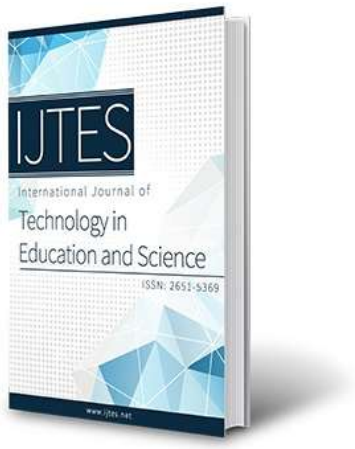

www.ijtes.net

Digital Competencies Scale for Teachers: A Validity and Reliability Study

Büşra Arık Güngör
Kayseri Measurement and Assessment Center, Turkiye

Mustafa Metin
Erciyes University, Turkiye

Sibel Saraçoğlu
Erciyes University, Turkiye

To cite this article:

Arık Güngör, B., Metin, M., & Saraçoğlu, S. (2025). Digital Competencies Scale for Teachers: A validity and reliability study. *International Journal of Technology in Education and Science (IJTES), 9*(3), 374-396. https://doi.org/10.46328/ijtes.629

IJTES International Journal of Technology in Education and Science
2025, Vol. 9, No. 3, 374-396 https://doi.org/10.46328/ijtes.629

Digital Competencies Scale for Teachers: A Validity and Reliability Study

Büşra Arık G üngör, Mustafa Metin, Sibel Saraçoğlu

Article Info

Article History

Received:
23 January 2025
Accepted:
28 June 2025

Keywords

Digital competence
Educational sciences
Scale development
Teacher

Abstract

The aim of this study is to develop a valid and reliable scale that can be used to assess teachers' digital competencies. The research employed a survey design, one of the quantitative research methods. The sample of the study consisted of 463 teachers from various disciplines working in Kayseri during the 2023-2024 academic year. Initially, a review of the literature was conducted, and a draft scale with 52 items in a five-point Likert format was created from a pool of 65 items. To ensure content validity, expert opinions were sought, and necessary adjustments were made based on the feedback. Exploratory and confirmatory factor analyses were conducted to establish the construct validity of the scale. As a result of the exploratory factor analysis, a six-factor, 32-item structure was identified, consisting of the following factors: "Empowering Students", " Developing Students' Digital Competence ", " Managing the Teaching-Learning Process", " Using Digital Resources", " Ensuring Professional Engagement" and " Ability to Evaluate and Assess" The confirmatory factor analysis confirmed the results of the exploratory factor analysis. To assess the reliability of the scores obtained from the scale, Cronbach's alpha internal consistency coefficients were calculated for both the overall scale and its sub-factors. Based on the analyses, the researchers determined that the scale is valid and reliable and recommended its use for assessing teachers' digital competencies.

Introduction

Technological advancements, accelerated by the Fourth Industrial Revolution, such as artificial intelligence, the Internet of Things, robotics, augmented reality, cloud computing, data analytics, cyber-physical systems, and cybersecurity, have also led to significant economic and sociocultural transformations (Schmidt, 2017). In the context of the Sustainable Development Goals (SDGs) for 2030, it is highlighted that the widespread use of Information and Communication Technologies (ICT) has the potential to rapidly advance digital culture and promote the development of inclusive knowledge societies (Benali & Mak, 2022). It is predicted that many future jobs will require digital skills (Olivares et al., 2018). Therefore, individuals must be equipped with certain skills to adapt to these ongoing changes and developments (Levano-Francia et al., 2019). In this regard, individuals should be able to critically evaluate, use, and share information in response to the ever-evolving and advancing technologies (Castro-Granados & Artavia-Diaz, 2020; Napal Fraile et al., 2019). In other words, with the rapid access to information brought about by digitalization, individuals are expected to possess digital competencies that allow them to assess the accuracy and objectivity of information, manage and share it effectively, and utilize

media proficiently (Bejakovic & Mrnjavac, 2020; Napal Fraile et al., 2018; Pangrazio et al., 2020).

Digital competence is an evolving concept that is shaped not only by technological advancements but also by political and economic goals and expectations related to citizenship in the information society. Although various definitions of digital competence exist in the literature, it can generally be described as a broad set of skills that encompass individuals' ability to use digital technologies effectively, critically, and safely. In this context, digital competence includes not only technical skills but also the ability to use digital technologies in a meaningful and conscious manner, organize and share information effectively, solve problems, communicate, collaborate, and adapt to digital culture. Furthermore, digital competence involves a commitment to continuous development and ethical use as part of lifelong learning (Alarcon et al., 2020; Blanco, 2018; Ferrari, 2012; Ilomaki et al., 2016). This definition demonstrates that being digitally competent goes far beyond possessing technical skills, and that the ability to use digital tools and technologies is merely one of the many aspects of digital competence (Falloon, 2020).

The foundation for individuals' expected technological competence and development is laid in educational settings. Factors such as the information explosion resulting from increased internet use, the Fourth Industrial Revolution, innovative pedagogical approaches, and the transition to open educational resources have necessitated the adaptation of education systems to these changes. This has not only altered the demands on teachers but also highlighted the need for a significant transformation of their roles (Maldonado-Mahauad et al., 2018; McGreal, 2017; Redecker, 2017; Reyna et al., 2018; Schmidt, 2017; Suarez-Rodriguez et al., 2018). Consequently, the teaching profession is becoming increasingly complex, requiring teachers to possess a broader range of competencies (Mubmann et al., 2021). In addition to their traditional roles, modern educators are now expected to perform a wider variety of tasks, including understanding the individual needs of students, using technology effectively, conducting data analysis, enhancing communication skills, guiding students, and at times, even providing mentorship. Thus, teachers are no longer merely transmitters of knowledge but are seen as facilitators of digital learning environments (Yelubay et al., 2022). Therefore, educators must design learning environments in which students can collaborate with peers, and develop critical thinking and creativity skills while using digital technologies (Harari, 2018; Yılmaz Ergül & Taşar, 2023).

Teachers play a key role in the appropriate use of digital technologies (OECD, 2019). Therefore, it is crucial to enhance teachers' digital competencies in order to prepare students for life and their future careers (Instefjord & Munthe, 2017; Starkey, 2019). Research indicates that teachers with strong digital competence do not face challenges in integrating digital technologies into their lessons or in enabling students to learn and use these technologies effectively (Dinçer, 2018). In a report published by the OECD (2019) on the opportunities and potential risks posed by digital transformation, it is highlighted that the use of digital resources by teachers lacking appropriate digital skills could distract both students and teachers, resulting in negative impacts on learning outcomes. Ristic (2018) emphasizes that teachers' digital competence is not only related to the rapid changes and developments in ICT but is also closely linked to their pedagogical, subject knowledge, psychological, and methodological competencies, as well as the development of these qualities, making it a dynamic and complex issue. Consequently, determining the digital competencies expected of teachers in line with the needs of the digital

age and developing teachers accordingly has become inevitable (Benali & Mak, 2022; Galkina, 2017; Redecker, 2017). The pandemic period has been one of the most concrete examples demonstrating the importance of ICT as a learning tool and the significance of teachers' digital competencies (Erbilgin & Şahin, 2021; Kalimullina et al., 2021).

