



# Social inclusion as a perspective for the validation of the "DigCompEdu Check-In" questionnaire for teaching digital competence

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## Abstract

Making use of digital technologies and all the possibilities that benefit education is one of the objectives of the European Framework for the Digital Competence of Educators, as well as their potential for personal development and social inclusion, among other aspects. The aim of this study was to validate the «DigCompEdu Check-In» scale as an instrument for the self-reflection of educators regarding their digital competence from the perspective of social inclusion. This questionnaire provides a more accurate view of the digital competence framework and allows self-evaluating the strengths and weaknesses/needs of educators in digital learning. Exploratory and confirmatory factor analyses were performed, using structural equations. The study sample consisted of 2,262 faculty members from different public universities of Andalusia (Spain). The obtained results show the reliability and validity of the instrument and allow generating accurate scientific knowledge for the improvement of education quality and social inclusion, in both university and non-university institutions.

**Keywords** Social inclusion · Digital competence · University teaching · ICT · Structural equation method

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## 1 Inclusion, digital competences and ICT

Digital society is already a reality. In previous decades, education has incorporated Information and Communication Technologies (ICTs) in the teaching practice; however, the COVID-19 pandemic has demonstrated that there is no return, and that ICTs are here to stay. These great changes, generated by the immersion of ICTs in the education system, caused the demand and need for more flexible spaces that respond to those needs that emerge from facing new situations in the teaching and learning processes, which require the development of new strategies that increase the capacity of educators to carry out their teaching practice, regardless of the formative scenario from which they have to implement their teaching (Ayale-Pérez & Joo-Nagata, 2019; Ilomäki et al., 2016).

Digital competence (i.e., the capacity to use technology and the cognitive capacity required to do so successfully) is essential within the current and future process of social inclusion. The phenomenon of ICTs and their impact on the scope of education could be contemplated from a double perspective. On the one hand, they have contributed to the expansion of the digital divide, and their incorporation has promoted aspects of inequality (e.g., people who have access vs those who do not; people who have skills vs those who do not) and differences of not only development spaces, but also in the frontiers that are set in terms of digital literacy (Nilholm, 2021; Vyrastekova, 2021; Mercader & Duran-Bellonch, 2021). On the other hand, ICTs are presented as an opportunity for the inclusion of all disadvantaged people (training, work, health, access to information, expression, etc.). Therefore, diversity and social inclusion are directly linked to the use of ICTs in the so-called Information and Knowledge Society. However, it is important to take into account that the sole presence of digital technologies and materials do not guarantee an inclusion process; on the contrary, their proper use and management favour social inclusion, as long as several conditions are met, which Cabero & Córdoba (2009) highlighted as necessary for a true educational digital inclusion: “Firstly, ICTs must be present; then, access to and use of technology; and lastly, a process of digital literacy must be generated to learn the symbolic languages of an information and knowledge society”.

From education, the aim is “to provide opportunities of professional and personal growth through meaningful experiences that lead to the development of useful skills, knowledge, aptitudes and habits to become a functional part of society”. To this end, social inclusion is especially important, as it generates a conglomerate of opportunities through the global acceptance of its members, as long as it is considered an essential strategy to overcome the inequalities (personal, cultural and economic) that derive from difference. In this sense, a value of justice is granted to digital inclusion, as it improves the quality of life through the accessibility to digital services, digital literacy, the responsible use of ICTs, and the access to education and the job market.

In this context, digital competences are set as an element that can favour educational marginalisation, since the educator who does not have the fundamental

skills (digital) to perform well in the new school (i.e., “pushed” and “transformed” by the events of the last years) may become obsolete. As was stated by Maestre et al. (2017), “such cultural context leads to a certain marginalisation for those people who do not have the necessary competences to perform well in the current mutation and transformation of digital society”. As has been pointed out by different authors (Díaz-García et al., 2016; He & Zhu, 2017; Hsu, 2010; Misk Foundation, 2021), research suggests that better qualification in the use of technology increases the probabilities of educators to integrate ICTs successfully in their teaching. Thus, it is necessary to reinvent the teacher role and, consequently, the education systems.

