribute to the management and processes of teaching and learning.
	13	I appropriate digital technologies and use them didactically in my pedagogical practices.
Social, ethical, legal, and citizenship dimension of pedagogical practices	14	I use digital technologies to encourage students' social participation, promoting digital citizenship.
	15	I guide my students on the ethical and responsible use of digital technologies (e.g., cyberbullying, privacy, ethics, security, etc.).
	16	I use digital technologies to disseminate information to the school and local community.
	17	I promote activities in which students have the opportunity to critically read and interpret the information available on digital media.
	18	I use digital technologies to adapt activities for students with disabilities or difficulties in the learning process.

	19	I feel capable of using technologies to evaluate my teaching practice and implement actions for improvements.
Dimension of professional development and responsibility in pedagogical practices	20	I use digital technologies to record my planning and the results of my pedagogical practice.
	21	I seek to stay updated on digital technologies to incorporate improvements into my teaching practice.
	22	I use technology to participate in learning communities, engage in peer exchanges, and share knowledge.

Source: Author's own elaboration.

4 DISCUSSION

Reliability and validity are essential in research, ensuring that instruments are consistent and accurate. While reliability guarantees the reproducibility of results, validity verifies whether the instrument measures what it intends to measure. Studies with alumni are important for improving curricula, as shown by Amaral (2023), who highlights the need for greater integration between teaching and industrial practice in a Chemistry course. Likewise, Xavier and Freitas (2023) emphasize that alumni narratives help adapt teaching to the cultural reality of students, particularly in subjects such as Mathematics.

According to the authors, alumni construct pedagogical practices and curriculum meanings that reflect the cultural realities of their contexts. Although there is a prescriptive curriculum that guides actions and seeks to homogenize pedagogical practices, there is a need to design Mathematics lessons that respect the cultures and differences of students, thus constructing curriculum meanings as narratives of identities linked to the realities in which they are embedded (Xavier & Freitas, 2023).

Although there are studies involving alumni in various educational modalities, there is a lack of research on the digital competencies of these alumni, especially in relation to the integration of digital technologies in pedagogical practices, as noted by Silva and Ramos (2023). Moreover, research on alumni from distance education teacher training programs is scarce, and no current evaluation scale is applicable to these professionals. The scarcity of research also highlights the lack of involvement of school teams in the development of curricular reforms, which are often made without considering local realities, forcing teachers to adapt to educational policies and the actual conditions of schools.

The current environment has increasingly demanded certain knowledge, skills, and attitudes from alumni of teacher education programs. In this context, it is crucial to constantly reflect on the

digital competencies that are part of pedagogical practices for the integration of digital technologies in education and may be present in the initial teacher training (Centro de Inovação para a Educação Brasileira, 2019). Based on the CIEB (Centro de Inovação para a Educação Brasileira, 2019), the validated scale presented here is an instrument capable of evaluating three dimensions of pedagogical practice for integrating digital technologies into educational practices: the pedagogical dimension, the citizenship dimension, and the professional dimension. In summary, these dimensions propose the evaluation of twelve digital competencies of alumni: pedagogical practice, assessment, personalized teaching, curation and creation, secure integration, responsible integration, critical integration, inclusive integration, self-development, self-assessment, sharing, and communication.

The proposed scale contributes to the improvement of teacher training in the context of distance education by creating a specific instrument to assess the digital competencies of teachers who graduated from this modality. By promoting a contextualized analysis of initial training in distance courses, such as those offered by the institutions studied, it enabled reflection on the potential of these programs to develop digital competencies in their alumni. This, in turn, ensures that these future teachers are equipped to promote personalized and innovative pedagogical practices in school contexts after completing their courses.

It is emphasized the need for policies to monitor alumni as a factor of quality in undergraduate programs. According to Simon, Arnoni, and Pacheco (2017, p. 2), alumni assessment is crucial for higher education institutions (HEIs) to evaluate the impact of the training offered, guiding management actions and aligning the course profile with the interests of the target audience. In this regard, we reaffirm the importance of higher education evaluation systems that prioritize listening to alumni in order to enhance teacher training and the acquisition of digital competencies necessary for working in diverse contexts and modalities.