In recent years, with the increasing focus on defining the characteristics of digital competencies expected from teachers and how these competencies should be strengthened, various digital competence frameworks have been developed by different countries and organizations to serve as guidelines for teachers (Brox, 2017). Some of these include the "Model of Teachers' Digital Competence" (Krumsvik, 2012), the "Three-Pillar Model of Professional Digital Competence" (Ottestad et al., 2014), "ISTE Standards for Educators" (ISTE, 2017), the "European Framework for the Digital Competence of Educators (DigCompEdu)" (Redecker, 2017), the "Education and Skills 2030 Project" (OECD, 2019), and the "Higher Education Digital Competence Framework (HeDiCom)" (Tondeur et al., 2023). Among the frameworks developed to assess teachers' digital competencies, DigCompEdu, evaluated by 179 experts, has emerged as the most suitable and widely used framework. DigCompEdu aims to enable teachers to diversify learning environments using digital technologies, enhance students' digital competencies, and ensure their safety in the digital world. DigCompEdu comprises 22 competencies organized into six areas: professional engagement (institutional collaboration, professional cooperation, reflective practice, continuous professional development), digital resources (selection of digital resources, managing, protecting, and sharing resources, creating and editing digital content), teaching and learning processes (teaching, guidance, collaborative learning, self-directed learning), assessment (assessment methods, data analysis, feedback and planning), empowering learners (accessibility, inclusivity, personalization, differentiation, ensuring active student participation), and facilitating students' digital competence (media literacy, digital communication and collaboration, responsible usage, problem-solving) (Ghomi & Redecker, 2019).

In Turkey, the 2017 publication of the "General Competencies for the Teaching Profession" by the Ministry of National Education (MoNE) includes the statement, "Uses ICT effectively in the learning and teaching process," under the "Professional Skills" section of the competency indicators. Additionally, through the "Digital Transformation in Teacher Education" project planned by MoNE, the aim is to develop and enhance teachers' digital competencies to equip students with 21st-century skills and nurture a productive generation (MoNE, 2020).

The process of developing teachers' digital competencies begins with assessing their ability to use digital technologies in education—specifically how, where, for what purpose, and when to use them (Kozuh et al., 2021). For this reason, it is first necessary to measure teachers' digital competencies. Measuring teachers' digital competencies is essential because teachers who possess digital skills can effectively use technology to offer students a more impactful learning experience. This helps students develop their digital skills and prepares them for the demands of future work and life. Therefore, assessing teachers' digital competencies is crucial for student success. Teachers with digital competencies can enrich their teaching materials using various digital tools and resources, enabling students to learn more effectively and making the learning process more engaging. Thus, measuring teachers' digital competencies is essential and necessary to improve the quality of education. Teachers with digital competencies can bridge the digital divide among students, ensuring equality in education by

providing every student with equal access to technology. Digital competencies are a fundamental requirement for teachers to continuously develop themselves. As technology evolves rapidly, it is crucial for teachers to keep pace with these changes and utilize the latest technologies and educational approaches. Teachers with digital competencies can communicate more effectively with students, parents, and other educational stakeholders. Moreover, by using digital tools, they can perform tasks such as lesson planning, assessment, and evaluation more efficiently (UNESCO, 2018). Therefore, the data derived from assessing teachers' digital competencies is vital for supporting their personal development and improving student success.

A valid and reliable scale is required to assess teachers' digital competencies. From this perspective, it can be stated that there is a significant need for studies aimed at developing scales to assess and evaluate teachers' levels of digital competence. When the national and international literature is reviewed, it is evident that various scale development studies have been conducted to assess the digital competencies of teachers and teacher candidates (Alarcon et al., 2020; Çebi & Reisoğlu, 2022; Gümüş & Kukul, 2020; Karakuş et al., 2022; Toker et al., 2021; Tzavilkou et al., 2022; Yılmaz Ergül & Taşar, 2023; Wang et al., 2021). When assessing teachers' digital competencies, their social, cultural, ethical, and educational nature should also be taken into consideration. Although the competencies expected from teachers are aligned with the needs of the age, they may vary depending on the cultural, social, and economic characteristics of the country (He & Li, 2019; Ilomaki et al., 2016; Skantz et al., 2022). In this context, it is believed that there is a need for an up-to-date scale capable of meeting both global and national requirements for assessing teachers' digital competencies, and a valid and reliable scale is intended to be developed to address this need. The developed scale is expected to serve as an important resource for determining the current state of teachers' digital competencies and identifying the areas where teachers require further development. Furthermore, the results of this research could guide the development of supportive training programs and even teacher education programs aimed at enhancing teachers' digital competencies after assessing and evaluating their levels. In addition, this developed scale is expected to contribute to the literature by being used as a data collection tool in studies on teachers' digital competencies. In line with the research objectives, the following questions are sought to be answered:

- Is the Teachers' Digital Competencies Scale reliable?
- Is the Teachers' Digital Competencies Scale valid?

Method

Research Design

The study employed a survey design, which is one of the quantitative research designs. Quantitative research focuses on the collection, analysis, and interpretation of numerical data and typically aims to test hypotheses. This method involves the use of quantitative data to understand a particular phenomenon or determine relationships (Creswell, 2014). Survey research, in particular, is a type of quantitative research conducted on large samples to determine participants' interests, attitudes, and skills (Büyüköztürk et al., 2021). In this study, a survey method was chosen to determine the validity and reliability of the Teachers' Digital Competencies Scale, developed using data from a large sample of participants.

Population and Sample

The accessible population of this research consists of teachers from various disciplines working in the city of Kayseri. The sample of the study was selected using a probabilistic (random) sampling method from among teachers who volunteered to participate in the study. In random sampling, each component of the population has an equal chance of being included in the sample (Patton, 2018). Therefore, the random sampling method was chosen for this study, as each teacher had an equal probability of being selected for the sample. The demographic information of the participating teachers is shown in Table 1.

Table 1. Demographic Characteristics of Teachers

Demographic Variables	Category	Frequency	Percentage
Gender	Female	247	53.0%
	Male	219	47.0%
Age	20-30	56	12.0%
	31-40	255	54.7%
	41-50	132	28.3%
	51-60	23	4.9%
Location	City Center	353	75.8%
	District Center	44	9.4%
	Town/Village	14	3.0%
	Rural Area	55	11.8%
Educational Level	Bachelor's Degree	308	66.1%
	Master's Degree	140	30.0%
	Doctorate	18	3.9%
Professional Experience	1-5 years	25	5.4%
	6-10 years	93	20.0%
	11-15 years	162	34.8%
	16-20 years	72	15.5%
	21-25 years	93	20.0%
	26+ years	21	4.5%
Subject Area	Turkish	37	7.9%
	Mathematics	95	20.4%
	Science	188	40.3%
	Social Studies	35	7.5%
	Primary Teacher	19	4.1%

Demographic Variables	Category	Frequency	Percentage
	Religious Education	15	3.2%
	English	26	5.6%
	Other Subjects	51	10.9%

As seen in Table 1, 53.0% of the teachers participating in the study were female, while 47.0% were male. In terms of age, 12.0% of the participants were aged 20-30, 54.7% were aged 31-40, 28.3% were aged 41-50, and 4.9% were aged 51-60. Regarding location, 75.8% of the teachers worked in city centers, 9.4% in district centers, 3.0% in towns or villages, and 11.8% in rural areas. In terms of educational attainment, 66.1% of the participants held a bachelor's degree, 30.0% had a master's degree, and 3.9% had a doctorate. The professional experience of the teachers ranged from 1-5 years (5.4%) to 26 years and above (4.5%), with the majority (34.8%) having 11-15 years of experience. Regarding subject areas, 7.9% of the teachers taught Turkish, 20.4% taught Mathematics, 40.3% taught Science, 7.5% taught Social Studies, 4.1% were Primary Teachers, 3.2% taught Religious Education, 5.6% taught English, and 10.9% were from other subject areas. Overall, the participants were heterogeneous in terms of various demographic variables.

In the CFA application conducted in order to verify the factor structures of the scale obtained as a result of the exploratory factor analysis conducted in the study, the sample consists of 200 teachers who were not included in the sample previously applied to the scale. When the characteristics of the teachers participating in the confirmatory factor analysis are taken into consideration, it is seen that 52% are female and 48% are male, when the age range is examined, it is seen that 17.0% are 20-30, 54.9% are 31-40, 23.3% are 41-50, and 4.7% are over 51-60.