The European Framework for the Digital Competence of Educators (DigCompEdu) (Barragán-Sánchez et al., 2021; Cabero-Almenara et al., 2011, 2020a, b; Redecker & Punie, 2017; Rodríguez-García et al., 2019) aims to support the national, regional and local efforts to promote the digital competence of educators, providing a European space of reference, with a common language and logic (Ilomäki et al., 2016; Mattar et al., 2022). The present study is based on such space to establish this research line, through the design of a scale of teacher digital competences that aims to measure different dimensions. From this article, the attention is focused on the competence called “student empowerment”, from which accessibility, inclusion, personalisation and active commitment of the students with their own learning provide a view of the digital needs for an inclusive society (Derenzis et al., 2020; Lin et al., 2020).

In this study, we attempted to validate the scale called “DigCompEdu Check-In”, which is used for the self-reflection of educators to allow them to self-evaluate their strengths and weaknesses/needs or areas for improvement in digital learning. Taking into account the importance of having a powerful instrument that can be used to self-evaluate the competences of educators, the objectives of the present study were to: a) analyse the validity of the instrument through Cronbach’s alpha and McDonald’s omega; b) analyse the validity of the scale construct by analysing the simple correlations with an exploratory factor analysis; c) guarantee that the information obtained through the analysis and the different interpretations value the reality that is intended to be measured; and d) determine the variables and structure of the scale, showing the relationships between the different dimensions.

## 2 Method

### 2.1 Description of the sample

The population that composed the study sample was constituted by the faculty members of the public universities of Andalusia (Spain) in the academic year 2021/2022. For their selection, incidental or convenience criteria were used, depending on their availability to complete the questionnaire (Hernández-Sampieri et al., 2014).

**Table 1** University, field of knowledge and years of teaching experience of the participating faculty

		f	%
University	Seville	808	35.7
	Pablo de Olavide	214	9.5
	Granada	178	7.9
	Huelva	182	8.0
	Cádiz	276	12.2
	Córdoba	150	6.6
	Málaga	162	7.2
	Jaén	150	6.6
	Almería	142	6.3
Field of knowledge	Arts and Humanities	360	15.9
	Science	346	15.3
	Health Sciences	300	13.3
	Engineering and Architecture	434	19.2
	Social and Legal Sciences	822	36.3
Years of teaching experience	1–3 years	194	8.6
	4–5 years	124	5.5
	6–9 years	194	8.6
	10–14 years	308	13.6
	15–19 years	268	11.8
	20 or more years	1,174	51.9

**Table 2** Validity of the instrument and its dimensions obtained with Cronbach's alpha and McDonald's omega

	Cronbach's alpha	McDonald's omega
Professional commitment	0.749	0.842
Digital resources	0.628	0.807
Digital pedagogy	0.841	0.821
Evaluation and feedback	0.788	0.790
Student empowerment	0.733	0.784
Facilitating student digital competence	0.853	0.898
Total	0.946	0.967

A total of 2,262 faculty members from different public universities of Andalusia completed the questionnaire. Of the total sample, 1,236 (54.6%) were women and 1,026 (45.6%) were men, with two predominating age ranges of 50–54 years (37.3%) and 40–49 years (29.4%). Next, Table 1 shows the data obtained regarding the university of origin, field of knowledge and years of teaching experience (Table 2).