The importance of rethinking instruments aimed at alumni of higher education institutions has increasingly emerged, and the need for them to be heard in evaluation processes. With the creation of the Sinaes (National System for the Evaluation of Higher Education), the inclusion of alumni as participants in the evaluation process of education was regulated, promoting policies and systems for alumni tracking (Dantas et al., 2023). This highlights the need to develop instruments tailored to this audience. In light of this, the alumni evaluation scale proposed and validated, as described in this study, aims to guide initial teacher training programs and future public policies, particularly in basic education.

It is important to highlight the relevance of policies for the monitoring and evaluation of teacher training courses, both in-person and distance learning, with a focus on quality rather than the mode of delivery. The 2022 Census of Higher Education revealed concerns, particularly with distance education, but also with in-person teaching. The mission of institutions should go beyond course completion, integrating alumni into educational contexts and committing to the quality of distance education, as well as promoting the development of competencies.

5 FINAL CONSIDERATIONS

The validation of research instruments becomes an essential step to ensure consistency and guarantee that the scale developed will allow the exploration of key content in order to achieve the general and specific objectives of scientific research.

The content validation of the instrument carried out by the experts was of utmost importance, providing reflections on aspects that require reconsideration to ensure a better understanding of the scale by the research participants. This study aims to explain the main points of evaluating the measurement properties of research instruments in practice. We conclude that careful consideration of the reliability and validity aspects of instruments is necessary to ensure the quality of the applied instruments and the practical application of study results. Through this process, it was verified that the instrument met the necessary criteria to be considered a validated tool.

In this sense, the scale for evaluating the digital competencies of graduates from teacher education courses was validated through expert validation procedures and reliability testing via Cronbach's alpha calculation, indicating that this scale can be used in other similar contexts. The validated scale for the distance learning context can be adapted and applied to graduates of in-person teacher education programs, following the same validation procedures used for this population.

Finally, the potential of distance education (EAD) for training teachers to integrate digital technologies into their practices is highlighted, as well as the importance of a critical look at the quality of the courses offered. Quality assessment must be grounded in continuous monitoring and evaluation, including the tracking of alumni.

REFERENCES

AMARAL, M. L. M. do. **Percepções de discentes e egressos de um curso de graduação em Química**: bacharelado sobre sua formação profissional. 2023. Trabalho de Conclusão de Curso (Bacharelado em Química) – Instituto de Ciências Exatas e Naturais do Pontal, Universidade Federal de Uberlândia, Ituiutaba, 2023. Disponível em: https://repositorio.ufu.br/handle/123456789/37140. Acesso em: 8 dez. 2023.

BRASIL. **Lei nº 10.861, de 14 de abril de 2004**. Institui o Sistema Nacional de Avaliação da Educação Superior – SINAES e dá outras providências. Brasília: Presidência da República, 2004. Disponível em: https://www.planalto.gov.br/ccivil_03/_ato2004-2006/2004/lei/l10.861.htm. Acesso em: 29 set. 2016.

BRASIL. **Lei nº 13.005, de 25 de junho de 2014**. Aprova o Plano Nacional de Educação - PNE e dá outras providências. Brasília: Presidência da República, 2014. Disponível em: http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2014/lei/l13005.htm. Acesso em: 12 set. 2019.

BRASIL. **Decreto nº 8.752, de 9 de maio de 2016**. Dispõe sobre a Política Nacional de Formação dos Profissionais da Educação Básica. Brasília: Presidência da República, 2016. Disponível em: http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2016/decreto/d8752.htm. Acesso em: 12 set. 2019.

BRASIL. Ministério da Educação. Secretaria de Educação Básica. Diretoria de Políticas e Regulação da Educação Básica. Coordenação-Geral de Temas Transversais da Educação Básica e Integral. Coordenação-Geral de Inovação e Integração com o Trabalho. **Temas contemporâneos transversais na BNCC**: contexto histórico e pressupostos pedagógicos. [*S. l.*]: MEC, 2019. Disponível em: http://basenacionalcomum.mec.gov.br/images/implementacao/contextualizacao_temas_contemporaneos.pdf. Acesso em: 22 maio 2022.

BURNS, N.; GROVE, S. **The Practice of Nursing Research**: Conduct, Critique, and Utilization. 3 ed. Montreal: W. B. Saunders, 1997.