In addition, when the teachers are examined in terms of their place of duty, it is seen that 65.5% are in the city center, 19.7% are in the district center, 4.2% are in a town/town, and 10.6% are in a village school. When the teachers are examined on a branch basis, it is seen that 17.9% are Turkish, 10.4% are Mathematics, 35.3% are Science, 12.5% are Social Studies, 5.2% are Class Teachers, 2.1% are Religious Education and Human Rights Education, 6.7% are English and 9.8% are from other branches. Since the teachers who underwent EFA and CFA were different groups, it can be said that the sample included in the study consisted of a total of 633 people.

Development of the Measurement Tool

In the process of developing the scale to assess teachers' digital competencies, several studies on scale development steps were reviewed (Aslan & Erbenzer, 2023; Aydoğan & Gündoğdu, 2023; Cabero-Almenara et al., 2023; Cohen and Swerdlik, 2009; Davis, 1992; Devellis, 2017; Karakuş et al., 2022; Kuş Gürbey & Metin, 2022; Metin & Korkman, 2021; Toker et al., 2021; Yılmaz et al., 2021). Based on these reviews, a five-step process was followed in developing the scale: item pool creation, expert consultation for item evaluation, preparation of the draft scale and pilot testing, and validity and reliability analyses. Each stage of the process is explained in detail below.

Item Pool Creation

In creating the scale items, a literature review was conducted on the topic of teachers' digital competencies. The theoretical foundations of "Teachers' Digital Competencies," their significance, their impact on educational outcomes, expectations from teachers, developed competency frameworks, and scale development studies on this subject were thoroughly examined (ISTE, 2017; Kelentric et al., 2017; Krumsvik, 2012; Ottestad et al., 2014; Redecker, 2017; Tondeur et al., 2023; UNESCO, 2018). Based on the findings from these sources, the necessary digital competencies for teachers were identified, and scale items were drafted. Additionally, face-to-face interviews were conducted with five teachers, and feedback was collected from ten teachers through an open-ended survey. In these interviews, teachers were asked questions such as: "For what purposes and which digital resources do you use?", "Which digital technology tools do you use in teaching, learning, assessment, and evaluation processes, and for what purposes?", and "What do you do, and how do you do it, to empower students and enhance their digital competencies?" As a result of the literature review and the interviews with teachers, a 52-item draft scale was created using a five-point Likert-type scale with options: "Strongly Disagree", "Disagree", "Neutral", "Agree" and "Strongly Agree".

Consulting Experts

In order to ensure the content and face validity of the draft scale, expert consultation was sought. Content validity refers to whether the scale items adequately reflect the behavior or competencies being measured (Büyüköztürk et al., 2021; Cronbach & Meehl, 1955). The 52-item draft scale developed during this study was reviewed by a subject-matter expert in science education with experience in scale development, who evaluated it in terms of format, meaning, and content validity. Based on the feedback received, necessary revisions were made to the scale. Following expert opinions, eight items were removed, resulting in a 44-item, five-point Likert-type scale.

Pilot Testing

In light of the feedback from the science education expert, the items in the revised scale were randomly ordered prior to the application process. To avoid influencing participants, the purpose of the study was mentioned at the beginning of the scale form, but no specific explanation of "Digital Competence" was provided. The draft scale was pilot tested on 18 teachers. Feedback was collected from the teachers regarding the completion time, clarity of the items, and whether the scale was suitable for the teacher group. Based on the teachers' feedback, it was concluded that the items in the 44-item draft scale were clear, appropriate for teachers, and that the completion time was sufficient.

Descriptive Analysis and Factor Analysis

The scale, revised based on expert feedback, was administered to 466 teachers, and the resulting data were used to conduct validity and reliability analyses. In this process, three participants who answered "Strongly Agree" or "Strongly Disagree" to all items were excluded from the sample. The final analysis was conducted on data from

a sample of 463 teachers. Skewness and kurtosis values were examined to determine whether the scores obtained from the teachers' responses to the draft scale were normally distributed. In addition, the Q-Q plot test and histogram were also examined. For the scale items deemed to exhibit normal distribution, exploratory factor analysis (EFA) was first conducted to ensure construct validity, followed by confirmatory factor analysis (CFA). To determine whether the data were suitable for factor analysis and whether an adequate sample size was used, the Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity were examined. Attention was paid to the significance of the Bartlett test and a KMO value above 0.70 (Kline, 2005; Pallant, 2020; Seçer, 2015). Additionally, to determine the number of factors in the scale, items with eigenvalues greater than one were identified, and it was emphasized that each item's factor loading should be at least 0.30 (Seçer, 2015; Turgut & Baykul, 1992). The "direct oblimin" (oblique rotation) method was applied to identify the ideal factor structure. During the oblique rotation, it was ensured that the factor loadings did not overlap. The higher the variance explained by the factors, the stronger the factor structure of the scale. A variance explained above 40% is recommended for meaningful factors (Kline, 2005; Scherer et al., 1988). This criterion was also considered during the scale development process. Additionally, factor names were assigned based on the items grouped under each factor. The suitability of the factor structure revealed by the EFA was checked using CFA. EFA was applied to the data obtained from 463 participants, and then CFA was performed with 200 participants randomly selected from a different sample group. The model fit was evaluated using criteria such as RMSEA, CFI, GFI, and chi-square. The exploratory factor analysis for the scale was tested using SPSS 27.0, while confirmatory factor analysis was conducted using the Lisrel 10.2 software.

Reliability Analysis

To assess the reliability of the draft scale, Cronbach's alpha internal consistency coefficient and the reliability coefficient for the sub-factors were calculated. A Cronbach's alpha value above 0.70 indicates a high level of reliability for the scores obtained from the scale (Pallant, 2020).

Findings

Findings Related to the Distribution of Data

To determine whether the scale items exhibited normal distribution, the skewness and kurtosis values of the items were first examined. The descriptive statistics of the scale items are presented in Table 2.

Table 2. Descriptive Statistics of Scale Items

Mean	Median	Mode	Standard Deviation	Skewness	Standard Error (Skewness)	Kurtosis	Standard Error (Kurtosis)
175.00	175.00	176.00	12.7354	0.019	0.113	-0.244	0.226

Upon examining Table 2, it can be seen that the skewness and kurtosis values fall within the range of +1 and -1.

Additionally, the mean, median, and mode values are close to each other. Therefore, it can be concluded that the scale data exhibit a normal distribution.To further assess the normality of the distribution of the scale items, the histogram, Q-Q Plot test graphs, and the results of the Kolmogorov-Smirnov and Shapiro-Wilk tests were examined. The normal distribution graphs for the scale items are presented in Figure 1.