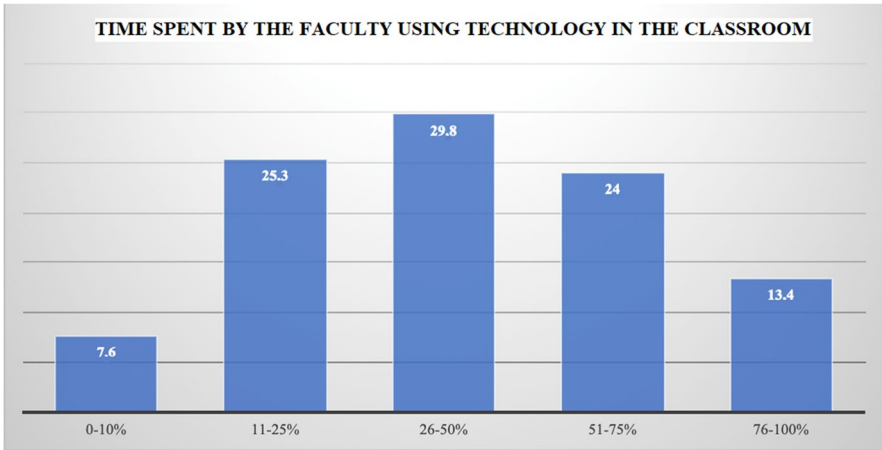


Fig. 1 Time spent by the faculty using technology in the classroom

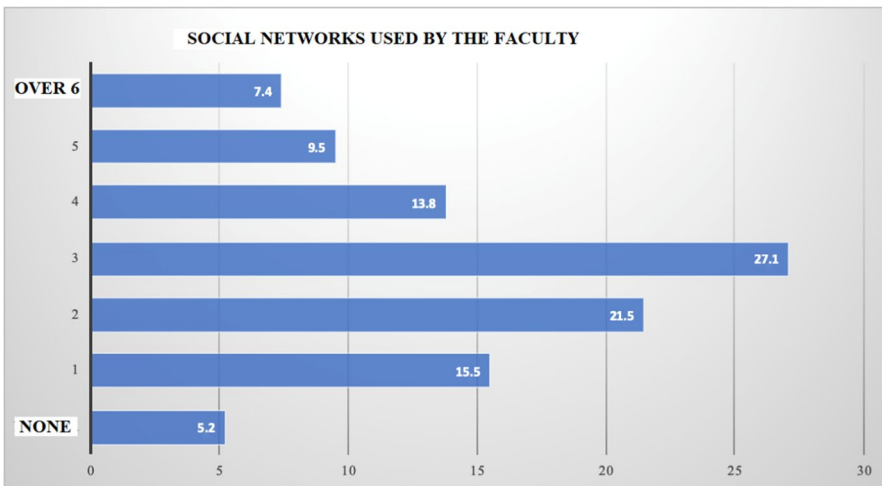


Fig. 2 Social networks used by the faculty

As can be observed in Table 1, all public universities and fields of knowledge are represented. Over half of the participants have 20 or more years of teaching experience (51.9%), which grant stability to the findings of this study, as this indicates that these faculty members have developed their teaching career for many years.

With respect to their digital profile, only 1.5% did not use technology in their teaching practice. Similarly, Figs. 1, 2 shows that 24% of the faculty use technology in 51–75% of the classroom time, whereas almost 30% of them use technology

in 11–25% of the classroom time. Only 7.6% of the faculty spend 0–10% of the classroom time using technology.

With respect to their competence for the management of different technologies, the results indicate that, in their everyday practice, 81% used a computer, 70% used a Tablet, 72.1% used a Smartphone and 66.4% used the Internet.

As can be observed, most of the sample stated that they use between one and three social networks, whereas only 5.2% do not use any social network.

## 2.2 Data-gathering instrument

The questionnaire used is currently being piloted with educators from all Member States of the EU (Joint Research Centre, 2019). It is worth pointing out that each competence is represented by a single item, and thus the most generic concept that encompasses the entirety of the specific content of the competence is selected. The 22 items that compose the questionnaire respond to the 6 competence areas: professional commitment (4), digital resources (3), digital pedagogy (4), evaluation and feedback (3), student empowerment (3) and facilitating student digital competence (5). This article contributes to the translation and adaptation of such instrument to the Spanish context (Appendix 1).

The questionnaire was administered online to all the Teaching Staff of the public universities, after two weeks it was sent again to those who had not answered and to those who were returned, because the email address was not correctly stated. Finally, the study had the answers of a total of 2,262 professors from different public universities in Andalusia.

## 2.3 Data gathering and analysis procedure

The instrument was administered on-line, using “Google Forms”, in the first months of the year 2021 in the different public universities of Andalusia. The data matrix was modified for operational reasons, although it is worth mentioning that such recoding does not affect the validity and reliability of the measure. The reliability, discriminant validity and convergent validity of the questionnaire were calculated using the following coefficients: Cronbach’s alpha, McDonald’s omega, composite reliability (CR), average variance extracted (AVE) and maximum shared variance (MSV).

To determine the construct validity of the instrument, an exploratory factor analysis (EFA) was carried out. The factor selection was performed using the main components method. The obtained factors were orthogonally rotated using the varimax method with Kaiser normalisation. The SPSS statistical software was used to carry out all statistical analyses.

After defining the number of factors, a confirmatory factor analysis (CFA) was performed to confirm the variables and structure of the instrument, by modeling diagrams and using structural equations (Ruiz et al., 2010). The method used to test the theoretical model was weighted least squares (WLS), which provides consistent

estimations in samples that do not meet normality criteria (Ruiz et al., 2010). For this last procedure, the AMOS statistical software was used. The “Kolmogorov–Smirnov goodness-of-fit test” was also carried out, which allowed confirming that the data are not normally distributed, with a significance (p-value) of 0.000 for all items (non-normal distribution).