CENTRO DE INOVAÇÃO PARA A EDUCAÇÃO BRASILEIRA. **Competências de professores e multiplicadores para uso de TICs na educação**. Brasília, 2019. Disponível em: http://cieb.net.br/wpcontent/uploads/2019/02/CIEB_NotaTecnica8_FEV2019.pdf. Acesso em: 14 abr. 2019.

COHEN, L.; MANION, L.; MORRISON, K. **Research methods in education**. 8. ed. New York: Routledge, 2018.

DANTAS, V. F. V. *et al.* As transformações nos sinais e seus impactos na avaliação da educação superior brasileira. *In:* COLÓQUIO INTERNACIONAL DE GESTÃO UNIVERSITÁRIA, 21., 2023, Equador. **Anais eletrônicos** [...]. Equador: UFSC/INPEAU, 2023. Disponível em: https://

repositorio.ufsc.br/handle/123456789/243914. Acesso em: 8 dez. 2023.

DEVELLIS, R. F. **Scale development: theory and applications**. 4. ed. Thousand Oaks: SAGE Publications, 2017.

FIELD, A. **Discovering statistics using IBM SPSS statistics.** 4. ed. London: SAGE Publications, 2013.

GIL, A. C. **Métodos e técnicas de pesquisa social**. 6. ed. São Paulo: Atlas, 2019.

GLINER, J. A.; MORGAN, G. A. **Research methods in education: integrating quantitative and qualitative approaches**. 9. ed. Thousand Oaks: SAGE Publications, 2011.

GRANT, J.; DAVIS, L. Selection and use of content experts for instrument development. **Research in Nursing and Health**, [*S. I.*], v. 20, n. 3, p. 269-274, 1997.

HERMIDA, P. M. V. **Elaboração e validação de instrumentos para a coleta de dados na assistência de enfermagem**. 2005. Dissertação (Mestrado em Enfermagem) – Faculdade de Ciências Médicas, Universidade Estadual de Campinas, Campinas, 2005. Disponível em: https://repositorio.unicamp.br/acervo/detalhe/334690. Acesso em: 8 dez. 2023.

LUCAS, M.; MOREIRA, A. **DigCompEdu**: Quadro Europeu de Competência Digital para Educadores. Aveiro: UA Editora, 2018.

MARCONI, M. de A.; LAKATOS, E. M. **Fundamentos da metodologia científica**. 6. ed. São Paulo: Atlas, 2009.

MARTÍN-BARBERO, J. **A comunicação na educação**. São Paulo: Contexto, 2014.

MATOS, D. A. S. Confiabilidade e concordância entre juízes: aplicações na área educacional. 2014. Disponível em: https://www.repositorio.ufop.br/handle/123456789/5716. Acesso em: 8 dez. 2023.

MATTAR, J.; RAMOS, D. K. **Metodologia da pesquisa em educação**: abordagens qualitativas, quantitativas e mistas. São Paulo: Edições 70, 2021.

MODELSKI, D.; GIRAFFA, L.; CASARTELLI, A. de O. Tecnologias digitais, formação docente e práticas pedagógicas. **Educação e Pesquisa**, São Paulo, v. 45, 2021. Disponível em: https://www.revistas.usp.br/ep/article/view/157696. Acesso em: 1 fev. 2021.

OLLAIK, L. G.; ZILLER, H. Concepções de validade em pesquisas qualitativas. **Educação e Pesquisa**, São Paulo, v. 38, n. 1, p. 229-241, 2012. Disponível em: https://www.revistas.usp.br/ep/article/view/28336. Acesso em: 8 dez. 2023.

PASQUALI, L. **Psicometria**: teoria dos testes na psicologia e na educação. 2. ed. Petrópolis: Vozes, 2010.

POLIT, D. F.; BECK, C. T. **Fundamentos de Pesquisa em Enfermagem**: avaliação de evidências para a prática da Enfermagem. 9. ed. Porto Alegre: Artmed, 2019.

REDECKER, C.; PUNIE, Y. **DigCompEdu**: European framework for the digital competence of educators. Luxembourg: Publications Office of the European Union, 2017.

RUBIO, D. M. *et al*. Objectifying content validity: Conducting a content validity study in social work research. **Social Work Research**, [*S. l.*], v. 27, n. 2, p. 94-104, 2003.

SANTOS, C. C. **Desenvolvimento do e-DigCompEdu**: quadro de referência das competências digitais docentes do ensino superior online. 2023. Tese (Doutorado) — Universidade de Lisboa, 2023.