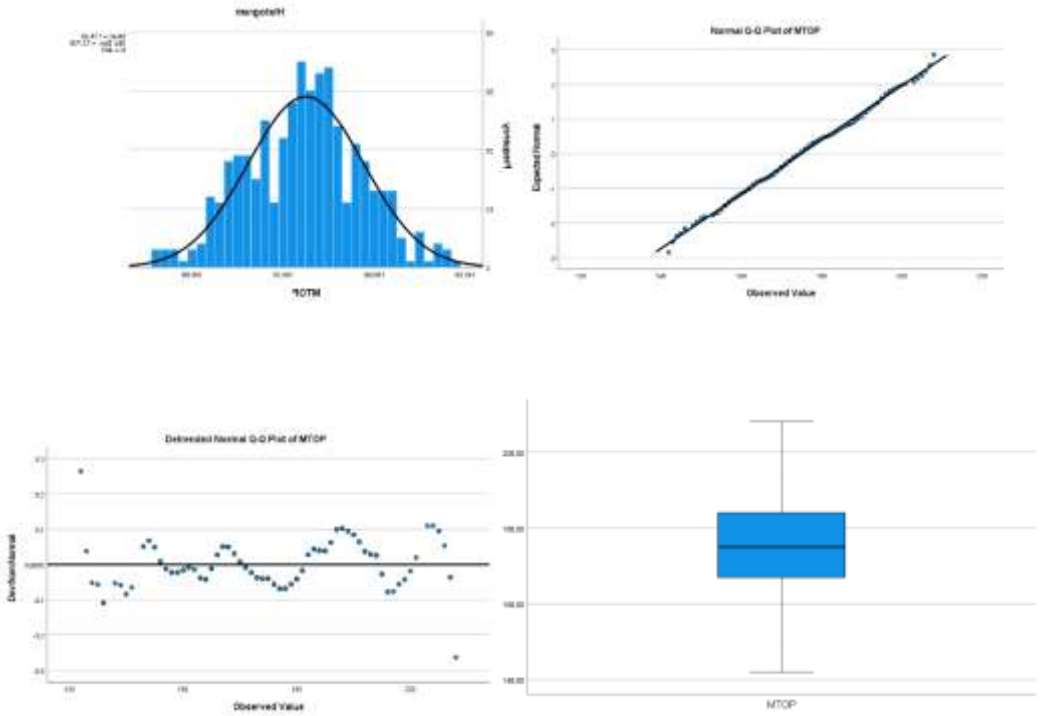

Figure 1. Normal Distribution Graphs of the Scale Items

Upon examining Figure 1, it can be observed that the histogram shows a concentration in the middle, and the majority of the data points in the Q-Q plot graphs align closely with the line. This indicates that the data exhibit a normal distribution. The results of the Kolmogorov-Smirnov and Shapiro-Wilk tests for the scale items are presented in Table 3.

Table 3. Kolmogorov-Smirnov and Shapiro-Wilk Test Results for Scale Items

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
MTOP	0.043	463	0.080	0.995	463	0.148

As shown in Table 3, the significance value of the Kolmogorov-Smirnov test is greater than 0.05. Therefore, it can be concluded that the scale administered to 463 participants follows a normal distribution.

Findings Related to the Validity of the Scale

Given that content and face validity studies were conducted before the draft scale was administered, the relevant data are provided prior to the findings. In the findings section, information is provided regarding the construct

validity study conducted after the application of the scale.To determine the factors of the items in the draft scale, exploratory factor analysis (EFA) was conducted twice. To assess the suitability of the data obtained from the scale application for factor analysis, the KMO (Kaiser-Meyer-Olkin) and Bartlett's test were conducted. The results of the KMO and Bartlett's tests are presented in Table 4**.**

Table 4. KMO and Bartlett's Test Results for the Scale

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.820
Bartlett's Test of Sphericity	Approx. Chi-Square	15353.327
	df	465
	Sig.	0.000

As seen in Table 4, the Bartlett's test result shows a significance (p) value smaller than 0.05, indicating that there is a significant difference between the variables and that there is a sufficient relationship among the variables for conducting factor analysis. Additionally, the fact that this value is smaller than 0.05 suggests that the data exhibit a normal distribution. The KMO value of 0.820 found as a result of the analysis indicates that the sample size is sufficient for determining the factors.

In factor analysis, determining the number of factors involves considering various aspects such as the point of inflection on the scree plot, eigenvalues greater than one, the explained variance ratio, and the contribution of the factor to the total variance (Çokluk et al., 2010; Field, 2005; Pallant, 2020). As a result of the first exploratory factor analysis, a nine-factor structure emerged. Items 7, 22, 44, 26, 33, 34, and 38, which showed overlap, were removed from the scale. Exploratory factor analysis was then repeated with 37 items. Items 8, 13, 27, 31, and 39, which also showed overlap, were removed. Finally, a scree plot of the eigenvalues of the scale items was examined to determine the number of factors for the 32-item scale (see Figure 2).

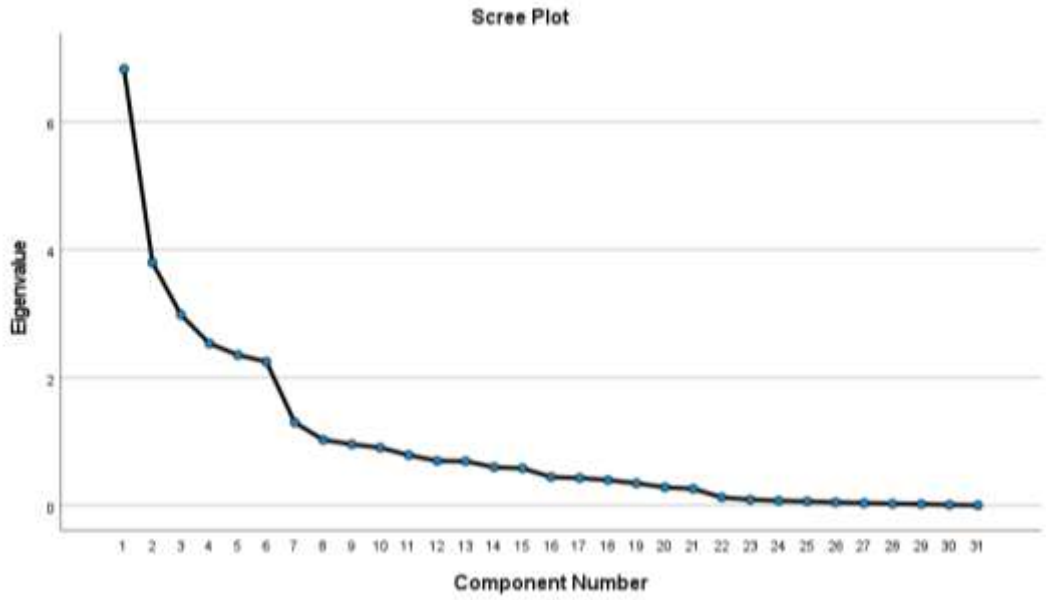

Figure 2. Scree Plot Based on the Second Factor Analysis

Upon examining Figure 2, it was determined that there is a break after the sixth factor, indicating that the number of factors is six. The eigenvalues and variances of the six-factor, 32-item scale are presented in Table 5**.**

Table 5. Eigenvalues and Variance Percentages of the Scale Items

Factor	**Eigenvalue**	**Variance Percentage**	**Cumulative Variance Percentage**
Factor 1	6.839	21.372%	21.372%
Factor 2	3.798	11.870%	33.242%
Factor 3	2.996	9.364%	42.606%
Factor 4	2.554	7.983%	50.588%
Factor 5	2.413	7.542%	58.130%
Factor 6	2.252	7.038%	65.168%

Upon examining Table 5, it can be observed that the 32 items in the scale are grouped under six factors, each with an eigenvalue greater than 1. The variance explained by these six factors for the scale is 65.168%. The items and loadings of the six-factor scale are presented in Table 6.