### 3 Results

The reliability of the instrument was analysed using Cronbach’s alpha and McDonald’s omega, globally and for each of its dimensions. Cronbach’s alpha is the most widely used method for the estimation of the internal consistency, although some authors have defined the use of the omega coefficient, as it is a more stable calculation that reflects the true reliability level (Ventura-León & Caycho-Rodríguez, 2017).

The results show a Cronbach’s alpha and McDonald’s omega of 0.946 and 0.967, respectively, in the global result. It is established that this index is very high ( $> 0.9$ ), indicating that the questionnaire has a high degree of reliability (O’Dwyer & Bernauer, 2016). The partial results also show high reliability indices for each dimension of the instrument: professional commitment (0.749 and 0.842), digital resources (0.628 and 0.807), digital pedagogy (0.841 and 0.821), evaluation and feedback (0.788 and 0.790), student empowerment (0.733 and 0.784) and facilitating student digital competence (0.853 and 0.898). As can be observed, all dimensions present a reliability of over 0.7, except in the alpha value of digital resources, whereas in the omega value they exceed 0.8, except in evaluation and feedback and student empowerment. Moreover, according to Fox (1987), correlations from 0.700 and even 0.600 are acceptable when estimations of opinion or critique are carried out, and when the scales are applied in different contexts (Barclay et al., 1995).

To determine the validity, we analysed the simple correlations of each item with the theoretical dimension or construct through an exploratory factor analysis. The results are shown in Tables 3, 4.

All items obtained factor loadings above 0.700 with their associated factor. Therefore, all items are integrated in their respective dimensions (Carmines & Zeller, 1979).

The construct validity of the test was obtained through an exploratory factor analysis (previously, the applicability of the factor analysis was confirmed using the KMO test), with a statistically significant coefficient of 0.971, and Barlett’s sphericity test, with significance (p-value) equal to 0.000, indicating that the factor analysis can be applied.

The results, which explain 73.53% of the variance, determine the 6 theoretical factors proposed:

The removal of items A4, C3, F4 ( $< 0.7$ ) guarantees the content validity and increases the explained variance. In addition to the theoretical model proposed by the exploratory factor analysis (EFA), we performed a confirmatory factor analysis (CFA), which allowed us to compare the results. Some authors highlight the suitability of this confirmatory analysis to validate an instrument adapted to another language or

**Table 3** Correlations of the items with the associated dimensions

	A	B	C	D	E	F
A1	0.721**					
A2	0.727**					
A3	0.782**					
A4	0.773**					
B1		0.761**				
B2		0.726**				
B3		0.763**				
C1			0.806**			
C2			0.817**			
C3			0.772**			
C4			0.823**			
D1				0.828**		
D2				0.780**		
D3				0.845**		
E1					0.863**	
E2					0.836**	
E3					0.780**	
F1						0.770**
F2						0.794**
F3						0.762**
F4						0.775**
F5						0.803**

applied to a different population, since it is not possible to guarantee that the items are understood in the same way, or that the latent variables or factors have the same conceptualisation (Batista-Foguet et al., 2004). The aim is to confirm the variables and the structure of the scale, showing the existing relationships between the different dimensions. Figure 3 presents the proposed structure diagram with the item-dimension and dimension-dimension correlation indices.

As can be observed in the model, the six latent variables or dimensions are adequately correlated with their items; likewise, there is a strong correlation between dimensions (0.63 and 0.95), and there are weak correlations only between dimension D-B and item B3 (0.49). These were considered within the limitations of the study, although the results confirm the proposed theoretical model.