SILVA, G. A. da. *et al*. Escalas de Avaliação na Educação a Distância: Revisão Sistemática de Literatura. **EducaOnline**, [*S. l.*], v. 14, n. 1, p. 96-118, 2020.

SILVA, K. K. A. *et al*. Modelo de Competências Digitais para alunos na Educação a Distância: revisão e atualização de uma proposta brasileira. **Revista de Estilos de Aprendizaje**, [*S. l.*], v. 16, n. 32, p. 5-18, 2023.

SILVA, K. K. A. da; BEHAR, P. A. Competências digitais na educação: uma discussão acerca do conceito. **Educação em Revista**, [*S. l.*], v. 35, 2019. Disponível em: https://www.semanticscholar.org/reader/ef4a4f2daadd48e47d48ee603d819d63cadb2556 Acesso em: 8 dez. 2023.

SILVA, G. A. da; RAMOS, D. K. O impacto das tecnologias digitais na formação inicial de professores sobre as suas práticas pedagógicas. **Revista Eletrônica de Educação**, [*S. l.*], v. 17, p. 1-30, 2023. Disponível em: https://www.reveduc.ufscar.br/index.php/reveduc/article/view/4857. Acesso em: 8 dez. 2023.

SILVA FILHO, V. P. da. Competências Digitais na educação a distância: conjecturas e desafios da sociedade digital. **ESUD CIESUD SIGATEC 2024**, [*S. l.*], p. 14-14, 2024.

SILVA JÚNIOR, S. D. da; COSTA, F. J. Mensuração e Escalas de Verificação: uma Análise Comparativa das Escalas de Likert e Phrase Completion. *In:* SEMINÁRIOS EM ADMINISTRAÇÃO, 17., 2014. **Anais eletrônicos [...]**. [*S. l.*]: SEMEAD, 2014. Disponível em: http://sistema.semead.com.br/17semead/resultado/trabalhospdf/1012.pdf. Acesso em: 1 fev. 2021.

SILVERSTONE, R. **Por que estudar a mídia?** 3. ed. São Paulo: Loyola, 2011.

SIMON, L. W.; ARNONI, T. H.; PACHECO, A. S. V. Avaliação de egressos: perfil, perspectivas

e interesses dos alunos diplomados em duas instituições de ensino superior catarinenses. *In:* COLÓQUIO INTERNACIONAL DE GESTÃO UNIVERSITÁRIA, 17., 2017, Mar del Plata. **Anais eletrônicos** [...]. Mar del Plata: UFSC/MDP, 2017. Disponível em: https://repositorio.ufsc.br/xmlui/handle/123456789/181052. Acesso em: 17 jul. 2023.

SOUZA, A. C. de; ALEXANDRE, N. M. C.; GUIRARDELLO, E. de B. Propriedades psicométricas na avaliação de instrumentos: avaliação da confiabilidade e da validade. **Epidemiologia e serviços de saúde**, Brasília, v. 26, n. 3, p. 649-659, 2017. Disponível em: https://www.scielo.br/j/ress/a/v5hs6c54VrhmjvN7yGcYb7b/. Acesso em: 8 jan. 2023.

STEMLER, S. A comparison of consensus, consistency, and measurement approaches to estimating interrater reliability. **Practical Assessment, Research, and Evaluation**, [*S. l.*], v. 9, p. 4, 2004. Disponível em: https://scholarworks.umass.edu/pare/vol9/iss1/4/. Acesso em: 8 dez. 2023.

STEVENS, J. P. **Applied multivariate statistics for the social sciences**. 5. ed. New York: Routledge, 2009.

TILDEN, V.; NELSON, C.; MAY, B. Use of qualitative methods to enhance content validity. **Nursing Research**, [*S. l.*], v. 39, n. 3, p. 172-175, 1990.

XAVIER, F. J. R.; FREITAS, A. V. Sentidos de currículos em Matemática captados nos memoriais de formação de docentes que lecionam na EJA da zona rural de Sobral. **Revista de Ensino de Ciências e Matemática**, São Paulo, v. 14, n. 1, p. 1-22, 2023. Disponível em: https://revistapos.cruzeirodosul.edu.br/index.php/rencima/article/view/3895. Acesso em: 20 fev. 2023.