Table 6. Items and Loadings under the Factors

Scale Items	Factors					
	1.	2.	3.	4.	5.	6.
M30	0.95					
M28	0.95					
M23	0.94					
M21	0.95					
M29		0.97				
M37		0.96				
M2		0.95				
M24		0.51				
M17		0.35				
M42			0.97			
M43			0.96			
M41			0.96			
M40			0.95			
M14				0.96		
M32				0.95		
M16				0.95		
M18				0.55		
M15				0.55		
M1					0.82	
M3					0.76	

Scale Items	Factors					
	1.	2.	3.	4.	5.	6.
M5					0.67	
M11					0.61	
M12					0.37	
M8					0.37	
M36						0.79
M35						0.79
M19						0.70
M4						0.64
M10						0.54
M25						0.51
M6						0.34
M20						0.33

As seen in Table 6, four items are grouped under the first factor, five items under the second factor, four items under the third factor, five items under the fourth factor, six items under the fifth factor, and eight items under the sixth factor. When naming the factors, the semantic appropriateness of the content of the items under each factor is considered (Çakır, 2014). Upon examining the first factor, it is seen that the items reflect teachers' role in empowering students in terms of digital competence. Therefore, the first factor was named "Empowering Students (ES)". The second factor contains items related to supporting or developing students' digital competencies, thus it was named " Developing Students' Digital Competence (DSDC)". The third factor includes items about the use of digital materials in the teaching-learning process, so it was named "Managing the Teaching-Learning Process (MTLP)". The fourth factor contains items related to the use of digital resources, and hence was named "Using Digital Resources (UDR)". The fifth factor includes items concerning teachers' professional development in the context of digital competence, thus it was named "Ensuring Professional Engagement (EPE)". Lastly, the sixth factor includes items related to teachers' competencies in digital assessment and evaluation, and was named " Ability to Evaluate and Assess (AEA) ".To confirm the factors identified in the exploratory factor analysis (EFA), confirmatory factor analysis (CFA) was conducted using the sample group data for the 32-item scale with six factors. The fit indices of the scale items are presented in Figure 3, and the CFA results are provided in Table 7.

When evaluating the confirmatory factor analysis (CFA) results, the chi-square test results were examined. The chi-square value (614.62), divided by the degrees of freedom (df) value (309) for the 200-sample dataset, yielded a value of 1.989. A value below 3 indicates excellent fit (Kline, 2005). Furthermore, the RMSEA value between 0.05 and 0.08 is considered acceptable and indicates a good model fit. Additionally, the GFI value was found to be 0.92, which is above 0.90, demonstrating that the model is acceptable (Durkan, 2017). The CFI and IFI values, both above 0.90, indicate that the correlations between the data and the factor model are within an acceptable range (Bentler, 1990; Sümer, 2000). As a result of the factor analysis confirmation, a draft scale with 32 items and six factors was developed.

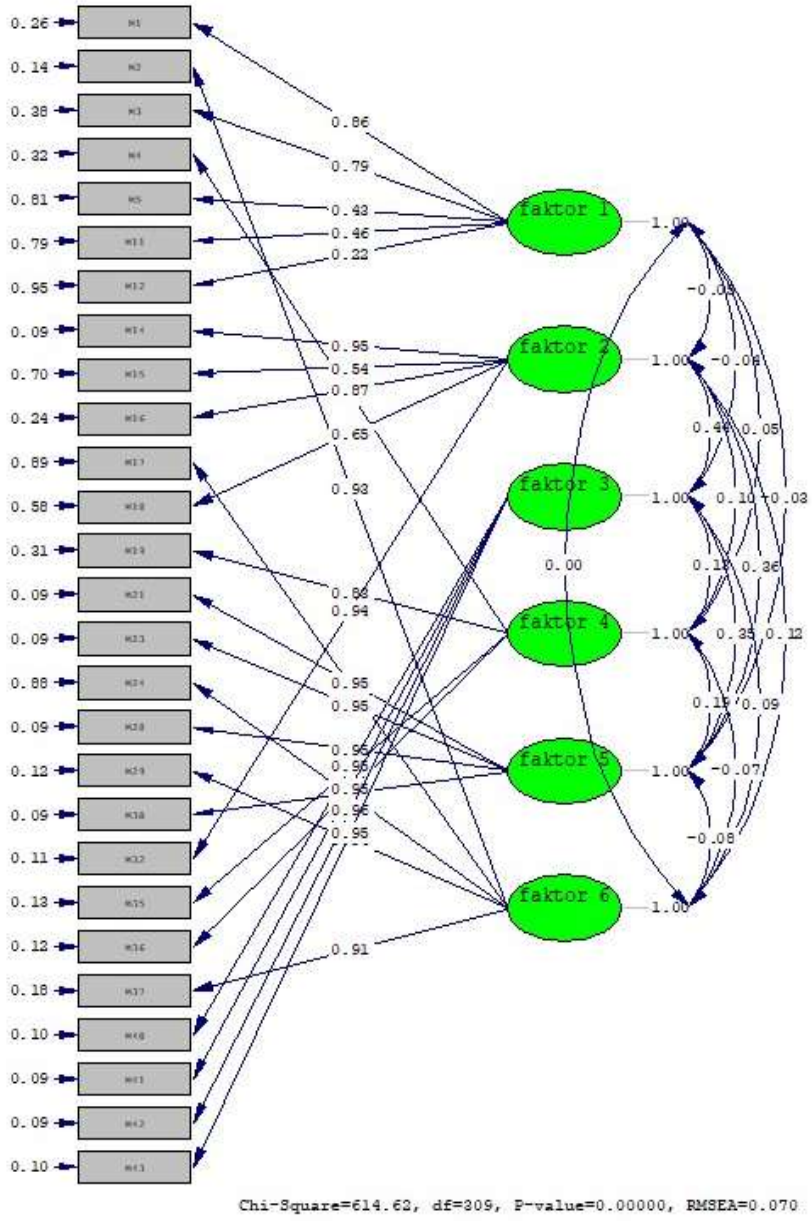

Figure 3. Confirmatory Factor Analysis (CFA) Results of the Scale Items

Table 7. Correlation Values Obtained from the Confirmatory Factor Analysis (CFA)

CFA Results	χ^2	df	χ^2/df	RMSEA	GFI	CFI	IFI
	614.62	309	1.989	0.070	0.92	0.93	0.93

Findings Related to the Reliability of the Scale

In the reliability analysis of the 32-item scale, for which construct validity was confirmed, the Cronbach's Alpha reliability coefficient was found to be $\alpha = 0.92$. When examining the item-total correlations for each item in the scale, it was observed that all items had positive values between 0.31 and 0.84, close to 1. This indicates a high level of internal consistency among the scale items (Büyüköztürk et al., 2021). Additionally, the reliability

coefficient for each factor in the developed scale was calculated, and the results are presented in Table 8.

Table 8. Reliability Coefficients of the Factors

Factors	Cronbach's Alpha Coefficient
Factor 1: ES	0.99
Factor 2: DSDC	0.83
Factor 3: MTLP	0.98
Factor 4: UDR	0.87
Factor 5: EPE	0.71
Factor 6: AEA	0.77

As seen in Table 8, the reliability coefficient for each factor in the scale is above 0.70. Therefore, it can be concluded that the scores obtained from the developed scale are reliable.

Discussion and Conclusions

In this study, a valid and reliable scale was developed to assess teachers' digital competencies. For the validity of the draft scale, content, face, and construct validity studies were conducted. In this context, the path followed in many studies that included content and face validity during the scale development process (Aydoğan & Gündoğdu, 2023; Bayrakçı & Narmanlıoğlu, 2021; Cabero-Almenara et al., 2023; Davis, 1992; Karakuş et al., 2022; Kuş Gürbey & Metin, 2022; Yılmaz et al., 2021) was also followed in the current research. Accordingly, expert opinion was sought for content and face validity. The draft scale form was evaluated according to the opinions of a subject-matter expert. Based on the feedback, some items were removed, and revisions were made to others. Taking this into account, it can be said that the current scale has high content and face validity.