To evaluate the quality of the model, the goodness-of-fit indices were calculated. Table 5 shows the obtained and reference values for the fit of the model according to (Lévy et al., 2006): Chi-Squared (CMIN), goodness-of-fit



**Table 4** Rotated component matrix

Item	Dim_A	Dim_B	Dim_C	Dim_D	Dim_E	Dim_F
A1	0.768					
A2	0.707					
A3	0.789					
A4	0.600					
B1		0.763				
B2		0.710				
B3		0.510				
C1			0.766			
C2			0.746			
C3			0.677			
C4			0.759			
D1				0.771		
D2				0.759		
D3				0.762		
E1					0.718	
E2					0.708	
E3					0.727	
F1						0.741
F2						0.739
F3						0.774
F4						0.614
F5						0.753

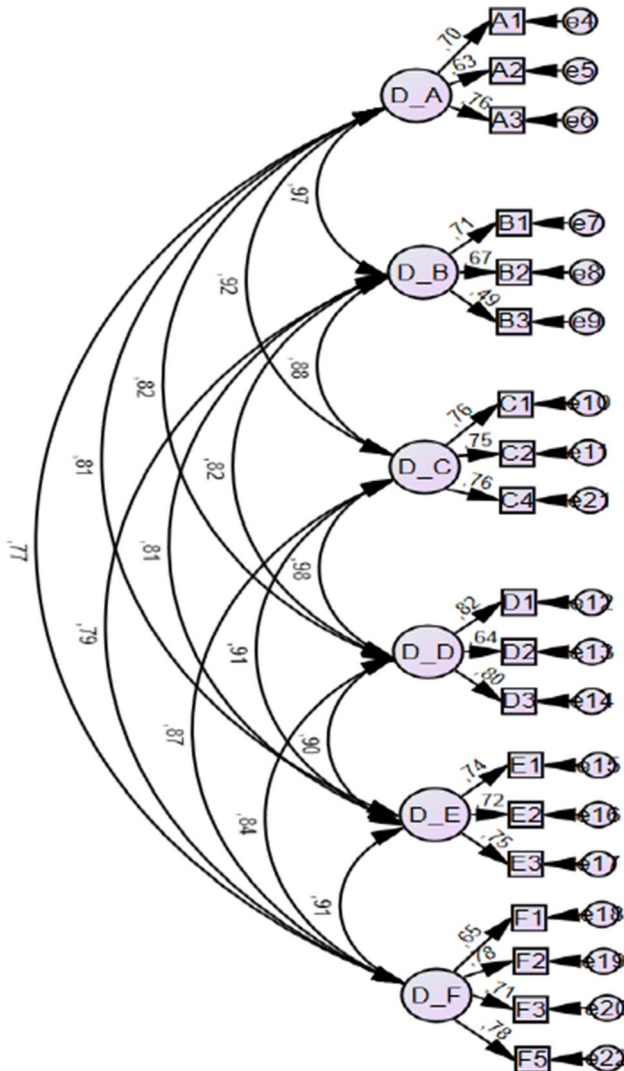
index (GFI), parsimony goodness-of-fit index (PGFI), normed fit index (NFI) and parsimony normed fit index (PNFI).

Complementarily, we calculated the coefficients of composite reliability (CR), average variance extracted (AVE) and maximum shared variance (MSV). Table 6 shows the results and the reference values for the fit of the model (Hair et al., 2010).

All the obtained values fit the reference values. Therefore, the reliability of the model (CR) and its convergent (AVE) and discriminant (MSV) validity are demonstrated.

## 4 Discussion and conclusions

The aim of the present study was to provide a tool with a high potential to measure and identify the digital competence of faculty members, focusing on student inclusion and empowerment. This work considered the UNESCO International Report on the Future of Education (2020), which indicates that the educational response to the COVID-19 crisis showed the capacity of educators to make use of their professional knowledge and collaborate in a creative manner (UNESCO, 2021). Many studies have been carried out on teacher digital competence in the Spanish educational context



**Fig. 3** Structure diagram of the «Digcompedu Check-In» questionnaire

**Table 5** Fit indices

Indices	Result	Fit
CMIN	395.744	CMIN < 500
GFI	0.962	GFI > 0.7
PGFI	0.770	PGFI > 0.7
NFI	0.956	NFI > 0.7
PNFI	0.766	PNFI > 0.7

**Table 6** Convergent and discriminant validity of the model

Dimension	CR	FIT	AVE	FIT	MSV	FIT
A	0.739	CR > 0.7	0.687	AVE > 0.5	0.548	MSV < AVE
B	0.756		0.694		0.548	
C	0.802		0.674		0.558	
D	0.800		0.674		0.458	
E	0.779		0.640		0.536	
F	0.823		0.640		0.420	

(Bullón et al., 2009; Cabero-Almenara et al., 2011; Durán et al., 2019; Lores Gómez et al., 2019; Touron et al., 2018) and in the international education context (Drossel & Eickelmann, 2017; Engen, 2019; Pérez Díaz, 2019; Reisoğlu & Çebi, 2020); however, the transformations caused by ICTs in the education system (at all levels, i.e., from early childhood education to higher education) have made it necessary for researchers and educators to design, validate and establish a common teacher digital competence framework. In this sense, the present study gains relevance, since the “DigCompEdu Check-In” scale was validated for two large groups: a) non-university educators, which includes early childhood, primary and secondary education and baccalaureate; and b) faculty members.

With respect to the reliability and validity of the “DigCompEdu” instrument, the findings allow generating accurate scientific knowledge for the improvement of education quality in universities and non-university institutions, as well as providing propositions for the design of training and counseling plans (Gisbert Cervera & Lázaro Cantabrana, 2015; Roblero, 2020; Rodríguez-García et al., 2019), developing alternatives that can attend to the demands of the Society of Knowledge (García-Valcárcel et al., 2015).

As is shown by many of the obtained results, the «DigCompEdu Check-In» instrument shows high reliability indices, both globally and in all its dimensions, with values that can be considered valid, since most of them are similar to those obtained by its authors in the German context (Ghomi & Redecker, 2019); thus, a priori, the tool shows great acceptance for the analysis of the European Framework for the Digital Competence of Educators.

Among the future research lines, we propose replicating this study in other university or non-university contexts, which would increase its reliability and validity. In turn, this study allows generating other studies in different lines, such as actions that enable educators to measure their teacher digital competences, although without self-perception, and the possibility of creating a tool that incorporates a larger number of items than the diagnostic instrument.

With respect to the limitations of the study, the type of measurement instrument, i.e., a questionnaire designed for teachers to self-evaluate their competences, may influence the use and application of the validated scale. This could be solved by contemplating some complementary measure of concurrent validity that grants robustness to the empirical evidence.

## Appendix 1

**Table 7** Translation and adaptation of «DigCompEdu Check-It»

AREA	COMPETENCE	ITEM	INDICATOR	LEVEL
I. Professional commitment	A. Organisational communication	I systematically use digital means to improve my communication with my students, their families and my colleagues. For instance: e-mail, messaging applications such as WhatsApp, blogs, the educational centre's website....	I rarely use digital communication means	A1
			I use basic digital communication means. For instance, e-mail	A2
			I combine different communication means. For instance: e-mail, the classroom blog, the educational centre's website....	B1
			I systematically select, adjust and combine different digital solutions to communicate effectively	B2
			I proactively reflect, discuss and carry out my communication strategies	C1
B. Professional collaboration		I use digital technologies to work with my colleagues inside and outside of my educational organisation	I rarely have the chance to collaborate with other colleagues	A1
			Sometimes I exchange materials with colleagues. For instance: using a pen drive, e-mail....	A2
			Among colleagues, we work together in collaborative environments or use shared units	B1
			I exchange ideas and materials with faculty from outside of my organisation, for instance, in an on-line teacher network	B2
			I create materials in a collaborative manner with other teachers in an on-line network	C1

Table 7 (Continued)

AREA	COMPETENCE	ITEM	INDICATOR	LEVEL
	C. Reflective practice	I actively carry out my teacher digital competence	I rarely have time to work on my teacher digital competence	A1
			I improve my competence through reflection and experimentation	A2
			I use different resources to develop my teacher digital competence	B1
			I discuss with my colleagues the use of digital technologies to innovate and improve the educational practice	B2
			I help my colleagues to develop their teaching strategies with digital technology	C1
	D. Digital training	I participate in on-line training courses. For instance: on-line courses of the administration, MOOCs, webinars...	It is something I have not considered yet	A1
			Not yet, but I am interested in it	A2
			I have participated in 1 or 2 on-line teacher training courses	B1
			I have participated in more than 2 on-line teacher training courses	B2
			I frequently participate in all sorts of on-line courses that improve my training as a teacher	C1
	A. Selection	I use different websites and search strategies to find and select a wide range of digital resources	I rarely use the Internet to find resources	A1
			I use search engines (e.g., Google) and/or educational platforms to find educational resources	A2
			I evaluate and select the digital resources that I find based on their suitability for my group of students	B1
			I compare the resources using a set of relevant criteria for my educational practice. For instance: quality, pedagogical adjustment, design and interactivity...	B2
			I advise colleagues about adequate digital resources and their search strategies	C1