To ensure the construct validity of the scale, both exploratory and confirmatory factor analyses were conducted. The KMO-Bartlett test results were examined to determine the suitability of the current study for factor analysis. The KMO value of 0.820 for the 463-participant sample group indicates that the study is suitable for factor analysis (Bryman & Cramer, 1999; Field, 2013). As a result of the exploratory factor analysis, the total variance explained by the 32-item scale was calculated to be 65.168% for the same sample. According to Henson and Roberts (2006), the variance value should be 52% or higher for scale studies. Therefore, the explained variance value in this study is at an acceptable level. In factor analysis, each factor should have at least two acceptable items. The more items there are under each factor, the higher the reliability and explanatory power of the factors (Seçer, 2017). In the exploratory factor analysis conducted, the presence of four items under the first factor, five under the second, four under the third, five under the fourth, six under the fifth, and eight under the sixth indicates that the factors in the scale are acceptable.

Confirmatory factor analysis (CFA) was conducted to confirm the six factors identified through exploratory factor analysis. For this purpose, a random sample of 200 participants was selected from the previous sample group, and

CFA was conducted on this group. As a result of the CFA, a χ^2/df ratio of 1.989 was obtained, with an RMSEA value of 0.070, a GFI value of 0.92, a CFI value of 0.93, and an IFI value of 0.93, indicating that the CFA model is a good fit. An RMSEA value between 0.050 and 0.080 is considered acceptable (Pallant, 2020). Similarly, GFI, CFI, and IFI values above 0.90 are considered acceptable (Schermelleh-Engel et al., 2003; Özdamar, 2013).

The six factors identified through the analyses were named as follows: ES, DSDC, MTLP, UDR, EPE and AEA. It was found that the resulting factors align with the six sub-competencies of the DigCompEdu framework for educators' digital competencies (Redecker, 2017). There are several studies in the literature with similar and differing results from the current study (Bayrakçı & Narmanlıoğlu, 2021; Kong et al., 2019; Mannila et al., 2018). For example, the scale developed by Mannila et al. (2018) includes five factors: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving. On the other hand, the scale developed by Kong et al. (2019) includes four factors: significance, impact, creativity belief, and competence belief. Similarly to the current study, the scale developed by Toker et al. (2021) consists of a six-factor structure. These differences may be due to variations in the target population and regional differences where the scale development study was conducted. Additionally, the social and cultural differences of the region and the time period in which the study was conducted may also affect the results (He & Li, 2019).

To determine the reliability of the 32-item scale, item-total correlations and Cronbach's Alpha coefficients were examined. The Cronbach's Alpha coefficient was calculated as 0.92 for the overall scale, and as 0.99, 0.83, 0.98, 0.87, 0.71, and 0.77 for each factor, respectively. Since these values exceed the acceptable reliability coefficient of 0.70 for scales, it can be concluded that the scores obtained from the scale are reliable (Anastasi, 1982; Büyüköztürk et al., 2021).

When examining the item-total correlations for each item, values between 0.31 and 0.84 were observed. Item-total correlations of 0.20 and above indicate that the items are consistent with each other and contribute positively to reliability, suggesting that the items in the scale are compatible with one another (Büyüköztürk et al., 2021). This may be due to the content validity ensured by reviewing the relevant literature and obtaining expert opinions during the item development process. Creating items that can evenly sample the content and ensure content validity plays a crucial role in enhancing the reliability and validity of the measurement outcome (Karip, 2015). In conclusion, the developed scale can be considered a valid and reliable tool for assessing teachers' digital competencies.

Recommendations

- The scale, which has been proven to be valid and reliable, can be used to measure teachers' digital competencies.
- This study was conducted only with teachers in the city of Kayseri. Future studies could be conducted with larger samples and in different cities.
- Teachers from different branches participated in the study. Field-specific studies can be conducted with branch-based sample groups.

References

Alarcón, R., Jiménez-Perez, E., & Vicente-Yagüe, M. I. (2020). Development and validation of the DIGIGLO, a tool for assessing the digital competence of educators. *British Journal of Educational Technology, 51*(6), 2407–2421. https://doi.org/10.1111/bjet.12919

Anastasi, A. (1982). *Psychological testing*. Macmillan Publishing Co. Inc.

Aslan, M., & Erbenzer, E. (2023). Development of a scale for teachers' self-efficacy perceptions in developing digital teaching materials. *Journal of Muğla Sıtkı Koçman University Faculty of Education, 10*(2), 226–237.

Aydoğan, R., & Gündoğdu, K. (2023). Development of the digital competence perception scale for primary school: A validity and reliability study. *Korkut Ata Journal of Turkology Studies, Special Issue 1 (100th Anniversary of the Republic)*, 984–999.

Bayrakcı, S., & Narmanlıoğlu, H. (2021). Digital literacy as a set of digital competencies: A scale development study. *Düşünce ve Toplum Social Sciences Journal,* 4, 1–30.

Bejakovic, P., & Mrnjavac, Ž. (2020). The importance of digital literacy on the labour market. *Employee Relations: The International Journal, 42*(4), 921–932. https://doi.org/10.1108/er-07-2019-0274

Benali, M., & Mak, J. (2022). A comparative analysis of international frameworks for teachers' digital competences. *International Journal of Education and Development Using Information and Communication Technology, 18*(3), 122-138.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*(2), 238–246. https://doi.org/10.1037/0033-2909.107.2.238

Blanco, S. M. (2018). Marco común de competencia digital docente. *Revista Iberoamericana de Educación a Distancia, 21*(1), 369-370.

Brox, H. (2017). What's in a wiki? Issues of agency in light of student teachers' encounters with wiki technology. *Nordic Journal of Digital Literacy, 12*(4), 129-142. https://doi.org/10.18261/issn.1891-943x-2017-04-03

Bryman, A., & Cramer, D. (1999). *Quantitative data analysis with SPSS Release 8 for Windows*. Taylor & Francis e-Library, Routledge.

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2021). *Scientific research methods* (31st ed.). Pegem Academy.

Cabero-Almenara, J., Gutiérrez-Castillo, J. J., Guillén-Gámez, F. D., & Gaete-Bravo, A. F. (2023). Digital competence of higher education students as a predictor of academic success. *Technology, Knowledge and Learning, 28*(2), 683-702.

Castro-Granados, A., & Artavia-Diaz, K. Y. (2020). Teaching digital skills: An initial approach. *Revista Electrónica Calidad en la Educación Superior, 11*(1), 47-80. https://doi.org/10.22458/caes.v11i1.2932

Creswell, J. W. (2014). *Araştırma deseni: Nitel, nicel ve karma yaklaşımları* (S. B. Demir, Trans., 4th ed.). Eğiten Kitap.

Çakır, A. (2014). *Factor analysis* (Doctoral thesis, Istanbul Commerce University). YÖK National Thesis Center. http://tez.yok.gov.tr/

Çebi, A., & Reisoğlu, İ. (2020). Digital competence: A study from the perspective of pre-service teachers in

Turkey. *Journal of New Approaches in Educational Research, 9*(2), 294-308.

Cohen, R. J., & Swerdlik, M. E., (2009). *Psychological testing and assessment: An introduction to tests and measurement* (7th Edition). The McGraw-Hill Companies.

Çokluk, Ö., Şekercioğlu, G., & Büyüköztürk, Ş. (2010). *SPSS and LISREL applications for multivariate statistics for social sciences*. Pegem Academy.

Cronbach, L. J., & Meehl, P. E. (1955). Construct validity in psychological test. *Psychological Bulletin*, 281-302.

Davis, L. L. (1992). Instrument review: Getting the most from a panel of experts. *Applied Nursing Research, 5*(4), 194–197. https://doi.org/10.1016/S0897-1897(05)80008-4

Dinçer, S. (2018). Are preservice teachers really literate enough to integrate technology in their classroom practice? Determining the technology literacy level of preservice teachers. *Education and Information Technologies, 23*(6), 2699–2718.

Durkan, E. (2017). Evaluation of the class teachers' applications that enable their students to use metacognitive reading strategies during fourth-grade Turkish lessons: The sample of Giresun province. *Turkish Studies, 13*(4), 519–550. http://doi.org/10.7827/TurkishStudies.12822

Erbilgin, E., & Şahin, B. (2021). The effects of a professional development program for technology integrated algebra teaching. *Research in Educational Policy and Management, 3*(2), 1-21. https://doi.org/10.46303/repam.2021.4

Ergül, D. Y., & Taşar, M. F. (2023). Development and validation of the teachers' digital competence scale (TDiCoS). *Journal of Learning and Teaching in Digital Age, 8*(1), 148–160.

Falloon, G. (2020). From digital literacy to digital competence: The teacher digital competency (TDC) framework. *Educational Technology Research and Development, 68*(5), 2449–2472. https://doi.org/10.1007/s11423-020-09767-4

Ferrari, A. (2012). Digital competence in practice: An analysis of frameworks. Luxembourg: Publications Office of the European Union. https://doi.org/10.2791/82116

Field, A. (2005). *Discovering statistics using SPSS* (2nd ed.). SAGE.

Galkina, L. S. (2017). Methodology for developing future economists' and managers' ICT competence using cloud technologies in training disciplines of information cycle: Specialty "Theory and methodology of training and education" (Doctoral dissertation). Permian State National Research University.

Ghomi, M., & Redecker, C. (2019). Digital competence of educators (DigCompEdu): Development and evaluation of a self-assessment instrument for teachers' digital competence. In *Proceedings of the 11th International Conference on Computer Supported Education* (pp. 541-548). https://doi.org/10.5220/0007679005410548

Gümüş, M. M., & Kukul, V. (2023). Developing a digital competence scale for teachers: Validity and reliability study. *Education and Information Technologies, 28*(3), 2747–2765. https://doi.org/10.1007/s10639-023-11691-0

Gürbey, S. K., & Metin, M. (2022). Development of a self-efficacy scale for preschool teachers on science teaching: Validity and reliability study. *Southeast Asia Early Childhood Journal, 11*(1), 106–129.

Harari, Y. N. (2018). *21. yüzyıl için 21 ders* [21 lessons for the 21st century] (in Turkish). Kolektif Kitap.

He, T., & Li, S. (2019). A comparative study of digital informal learning: The effects of digital competence and technology expectancy. *British Journal of Educational Technology, 50*(4), 1744–1758.

https://doi.org/10.1111/bjet.12778

Henson, R. K., & Roberts, J. K. (2006). Use of exploratory factor analysis in published research: Common errors and some comment on improved practice. *Educational and Psychological Measurement, 66*(3), 393–416. https://doi.org/10.1177/0013164405282485

Ilomaki, L., Paavola, S., Lakkala, M., & Kantosalo, A. (2016). Digital competence: An emergent boundary concept for policy and educational research. *Education and Information Technologies, 21*(3), 655-679. https://doi.org/10.1007/s10639-014-9346-4

Instefjord, E. J., & Munthe, E. (2017). Educating digitally competent teachers: A study of integration of professional digital competence in teacher education. *Teaching and Teacher Education, 67*, 37–45. https://doi.org/10.1016/j.tate.2017.05.016

International Society for Technology in Education. (2017). *ISTE standards for educators*. International Society for Technology in Education.

Kalimullina, O., Tarman, B., & Stepanova, I. (2021). Education in the context of digitalization and culture: Evolution of the teacher's role, pre-pandemic overview. *Journal of Ethnic and Cultural Studies, 8*(1), 226–238. https://doi.org/10.29333/ejecs/347

Karakuş, İ., Sünbül, Ö., & Kılıç, F. (2022). Pre-service teachers' perception of digital competence scale: a validity and reliability study. *Bayburt Education Faculty Journal, 17*(35), 935–956.

Karip, E. (2015). *Ölçme ve değerlendirme* (7th ed.). Pegem Akademi Yayıncılık.

Kelentrić, M., Helland, K., ve Arstorp, A. T. (2017). Professional digital competence framework for teachers. The Norwegian Centre for ICT in education. https://www.udir.no/contentassets/081d3aef2e4747b096387aba163691e4/pfdk-framework.pdf

Kline, R. B. (2005). *Principles and practice of structural equation modeling* (pp. 154–186). Guilford Press.

Kong, S. C., Wang, Y. Q., & Lai, M. (2019). Development and validation of an instrument for measuring digital empowerment of primary school students. In *Proceedings of the ACM*.

Kožuh, A., Maksimović, J., & Osmanović Zajić, J. (2021). Fourth industrial revolution and digital competences of teachers. *World Journal on Educational Technology: Current Issues, 13*(2), 160–177.

Krumsvik, R. J. (2012). The digital school and teacher education in Norway. In R. Schultz-Zander, B. Eickelmann, H. Mozer, H. Niesyto, & P. Grell (Eds.), *Jahrbuch Medienpädagogik 9* [The annual book of Mediapedagogy 9] (pp. 455–480). Springer VS.

Levano-Francia, L., Sanchez Diaz, S., Guillén-Aparicio, P., Tello-Cabello, S., Herrera-Paico, N., & Collantes-Inga, Z. (2019). Competencias digitales y educación. *Propósitos y Representaciones, 7*(2), 569-588.

Maldonado-Mahauad, J., Perez-Sanagustín, M., Kizilcec, R. F., Morales, N., & Munoz-Gama, J. (2018). Mining theory-based patterns from big data: Identifying self-regulated learning strategies in massive open online courses. *Computers in Human Behavior, 80*, 179-196. https://doi.org/10.1016/j.chb.2017.11.011

Mannila, L., Nordén, L. Å., & Pears, A. (2018). Digital competence, teacher self-efficacy and training needs. In *Proceedings of the 2018 ACM Conference on International*.

McGreal, R. (2017). Special report on the role of open educational resources in supporting the sustainable development goal 4: Quality education challenges and opportunities. *International Review of Research in Open and Distributed Learning, 18*(7), 292–305. https://doi.org/10.19173/irrodl.v18i7.3541

MEB. (2020). *Öğrenme süreçlerinde dijital içerik ve beceri destekli dönüşüm*.

Metin, M. & Korkman, N. (2021). A valid and reliable scale development study to determine the problems encountered by teachers in the distance education process*, Journal of Educational Technology & Online Learning, 4*(2), 215-235

Mußmann, F., Hardwig, T., Riethmüller, M., Klötzer, S., & Peters, S. (2021). *Arbeitszeit und Arbeitsbelastung von Lehrkräften ve Frankfurter Schulen 2020: Ergebnisbericht*. Büchner-Verlag.

Napal Fraile, M., Penalva-Velez, A., & Mendioroz Lacambra, A. M. (2018). Development of digital competence in secondary education teachers' training. *Education Sciences, 8*, 104. https://doi.org/10.3390/educsci8030104

OECD. (2019). *OECD skills outlook 2019*. Retrieved November 15, 2019, from https://www.oecd-ilibrary.org/sites/df80bc12-en/index.html?itemId=/content/publication/df80bc12-en

Olivares Carmona, K. M., Angulo Armenta, J., Prieto Méndez, M. E., & Torres Gastelú, C. A. (2018). EDUCATIC: Implementación de una estrategia tecnoeducativa para la formación de la competencia digital universitaria. *Pixel-Bit: Revista de Medios y Educación, 53*, 27–40.

Ottestad, G., Kelentrić, M., & Guðmundsdóttir, G. (2014). Professional digital competence in teacher education. *Nordic Journal of Digital Literacy, 9*(4), 243–249. https://doi.org/10.18261/ISSN1891-943X-2014-04-02

Özdamar, K. (2013). *Scale and test development in education, health, and behavioral sciences: Structural equation modeling.* Nisan Publishing.