Table 7 (Continued)

AREA	COMPETENCE	ITEM	INDICATOR	LEVEL
3. Digital pedagogy	B. Creation and modification	I create my own digital resources and modify the existing ones to adapt them to my needs as a teacher	I do not create my own digital resources	A1
			I create sheets of activities using the computer and then print them	A2
			I create presentations with digital slides. For instance: Power Point, Prezi...	B1
			I create and modify different types of digital resources	B2
			I set-up and adapt complex and interactive resources	C1
	C. Administration, exchange and protection	I safely protect the sensitive content. For instance: exams, marks, personal data...	I do not need to do that, because the educational centre does that	A1
			I avoid storing personal data electronically	A2
			I protect some personal data	B1
			I protect files with personal data using a password	B2
			I exhaustively protect personal data. For instance: by combining complex passwords, coding files, performing frequent software updates...	C1
A. Teaching	I carefully consider how, when and why I use digital technologies in the classroom, in order to guarantee that their added value is properly exploited	I do not use or rarely use technology in the classroom	A1	
		I make a basic use of the available equipment. For instance: audio, television, projector, digital board...	A2	
		I use a great variety of digital strategies in my teaching	B1	
		I use digital tools to systematically improve my teaching	B2	
		I use digital tools to implement innovative pedagogical strategies	C1	

Table 7 (Continued)

AREA	COMPETENCE	ITEM	INDICATOR	LEVEL
	B. Guides	I supervise the activities and interactions of my students in the on-line collaboration environments that we use	I do not use digital environments with my students	A1
			I do not supervise the activity of the students in the on-line environments that we use	A2
C. Collaborative learning			Sometimes I revise and consider them	B1
			I regularly supervise and analyse the on-line activity of my students	B2
			I regularly intervene with comments to motivate or correct the on-line activity of my students	C1
			My students do not work in teams	A1
		When my students work in groups or teams, they use digital technologies to acquire and document knowledge	It is not possible for me to integrate digital technologies in group work	A2
			I encourage the students who work in groups to search for information on-line or to present their results in digital format	B1
D. Self-directed learning		I use digital technologies to allow my students to plan, document and evaluate their learning by themselves. For instance: self-evaluation tests, digital portfolio, blogs, forums...	When they work in groups, I always ask them to use the Internet to find information and present their results in digital format	B2
			My students exchange and create knowledge jointly in a space of on-line collaboration. For instance: classroom blog, virtual platform, wiki...	C1
			It is not possible in my work environment	A1
			My students reflect on their learning, but not with digital technologies	A2
			Sometimes I use, for example, tests for self-evaluation	B1
			I use a wide variety of digital tools to allow my students to plan, document and reflect on their learning	B2
			I systematically integrate different digital tools to allow my students to plan, monitor and reflect on their progress	C1

Table 7 (Continued)

AREA	COMPETENCE	ITEM	INDICATOR	LEVEL	
4. Evaluation and feedback	A. Evaluation strategies	I use digital evaluation strategies to monitor the progress of my students	I do not supervise the progress of my students	A1	
			I regularly supervise the progress of my students, but not with digital means	A2	
	B. Analysis of evidence and tests		I analyse all the available data to identify those students who need additional support. "Data" include: student participation, performance, marks, attendance, activities and social interactions in on-line environments... The "students who need additional support" are those who show: risk of dropping out, low performance, learning disorder, specific learning needs or a lack of transversal skills (social, verbal or study skills)	Sometimes I use digital evaluation tools. For instance: a questionnaire, on-line multiple-choice tests....	B1
				I use a wide variety of digital tools to evaluate and monitor the progress of my students	B2
				I systematically use a wide variety of digital tools to evaluate and monitor the progress of my students	C1
				These data are not available and/or their analysis is not my responsibility	A1
				I only analyse academically relevant data. For instance: performance, marks....	A2
				I consider data on the activity and behaviour of the students to identify those who need additional support	B1
				I regularly examine all the available evidence to identify the students who need additional support	B2
				I systematically analyse the data, identify the students with additional support needs and intervene in a timely manner	C1
C. Feedback and planning	I use digital technologies to promote effective feedback	Feedback is not necessary in my work environment	A1		
		I provide comments to my students, but not in digital format	A2		
		Sometimes I use digital means to provide comments. For instance: automatic scores in on-line questionnaires, comments or "likes" in on-line environments....	B1		
		I use a wide variety of digital means to provide feedback	B2		
		I systematically use digital means to provide feedback	C1		



Table 7 (Continued)

AREA	COMPETENCE	ITEM	INDICATOR	LEVEL
5. Student empowerment	A. Accessibility and inclusion	When I propose digital tasks, I consider and approach possible problems, such as egalitarian access to the digital resources and devices, compatibility issues or low student digital competence	I do not usually propose digital tasks	A1
			My students do not have problems accessing and using digital technology	A2
			I adapt the task to minimise the difficulties	B1
			I discuss possible barriers with my students and I propose solutions	B2
			I am flexible with the digital tasks and allow variety. For instance: I adapt the task, discuss solutions, offer alternative ways of completing the task...	C1
			In my classes, all students must do the same activities	A1
	B. Differentiation and personalisation	I use digital technologies to provide personalised learning opportunities to my students. For instance: assigning different digital tasks to approach their individual learning needs, considering their preferences and interests....	I provide my students with additional digital resources	A2
			I provide optional digital activities for those students who have a more advanced level or those who need support	B1
			Whenever possible, I use digital technologies to provide differentiated learning opportunities	B2
			I systematically adapt my teaching to link it to the individual learning needs, preferences and interests of my students	C1
			In my classes, it is not possible to actively involve the students	A1
			I actively involve my students, but not with digital technologies	A2
C. Active participation of the students	I use digital technologies so that my students participate actively in class	In my classes, I use motivating digital stimuli. For instance: videos, animations, cartoons...	B1	
		My students engage with digital means in my classes. For instance: on-line activities, games, quizzes, applications...	B2	
		My students systematically use digital technologies to search, discuss and create knowledge	C1	

Table 7 (Continued)

AREA	COMPETENCE	ITEM	INDICATOR	LEVEL
6. Facilitating student digital competence	A. Media information and literacy	I teach my students how to evaluate the veracity of the information found in the Internet and to identify erroneous and/or biased information	This is not possible in my subject or work environment	A1
			Sometimes I remind my students that not all the information found in the Internet is reliable	A2
			I teach them to differentiate between reliable and unreliable sources	B1
			I discuss with my students how to verify the accuracy of the information	B2
			We thoroughly discuss how information is generated and how it can be distorted	C1
			This is not possible in my subject or work environment	A1
	B. Digital communication and collaboration	I propose tasks that require the students to use digital means to communicate and collaborate with each other or with an external audience	I rarely require my students to communicate or collaborate on-line	A2
			My students use digital communication and cooperation mainly among them	B1
			My students use digital means to communicate and cooperate among them and with an external audience	B2
	C. Creation of digital content	I propose tasks that require the students to create digital content. For instance: videos, audios, photos, presentations, blogs, wikis...	I program systematic tasks that allow my students to expand their communication skills by communicating among them and with external audiences	C1
			This is not possible in my subject or work environment	A1
			This is difficult to implement with my students	A2
			Sometime, as a fun activity	B1
			My students create digital content as an integral part of their learning	B2
			It is an integral part of their learning and I systematically increase the level of difficulty to further develop their skills	C1

Table 7 (Continued)

AREA	COMPETENCE	ITEM	INDICATOR	LEVEL
	D. Responsible use and well-being	I teach my students how to behave safely and responsibly when using the Internet	This is not possible in my subject or work environment	A1
			I inform my students that they must be careful when transmitting personal information on-line	A2
			I explain the basic rules to act safely and responsibly in on-line environments	B1
			We discuss and agree on rules of on-line behaviour	B2
			We systematically develop social rules for the students in the different digital environments that we use	C1
	E. Digital problem solving	I encourage my students to use digital technologies creatively to solve specific problems. For instance, overcoming emerging barriers or challenges in their learning process	This is not possible with my students, due to the work environment	A1
			I rarely have the chance to promote digital solutions to the problems of my students	A2
			Occasionally, whenever an opportunity arises	B1
			We often experience with technological solutions to specific problems	B2
			I systematically integrate tasks for the digital resolution of problems in a creative manner	C1

Source: Cabero-Almenara and Palacios-Rodríguez (2019)

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## Declarations

**Conflicts of interest/Competing interests** We wish to confirm that there are no conflicts of interest associated with this publication and no influence from the funders of the study.

**Ethical approval** This research did not include human or animal participants, thus formal consent is not required.

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