Pallant, J. (2020). *SPSS survival manual* (7th ed.). Taylor & Francis. https://www.perlego.com/book/2194248/spss-survival-manual-pdf

Pangrazio, L., Godhe, A. L., & Ledesma, A. G. L. (2020). What is digital literacy? A comparative review of publications across three language contexts. *E-Learning and Digital Media, 17*(6), 442-459. https://doi.org/10.1177/2042753020946291

Patton, M.Q. (2018). *Nitel araştırma ve değerlendirme yöntemleri* [Qualitative research and evaluation methods]. (Demir,S.B. & Bütün, M., trans.). Pegem Akademi

Redecker, C. (2017). European framework for the digital competence of educators. Luxembourg: Publications Office of the European Union. https://doi.org/10.2760/159770

Reyna, J., Hanham, J., & Meier, P. (2018). The internet explosion digital media principles and implications to communicate effectively in the digital space. *E-Learning and Digital Media, 15*(1), 36-52. https://doi.org/10.1177/2042753018754361

Ristić, M. (2018). Digitalne kompetencije nastavnika i saradnika. In V. Katić (Ed.), *Trendovi razvoja: Digitalizacija visokog obrazovanja* (pp. 1–14). Univerzitet u Novom Sadu: Fakultet Tehničkih nauka.

Scherer, R. F., Luther, D. C., Wiebe, F. A., & Adams, J. S. (1988). Dimensionality of coping: Factor stability using the ways of coping questionnaire. *Psychological Reports, 62*(3), 763–770. https://doi.org/10.2466/pr0.1988.62.3.763

Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online, 8*(2), 23–74.

Schmidt, V. H. (2017). Disquieting uncertainty: Three glimpses into the future. *European Journal of Futures Research, 5*(1), 1-10.

Seçer, İ. (2017). *Practical data analysis with SPSS and LISREL* (3rd extended ed.). Anı Publishing.

Skantz-Åberg, E., Lantz-Andersson, A., Lundin, M., & Williams, P. (2022). Teachers' professional digital competence: An overview of conceptualisations in the literature. *Cogent Education, 9*(1), 1–23. https://doi.org/10.1080/2331186X.2022.2063224

Starkey, L. (2019). A review of research exploring teacher preparation for the digital age. *Cambridge Journal of Education*. https://doi.org/10.1080/0305764X.2019.1625867

Suárez-Rodríguez, J., Almerich, G., Orellana, N., & Diaz-Garcia, I. (2018). A basic model of integration of ICT by teachers: Competence and use. *Educational Technology Research and Development, 66*, 1165-1187. https://doi.org/10.1007/s11423-018-9591-0

Sümer, N. (2000). Structural equation models: Basic concepts and examples. *Turkish Psychology Writings, 6*(3), 49–73.

Toker, T., Akgün, E., Cömert, Z., & Edip, S. (2021). Digital competence scale for educators: Adaptation, validity, and reliability study. *Milli Eğitim Journal, 50*(230), 301–328.

Tondeur, J., Howard, S., Van Zanten, M., Gorissen, P., Van der Neut, I., Uerz, D., & Kral, M. (2023). The HeDiCom framework: Higher education teachers' digital competencies for the future. *Educational Technology Research and Development, 71*(1), 33–53. https://doi.org/10.1007/s11423-022-10147-2

Turgut, M. F., & Baykul, Y. (1992). *Scaling techniques*. ÖSYM Publications.

Tzafilkou, K., Perifanou, M., & Economides, A. A. (2022). Development and validation of students' digital competence scale (SDiCoS). *International Journal of Educational Technology in Higher Education, 19*(1), 30. https://doi.org/10.1186/s41239-022-00327-6

United Nations Educational, Scientific and Cultural Organization (UNESCO) (2018). UNESCO ICT Competency Framework for Teachers, https://unesdoc.unesco.org/ark:/48223/pf0000265721

Wang, X., Wang, Z., Wang, Q., Chen, W., & Pi, Z. (2021). Supporting digitally enhanced learning through measurement in higher education: Development and validation of a university students' digital competence scale. *Journal of Computer Assisted Learning, 37*(4), 1063–1076. https://doi.org/10.1111/jcal.12548

Yelubay, Y., Dzhussubaliyeva, D., Moldagali, B., Suleimenova, A., & Akimbekova, S. (2022). Developing future teachers' digital competence via massive open online courses (MOOCs). *Journal of Social Studies Education Research, 13*(4), 73–97.

Yılmaz, E., Aktürk, A., & Çapuk, S. (2021). Dijital öğretmen yeterlilik ölçeği geliştirme: Geçerlik ve güvenirlik çalışması. *Adıyaman Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 38*, 34–68.

Author Information

Büşra Arık Güngör

https://orcid.org/0000-0002-0334-0786

PhD student

Kayseri Measurement and Assessment Center

Turkiye

Contact e-mail: *busrarik38@gmail.com*

Mustafa Metin

https://orcid.org/0000-0002-6936-510X

Erciyes University Faculty of Education

Turkiye

Sibel Saraçoğlu

https://orcid.org/0000-0001-9023-7383

Erciyes University Faculty of Education

Turkiye

Appendix 1. Digital Competencies Scale For Teachers

	Strongly Disagree **(1)** Disagree **(2)** Neutral **(3)** Agree **(4)** Strongly Agree **(5)**	**1**	**2**	**3**	**4**	**5**
	Factor 1: Empowering Students (ES)					
1	I can develop digital content that contributes to the social development of our students.					
2	I am unable to create digital content that enhances our students' skills (such as creativity, problem-solving, etc.).					
3	I can ensure that all students have access to learning resources.					
4	I can select digital content that is appropriate for our students' abilities.					
	Factor 2: Developing Students' Digital Competence (DSDC)					
1	I can teach students how copyright is applied.					
2	I guide students in analyzing digital information.					
3	I can select appropriate digital tools for students to become digitally literate.					
4	I can provide opportunities for students to critically evaluate digital resources.					
5	I can ensure that students verify the reliability of the digital information and resources they access.					
	Factor 3: Managing the Teaching-Learning Process (MTLP)					
1	I can use digital technology when creating lesson plans.					
2	I can use digital technology to support collaborative learning among students.					
3	I am unable to use digital technology to support students' self-directed learning.					
4	I can select digital materials that are appropriate for the subject.					
	Factor 4: Using Digital Resources (UDR)					
1	I can reorganize existing digital resources related to my field.					
2	I can protect lesson-related content by using storage platforms.					
3	I can ensure the proper use of digital resources in accordance with copyright regulations.					
4	I can create new digital resources related to the topic to be covered in class.					
5	I can select digital resources that are appropriate for students' individual differences.					
	Factor 5: Ensuring Professional Engagement (EPE)					
1	I can use digital technology in communication related to my institution.					
2	I can use digital technology to collaborate with my colleagues.					
3	I can share social media accounts that produce digital content related to my field.					
4	I can access digital technology to contribute to my professional development.					
5	I am unable to use digital technology for opening courses or providing training.					
6	I struggle to find digital resources that align with the learning objectives.					
	Factor 6: Ability to Evaluate and Assess (AEA)					
1	I can enable students to evaluate their own learning processes using digital technology.					
2	I can create digital assessment and evaluation activities that are suitable for student					

	Strongly Disagree **(1)** Disagree **(2)** Neutral **(3)** Agree **(4)** Strongly Agree **(5)**	**1**	**2**	**3**	**4**	**5**
	characteristics.					
3	I am unable to design interactive assessment tools appropriate for students.					
4	I can prepare digital assessment tools for evaluating what is taught in class.					
5	I am unable to use programs that track students' progress in an electronic environment.					
6	I can create a digital student portfolio to monitor students' progress.					
7	I can use digital content to analyze exams taken by students.					
8	I can use digital tools to provide feedback to students.					